

**Cannock Chase District  
Council**

**Environmental Protection Act  
1990, Part 2A: Initial Site  
Investigation**

**Land West of Fiveways,  
Cannock Road, Heath Hayes,  
Staffordshire**

February 2012

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## 1 INTRODUCTION

### 1.1 Terms of Reference

In January 2010, Grontmij Limited (Grontmij) was appointed by Cannock Chase District Council (the Council) to assist in the implementation of the Council's Part 2A Contaminated Land inspection strategy. Part 2A of the Environmental Protection Act 1990 (Part 2A) requires each local authority to inspect areas of land which it believes may constitute Part 2A Contaminated Land.

Contaminated Land is defined in Section 78(2) of Part 2A of the Environmental Protection Act 1990 as:

*“any land which appears to the local authority in whose area the land is situated to be in such a condition, by reason of substances in, on or under the land, that*

- *significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *pollution of controlled waters is being, or is likely to be, caused.*

Further information is provided in the above Act and associated statutory guidance (DEFRA Circular 01/2006 – EPA 1990, Part 2A: Contaminated Land).

Grontmij assisted the Council to prioritise a list of sites which could constitute Part 2A contaminated land for inspection, on the basis of the Council's Part 2A Inspection Strategy. The site subject to this report, located at Newlands Court and Newlands Lane, to the west of Fiveways, Cannock Road, Heath Hayes, Staffordshire (hereafter referred to as 'the site') was identified as a priority for inspection as:

- Environment Agency records indicate that the site operated as a landfill site between 1960 and 1965 - the type of waste received is unspecified. Historic mapping contained in reports held by the council pertaining to adjacent sites indicate that the southern end of the site may also comprise an infilled railway cutting.
- The site is considered to be sensitive as residential properties with gardens and playing fields overly the inferred extent of landfill.

Following the completion of a desktop study (see Appendix A), Grontmij was subsequently appointed by the Council to implement an initial exploratory site investigation, which was undertaken in December 2010, with follow up work undertaken throughout 2011. This report presents the findings of the investigation and assesses the significance of the contaminant concentrations detected.

This report is subject to the limitations presented in Appendix B.

## 2 BACKGROUND INFORMATION

### 2.1 Site Setting

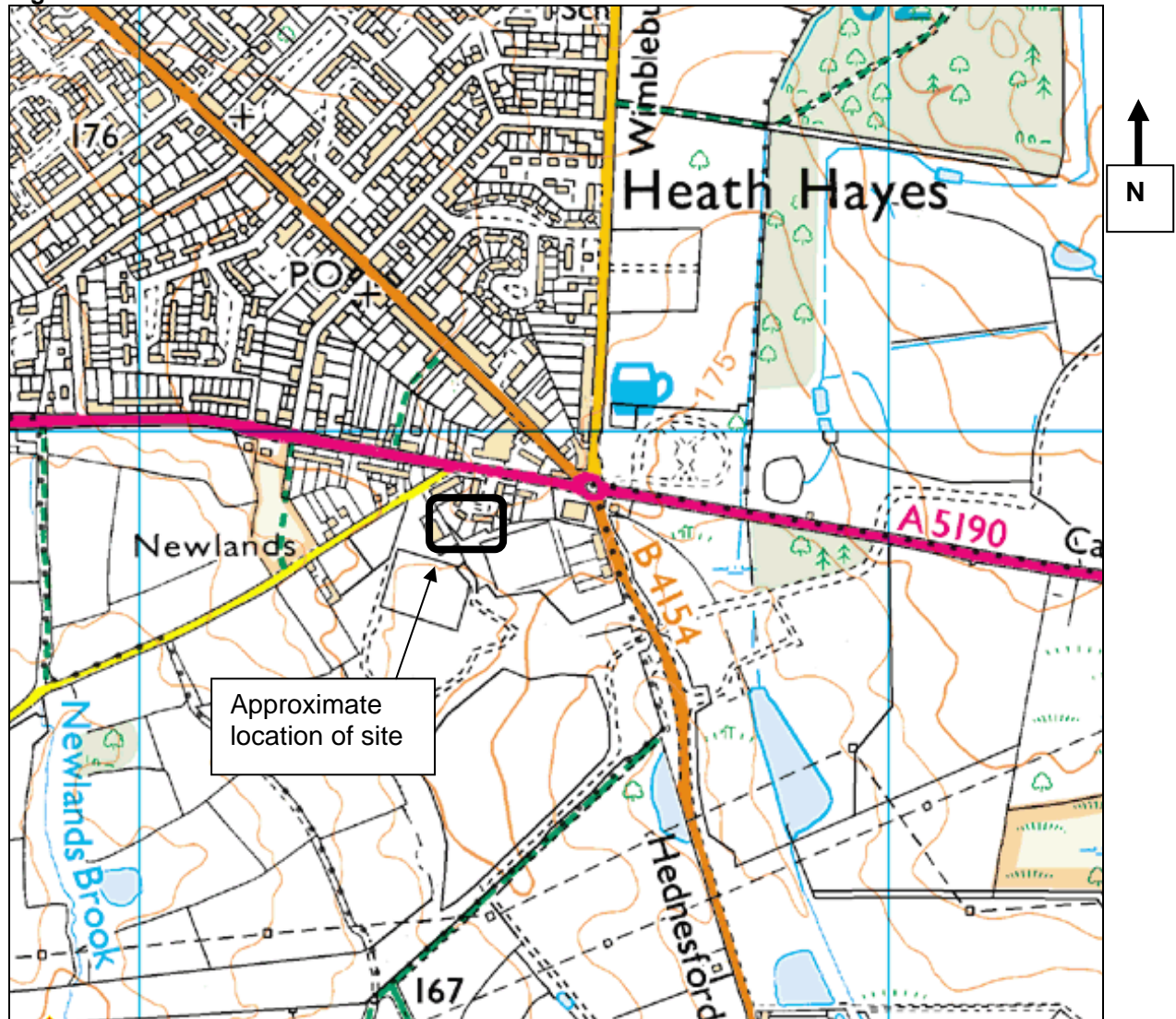
The site's setting and location are summarised in Table 2.1 and Figure 2.1.

**Table 2.1 – Site Setting**

Data	Information
Address	Former landfill beneath Newlands Court / Lane, to the west of Fiveways, Cannock Road, Heath Hayes, Staffordshire, WS12 3HZ.
Current site use:	Residential houses and gardens. Houses appear to have been constructed in late 1980's/early 1990's
Grid Reference:	Centre of site located at NGR 401503,309907
Site Area:	Approximately 1.5 ha.
Topography:	Site is generally flat; surrounding area falls gently towards the south-east
Surrounding land use	North: Cannock Road adjacent, residential properties beyond East: Residential (flats) adjacent, tyre-fitting centre approx 50m South: Playing fields and open land West: Residential / telephone exchange / open land
Mapped Geology	British Geological Survey (BGS) mapping indicates that the site is underlain by glacial till over Middle Coal Measures. The likely thickness of deposits is not stated.
Hydrogeology	The Coal Measures are regarded as a secondary A aquifer by the Environment Agency.
Abstractions	Environment Agency website indicates that there are no public (i.e. EA licensed) potable water abstractions within a 1km radius of the site
Source Protection Zones (SPZs)	The Environment Agency website indicates that the site does not lie within a SPZ.
Surface Waters	A pond is located approximately 300m south east of the site. Streams are located approximately 300m east and 500m south west of the site.
Historical Land Use	Environment Agency records indicate that the site operated as a landfill site between 1960 and 1965, the type of waste received is unspecified. Historic mapping contained in previous reports (Section 2.1) indicate that the southern end of the site may also comprise an infilled railway cutting. The site was subsequently developed with residential properties with gardens.
Ecologically designated sites <sup>1</sup>	Multi Agency Geographical Information for the Countyside (MAGIC) search identified "Biddulph's Pool and No Man's Bank" SSSI, located approximately 800m to the east (assessed to be too distant to be credibly affected by the study site). The SSSI is designated due to its Dwarf Shrub Heathland habitat
Archaeologically important sites	Pastscape website (English Heritage) indicates that there are no Archaeologically important sites within 250m of the site

<sup>1</sup> Includes sites designated as Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Special Area of Conservation (SAC, including candidate sites), Special Protection Area (SPA including potential sites), listed Wetlands of International Importance (Ramsar site) and Local Nature Reserves (LNR).

**Figure 2.1 – Site Location**



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## 2.2 Previous Reports

Grontmij has previously completed a desktop assessment of the site, as presented as Appendix A. The assessment included the review of on-line data resources, in-house mapping and records provided by the council, and a site walkover.

The desk study report included an initial Conceptual Site Model (CSM) of potential pollutant linkages, developed in accordance with the model procedures<sup>2</sup> and statutory guidance<sup>3</sup>. The CSM is re-presented as Table 2.2 overleaf.

<sup>2</sup> CLR11 Model Procedures for the Management of Land Contamination (EA & DEFRA September 2004)

<sup>3</sup> DEFRA Circular 02/2006, Environmental Protection Act 1990: Part IIA Contaminated Land., September 2006.

**Table 2.2 - Potential Pollutant Linkages**

No.	Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage <sup>1</sup>	Probability Of Linkage Occuring <sup>1</sup>	Overall Risk <sup>1</sup>	Comments
1	Residents of properties above infilled ground (including children playing in gardens)	Contaminants including (but not limited to) metals, hydrocarbons, (including PAHs), VOCs and SVOCs) and asbestos within landfill material and associated with use of former mineral railway. Off-site analysis has identified potentially elevated metals, TPH and PAH concentrations	Dermal contact and direct ingestion, inhalation of dust/vapours, consumption of home-grown vegetables	Medium	Likely	Moderate	Grass and/or topsoil coverage likely to mitigate risk to an extent – risk is greatest where possibly impacted soils are exposed or could be encountered, for example, when digging a vegetable patch or when children play outdoors. Properties are constructed directly above a potentially significant contamination source. Sample collection and analysis required to enable application of statistics, speciate TPH and PAH results, and refine conclusion on risk
2	Residents of properties above infilled ground	Methane and carbon dioxide from decomposition of deleterious elements of landfill material	Movement into buildings, subsequent asphyxiation and explosion risk	Medium	Likely	Moderate	Installation and monitoring of wells for gases and flow rates is required to refine conclusion on risk
3	Subsurface services serving the buildings (principally water supply)	Contaminants including (but not limited to) metals, hydrocarbons, (including PAHs), VOCs and SVOCs) within landfill material and associated with use of former mineral railway.	Chemical attack and tainting of water supply could occur at high contaminant concentrations / severe pH levels	Mild	Likely	Low to moderate	Further investigation data needed to refine assessment/CSM
4	Property (Structures) – sub-surface concrete	Sulphate and pH	Contact between contaminants and concrete	Mild	Likely	Low to moderate	Further investigation data needed to refine assessment/CSM

No.	Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage <sup>1</sup>	Probability Of Linkage Occuring <sup>1</sup>	Overall Risk <sup>1</sup>	Comments
5	Secondary A aquifer (Middle Coal Measures) beneath site	Contaminants including (but not limited to) metals, hydrocarbons, (including PAHs), VOCs and SVOCs within landfill material and associated with use of former mineral railway.	Leaching of soil contaminants to aquifer	Medium	Unlikely	Low	Cable percussive BHs advanced at a site 60m to east of the study site generally encountered layers of competent clay and mudstone prior to encountering a sandstone layer. Thus, leaching to the minor aquifer is unlikely (need to confirm presence of clay and mudstone at site, i.e. has not been quarried out)
6	Streams and pond (closest are 300m to south and east; inferred hydraulic gradient is towards south-east)	Contaminants including (but not limited to) metals, hydrocarbons, (including PAHs), VOCs and SVOCs within landfill material and associated with use of former mineral railway.	Leaching of soil contaminants to aquifer and subsequent off-site migration to surface waters	Medium	Unlikely	Low	Cable percussive BHs advanced at a site 60m to east of the study site generally encountered layers of competent clay and mudstone prior to encountering a sandstone layer (need to confirm has not been quarried out). Thus, leaching to the minor aquifer is unlikely. Aquifer also likely to be too deep to be in continuity with surface watercourses. Distance of study site from surface waters also mitigates risk, i.e. significant opportunity for attenuation of contaminants prior to reaching watercourse
7			Direct migration to surface waters within perched groundwater unit at c. 3m bgl	Medium	Unlikely	Low	Unlikely that the perched groundwater unit extends beyond the extent of landfilling and thus, the water would not be in continuity with the off-site watercourses

<sup>1</sup> Taken from Table 6.3, CIRIA report 552 (Contaminated Land Risk Assessment – A Guide to Good Practice). Severity classified as minor, mild, medium or severe. Probability classified as unlikely, low, likely or high. Overall risk considers both the severity and probability of the linkage (very low, low, moderate, high or very high). See extract in Appendix G



### 3 EXPLORATORY SITE INVESTIGATION

In order to further examine the potential pollutant linkages identified in Table 2.2, an exploratory site investigation was undertaken on the 8<sup>th</sup> and 13<sup>th</sup> December 2010. This section describes the site investigation undertaken and results obtained.

#### 3.1 Scope and Methodology

The intrusive site investigation undertaken in December 2010 to March 2011 included the following:

- A consultation exercise with residents living at the site, including a mailshot and a public open evening;
- Obtaining plans of underground services and CAT-scanning proposed drilling locations, using a Radiodetection CAT1 and signal generator;
- Drilling four hand held window sample holes (WS01 – WS04) to a maximum depth of 2.5m bgl, at the locations shown on Drawing 1. The window sample holes, which were drilled by Sherwood Drilling Services, were positioned in the rear gardens of housing located above the extent of infill, as indicated on historical mapping and by anecdotal evidence. Window Sampler positions were selected on the basis of achieving representative initial coverage of the site. The purpose of the window sample holes was to examine shallow and deeper soil conditions (including determination of presence / otherwise of clay or mudstone beneath the made ground, to restrict leaching), enable the retention of samples for laboratory testing, and facilitate the installation of 50mm diameter dedicated gas monitoring wells in each window sample;
- Advancing five hand dug pits (HP01 to HP05) to a maximum depth of 0.7m, to examine shallow soil conditions and augment the coverage of the site provided by the above window sampler holes;
- Logging soil arisings in accordance with BS5930:1999, and additionally noting any visual or olfactory evidence of potential contamination;
- Retaining representative soil samples of the strata encountered, which were selected on the basis of field observations of potential contamination and the aim of achieving good spatial and depth coverage of the site;
- Submitting retained samples to Alcontrol Geochem in cooled coolboxes and under full chain of custody documentation, and instructing the analysis of samples, and;
- Undertaking four ground gas monitoring rounds, using a Gas Data Ltd GFM435 gas analyser with internal flow pod.

Based upon the findings of the intrusive investigation, discussed in this report section, the following additional fieldwork was undertaken:

- Obtaining six additional shallow soil samples on 18<sup>th</sup> May 2011, by means of hand pitting, from #6 Newlands Court, for laboratory analysis for asbestos;
- Collection of four representative made ground samples for leachability testing, by means of hand pitting, on 31<sup>st</sup> May 2011;
- Collection of four tap water samples on 31<sup>st</sup> May 2011, for screening against UK drinking water standards, and;
- Obtaining five additional shallow soil samples on 22<sup>nd</sup> November 2011, by means of hand pitting, from #6 Newlands Court, for laboratory analysis for asbestos.

The results of the entire fieldwork programme outlined above are discussed in the following sections.

## **3.2 Results and Discussion**

### **3.2.1 Ground Conditions**

The ground conditions encountered at the site comprised Made Ground only, as discussed in further detail below.

#### *Made Ground*

It was difficult to penetrate through the Made Ground with hand-held drilling equipment, resulting in the refusal of all four hand held window sampler holes at a maximum depth of 2.5m bgl (in WS02). All five hand dug pits were successfully advanced to 0.7m bgl.

The Made Ground was predominantly granular in nature, consisting of gravelly sand with occasional clay layers or pockets. The gravel content of the Made Ground was variable, including fine to coarse ash, glass, quartz, brick, ceramics, fabric, plastic, shale, concrete and metal fragments; whole bricks were also encountered in WS03. Ash was encountered in WS02 (2.2m to 2.5m bgl), WS03 (0.25m to 1.55m bgl) and WS04 (1.5m to 2.0m bgl). A 5cm-thick layer of concrete was encountered in WS01 and WS02 at 0.5m bgl.

#### *Natural Deposits*

Superficial deposits, residual soils or solid geology were not encountered during the investigation due to the shallow refusals in made ground strata.

#### *Groundwater*

Groundwater was not encountered during the advancement of the exploratory holes.

The above findings are discussed further in Section 4 (updated Conceptual Site Model). Exploratory hole logs, providing full details of the strata encountered, are included within Appendix C.

### **3.2.2 Adequacy of Investigation Depth and Spatial Extent**

Superficial or residual deposits or solid geology was not encountered during this initial investigation, meaning that any contamination at greater depth within the made ground has not been intersected and the presence of low-permeability strata beneath the made ground has not been confirmed. Nonetheless, the investigation has enabled the sampling of shallow soils, most likely to pose a risk to human health, and an initial assessment of gas conditions within shallow soils at the site.

Therefore, although increased depth and spatial coverage of the site would be desirable in order to intersect the full depth of infill material, the investigation represents a good initial assessment of ground conditions at the site. The risk of contaminants leaching to controlled waters is discussed further in Section 3.2.6.

### **3.2.3 Field Evidence of Contamination**

The drilling arisings were inspected for visual and olfactory evidence of potential contamination. A summary of field observations recorded is presented in Table 3.1:

**Table 3.1 - Field Evidence of Potential Contamination**

Exploratory Hole	Depth from	Depth to	Visual and Olfactory Evidence of Contamination <sup>1</sup>
WS01	0.15	0.5	Steel, glass, plastic
WS01	0.7	1.15	Ash, plus fibrous material noted at 0.8m
WS02	2.2	2.5	Ash, plus possible hydrocarbon staining at 2.4m
WS03	0.25	1.55	Ash
WS04	1.5	2.0	Ash
HP01	-	-	(no evidence noted)
HP02	0.5	0.7	Fragments of black stained timber, broken glass and concrete.
HP03	0.3	0.3	Plastic fragments at 0.30m bgl
HP04	0.0	0.7	Fragments of metal pipe, cable and fabric.
HP05	-	-	(no evidence noted)

<sup>1</sup> Visual and olfactory evidence noted within the soil matrix

### **3.2.4 Soil Analysis Results and Discussion**

Twelve samples were submitted for laboratory analysis, under full chain of custody documentation and within chilled coolboxes, to ALcontrol Geochem of Deeside. ALcontrol holds UKAS and/or MCERTS accreditation for most analyses performed. The samples were selected for analysis on the basis of the observations of potential contamination made in the field, and to achieve good spatial coverage of the site.

Table 3.2 presents a summary of the analysis results. The results have been compared to screening values protective of human health, assuming the receptor is a residential property where plant uptake of contaminants occurs, and the plants are subsequently ingested by humans. The screening values used, in order of preference, comprise:

- 2009 Soil Guideline Values (SGVs) published by the Environment Agency / DEFRA, generated using the latest Contaminated Land Exposure Assessment (CLEA) model, version 1.06
- Generic Assessment Criteria (GAC) published by Land Quality Management Limited (LQM) or the Environmental Industries Commission (EIC), or calculated by Grontmij, all using CLEA
- SGVs published by the Environment Agency / DEFRA between 2002 and 2007, calculated using prior versions of the CLEA model (applies to lead only).

Full analytical testing results are included as Appendix D.



**Table 3.2 - Soil Analysis Results Summary**

Determinand	No. of Samples Tested	Minimum Value	Maximum Value	SGV / GAC <sup>1</sup>	Locations where SGV or GAC are exceeded
Arsenic	12	5.6	15	32	-
Barium	12	68	450	1300	-
Beryllium	12	0.3	1.9	51	-
Boron (water-soluble)	12	<1	1.1	291	-
Cadmium	12	<0.02	3.5	10	-
Chromium, hexavalent	12	<0.6	6.5	4.3	-
Chromium, total	12	9.4	39	3,000	-
Copper	12	15	200	2,330	-
Lead	12	24	400	450 <sup>2</sup>	-
Mercury	12	<0.14	0.6	170 <sup>3</sup>	-
Nickel	12	6.2	40	130	-
Selenium	12	<1	<1	350	-
Vanadium	12	13	40	75	-
Zinc	12	76	1100	3,750	-
Asbestos screen	10	<b>Asbestos-containing material detected in one sample</b>			<b>HP03 0.7m bgl</b>
Benzene	12	<0.01	0.02	0.16	-
Toluene	12	<0.01	0.02	270	-
Ethyl Benzene	12	<0.01	0.02	150	-
Xylene	12	<0.01	<0.01	98 <sup>4</sup>	-
TPH – CWG Hydrocarbons	7	None of the banded aliphatic/aromatic TPH-CWG screening criteria were exceeded. Full speciated results are presented in Appendix D			-
Polyaromatic Hydrocarbons (PAHs)	6	Several speciated PAH screening criteria were exceeded. Full speciated results are presented in Appendix D			-
<b>Benz(a)anthracene</b>	6	<0.01	<b>26</b>	4.7	<b>WS04 1.2-1.5m bgl</b>
<b>Benzo(a)pyrene</b>	6	<0.02	<b>18</b>	0.94	<b>WS04 1.2-1.5m bgl , HP02 0.7m bgl, WS02 2.2-2.5m bgl</b>
<b>Benzo(b)fluoranthene</b>	6	<0.02	<b>16</b>	6.5	<b>WS04 1.2-1.5m bgl</b>
<b>Chrysene</b>	6	<0.01	<b>20</b>	8	<b>WS04 1.2-1.5m bgl</b>
<b>Dibenz(ah)anthracene</b>	6	<0.02	<b>2.7</b>	0.86	<b>WS04 1.2-1.5m bgl</b>
<b>Indeno(123-cd)pyrene</b>	6	<0.02	<b>7.9</b>	3.9	<b>WS04 1.2-1.5m bgl</b>
Volatile Organic Compounds and Semi-Volatile Organic Compounds (excl.above)	3	All laboratory results below limit of detection with exception of below:			-
Dichloromethane	3	<0.01	0.03	0.98	-
Tetrachloroethene	3	<0.005	0.02	2.1	-
Styrene	3	<0.01	0.02	19	-
bis(2-Ethylhexyl) phthalate	3	<0.1	0.5	610	-
n-Dibutyl phthalate	3	<0.1	0.2	31	-

Values presented in mg/kg, correct to two significant figures (screening values presented without any rounding). **Bold values** indicate locations where observed concentrations exceed the screening value.

<sup>1</sup> Fifteen samples were tested for Soil Organic Matter (%SOM) content. A minimum value of <0.35% and a maximum of 6.14% were recorded, with a mean of 4.28% and a median of 4.24%. It is therefore justified, as a conservative measure, to use the SGVs and GAC generated using a 2.5% SOM value in CLEA in an initial screen, where the SGVs/GAC are SOM-dependant (mercury, phenol, PAHs, TPH-CWG and abovementioned VOCs and SVOCs). All other SGVs / GAC are not SOM-dependant

<sup>2</sup> SGV quoted was generated by DEFRA using earlier version of CLEA. An Environment Agency announcement on how lead will be addressed, including agreement of an acceptable "safe" level, and whether to consider an "uptake" model such as CLEA or alternative "intake" model, is awaited.

<sup>3</sup> Testing results presented represent total mercury. SGV presented is for inorganic mercury, whereas SGV presented is for inorganic mercury. Although the most stringent of the SGVs is for elemental mercury, the Environment Agency SGV for mercury in soil science report SC050021/Mercury SGV indicate that in cases where preliminary risk assessment has not identified a mercury issue at the site or conditions such as peaty or flooded soils then 'For general surface contamination and to simplify the assessment, the SGVs for inorganic mercury can normally be compared with chemical analysis for total mercury content because the equilibrium concentrations of elemental and methyl mercury compounds are likely to be very low'.

<sup>4</sup> SGV for para-xylene quoted (most stringent of the three isomers)

The concentrations of six PAH compounds within the sample taken from WS04, 1.2-1.5m exceeded the adopted Tier 1 screening values. However, this sample was taken at 1.2 to 1.5m bgl, at which dermal contact with soils and subsequent ingestion (directly or via contact with home-grown vegetables) is unlikely. The only likely means of human exposure to soil at >1.2m depth is via the volatilisation to indoor air pathway, but the identified PAHs are of low volatility - the LQM 2009 report<sup>4</sup> presenting GAC for PAHs indicates, in Table 10-57, that the CLEA model predicts a <0.1% contribution to total exposure via the indoor air pathway for each of the six PAHs of concern. Therefore, in regard to human health, the PAH concentrations recorded in sample WS04, 1.2-1.5m bgl are not of concern.

The concentration of benzo(a)pyrene in two further samples was also greater than the adopted Tier 1 screening value. Similarly to above, one of these samples was taken at >1m depth, and is not considered to present a risk to human health. The remaining sample was taken at 0.7m bgl in HP02, where a benzo(a)pyrene concentration of 1.6mg/kg was recorded. While this concentration exceeds the adopted Tier 1 screening value of 0.94mg/kg, and thus is in excess of the GAC, which essentially represents a concentration at which risk to human health is negligible, it is unlikely to present an unacceptable risk to human health when the Margin of Exposure (MoE) is considered.

The MoE approach essentially involves:

- Re-examination of the “point of departure” (PoD) contaminant concentration, above which unacceptable human health risk is predicted to occur, used in the generation of GAC. The PoD used to generate published GAC is normally a conservative interpretation of the “fit” of dose-response data, to be definitively protective of human health. From conversations with the Institute of Occupational Medicine (IOM), the interpretation of “fit” can be highly subjective, and a less conservative interpretation resulting in a greater screening value would be equally justifiable.
- Comparison of the “new” PoD concentration with predicted exposure at the study site.

Allied to the above, it is also possible for the risk assessor to re-consider what level of human health risk is considered acceptable (or more accurately, at what soil concentration relative to typical background concentrations in UK soils does the human health risk become unacceptable). The UK approach to unacceptable risk has typically been to consider that a risk greater than one excess death in 100,000 to be unacceptable, while there is evidence to support a slightly lower threshold of one in 10,000 as acceptable (see Section 5.5 of IOM report referenced below, referring to Committee on Carcinogenity research).

In the case of benzo(a)pyrene, we are aware of a previous study undertaken by the IOM<sup>5</sup> for a local authority, where a MoE-based screening value of between 1.7mg/kg and 3.6mg/kg for residential housing with gardens has been proposed as being unlikely to pose a Significant Possibility Of Significant Harm (SPOSH) to human health, on the basis of re-examination of toxicological evidence and the adoption of a “one excess death in 10,000” risk threshold. The maximum concentration of B(a)P recorded at the study site, at a depth of <1m where human exposure is credible, is 1.6mg/kg, lower than the proposed concentration range. On this basis, we consider that the B(a)P concentration recorded at the site is unlikely to pose a SPOSH to human health.

<sup>4</sup> The LQM / CIEH Generic Acceptance Criteria for Human Health Risk Assessment (2nd Edn). Land Quality Press, 2009

<sup>5</sup> Toxicological Review of the Risks of Exposure to Soil Containing Polycyclic Aromatic Hydrocarbons. Institute of Occupational Medicine, March 2009

Note: as the IOM “unlikely SPOSH” value of 1.7mg/kg to 3.6mg/kg is very similar to typical UK background soil concentrations of B(a)P cited in the above report, the IOM have further proposed that the “possibility of significant harm” to human health is only likely to become possibly “significant” (i.e. SPOSH) when B(a)P concentrations of around ten times the above concentrations (i.e. at least 17mg/kg) are recorded. This statement further reduces the perception of human health risk at the study site.

The recorded PAH concentrations in the two samples taken at >1m depth, while not considered to pose a risk to human health, are sufficiently high to potentially pose a leaching risk to controlled waters. Coupled with the fact that the exploratory holes all terminated in made ground without proving the presence of low-permeability soils, the observed concentrations suggest that leachability testing should be undertaken to confirm the risk to controlled waters (see Section 3.2.6).

The above opinions are based on a publically available qualitative assessment of recent work undertaken by others around the concentrations of polyaromatic hydrocarbons that may constitute SPOSH. It is not a detailed quantitative risk assessment (dQRA) for the Fiveways site. A dQRA to specifically consider the situation is beyond the scope of work agreed at this stage, but could be completed for Cannock DC if requested, to substantiate the views above and provide a more detailed review of SPOSH for the levels of polyaromatic hydrocarbons at the Fiveways site.

### **3.2.5 Asbestos Containing Materials within Soils**

During the investigations at the site, asbestos containing material (ACM) was identified in two locations:

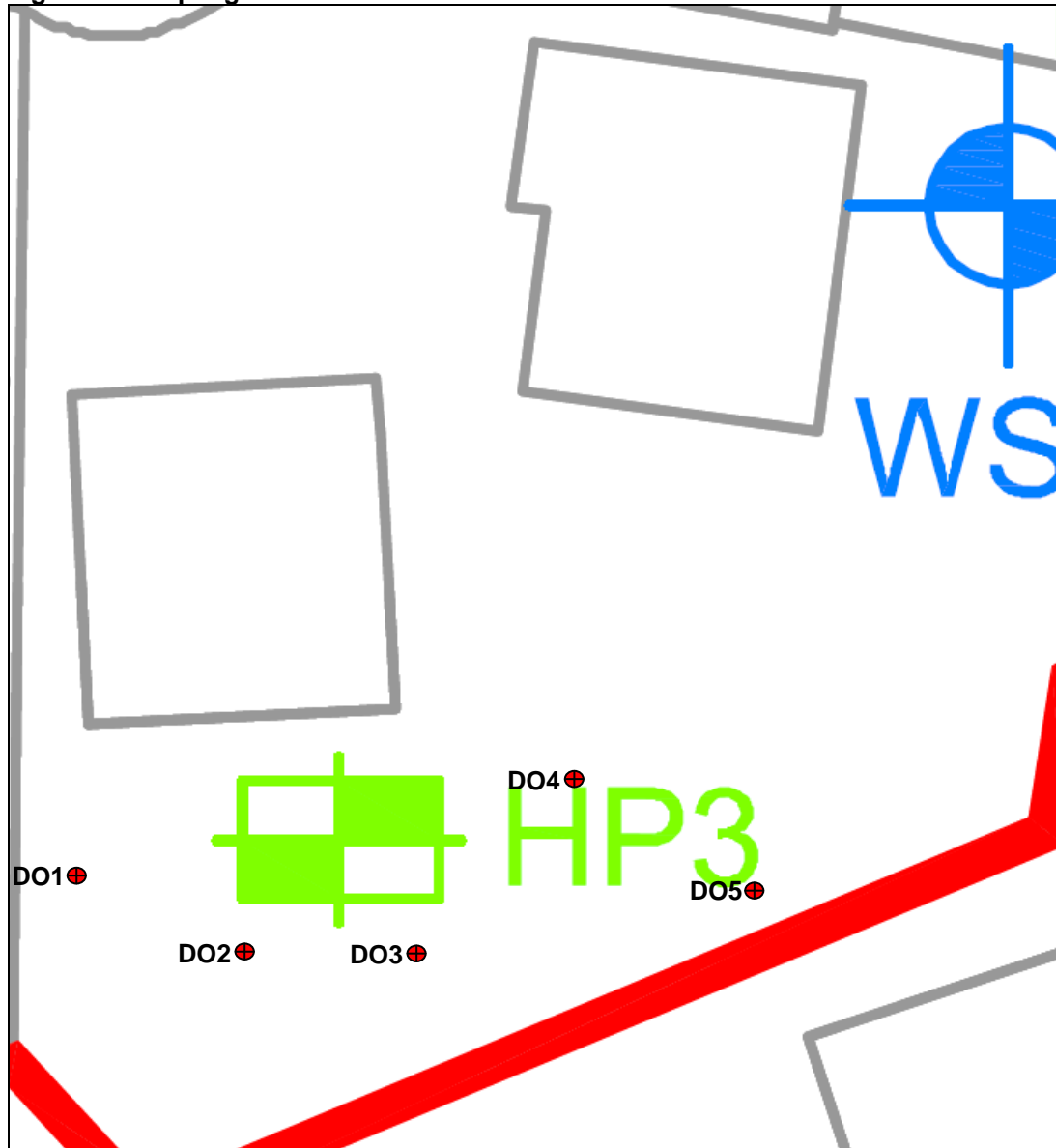
- During the original December 2010 investigation, where ACM was identified in HP3, 0.7m (rear garden of #6 Newlands Court).
- During the collection of a sample intended for leachate analysis from #11 Newlands Court on 31<sup>st</sup> May 2011. The sample was reported to be “typical of asbestos cement”, and that it contained both chrysotile and crocidolite asbestos fibres.

To examine whether the above two results were “chance positive” results of positioning the exploratory holes in particular locations in the gardens, or whether there was a potentially more significant presence of asbestos within the affected gardens, follow up sampling work was undertaken on 16<sup>th</sup> May 2011 (#6 Newlands Drive) and 22<sup>nd</sup> November 2011 (#11 Newlands Drive). Up to six additional soil samples were retained from each garden, by means of hand pitting. Disposable PPE suitable for work where asbestos could be encountered was worn by sampling personnel. The soil arisings obtained were placed on plastic sheeting and inspected for obvious visual evidence of possible ACM. Given the lack of obvious field evidence encountered, soil samples were taken from a variety of depths in the top 0.7m of the soil profile, and submitted for laboratory analysis.

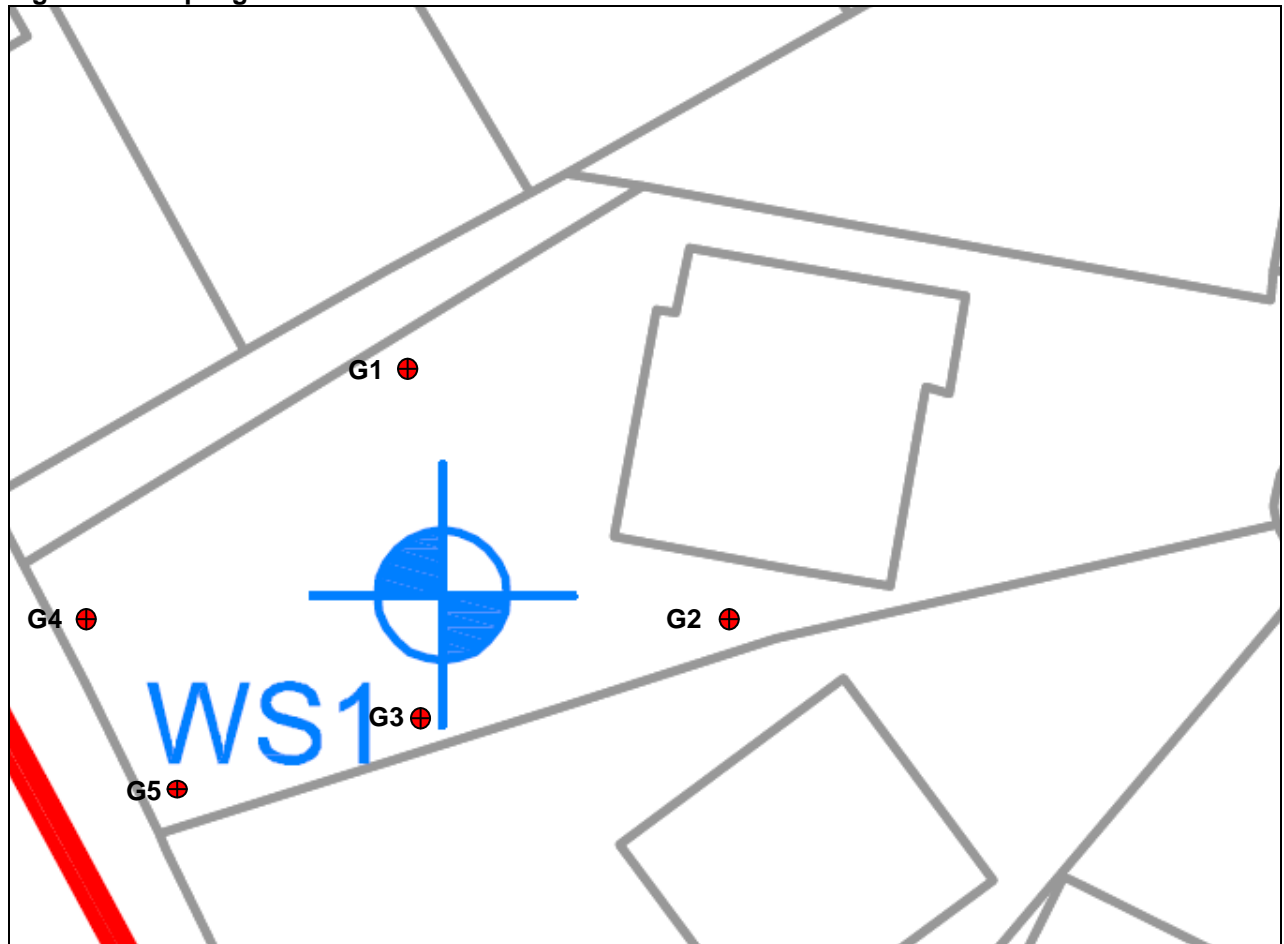
The samples taken on 16/5/11 were submitted to Jones Environmental Laboratory (Jones) and the samples taken on 22/11/11 to Scientific Analysis Laboratories Ltd (SAL), both on the basis of the turnaround each laboratory was able to offer at the time. Both laboratories undertook an analysis in accordance with the UKAS accreditation in operation at the laboratory at the time. However the earlier analysis was undertaken prior to the laboratory’s implementation of a more recent analytical method, meaning that the samples submitted to Jones have been screened for ACM only, while the samples submitted to SAL were screened for both ACM and free fibres in the soil matrix.

The two figures below indicate the locations from which soil samples were taken:

**Figure 1: Sampling Locations in 6 Newlands Court**



**Figure 2: Sampling Locations in 11 Newlands Court**



#### #6 Newlands Drive Results

Five hand pits (DD01 to DD05) were excavated within borders and flower beds to a maximum depth of 0.5m. Ground conditions typically comprised an indeterminate topsoil/made ground mix, comprising brown sand with gravel of quartz, brick, ash and breeze block, with some shallower rootlets. The material was notably compact and was difficult to penetrate into. A piece of possible asbestos-containing tile was noted in DD01 at 0.3m bgl.

Six samples of made ground were retained from a variety of depths for laboratory testing, including a sample of the possible asbestos-containing tile in DD01two samples retained from differing depths in pit DD1. The laboratory confirmed that none of the six samples contained asbestos-containing material.

#### #11 Newlands Drive Results

Five hand pits (G1 to G5) were excavated within borders and flower beds to a maximum depth of 0.55m. Ground conditions typically comprised brown sandy topsoil, to depths of between 0.05m and 0.25m bgl, over Made Ground, comprising brown slightly clayey gravelly sand. The gravel content of the made ground generally included brick and concrete, with glass, clinker and pieces of metal also noted. Black semi brittle material and gravel of broken tile was noted within sample G1 from 0.15 to 0.45m bgl – this material was suspected to be potentially asbestos-containing.

Five samples of made ground were retained from a variety of depths for laboratory testing. The samples included soil from G1 at 0.3m to 0.4m bgl, to include the material noted to be potentially asbestos-containing in the field.

The laboratory confirmed that the sample from G1 contained a piece of asbestos-containing cement and some asbestos-containing bitumen-backed roofing felt. "Free" asbestos fibres were not detected within the soil element of the sample. The remaining four samples did not contain any asbestos fibres or asbestos containing materials.

### Assessment

At #6 Newlands Court, asbestos was identified in the form of asbestos-containing cement in the original HP3, 0.7m bgl sample; asbestos containing materials were not identified in any of the six samples submitted for testing during the follow-up soil sampling exercise.

At #11 Newlands Court, asbestos was found in two samples (the 31<sup>st</sup> May sample intended for leachate analysis, and in sample G1) in the form of pieces of asbestos-containing cement and a section of asbestos-containing bitumen-backed roofing felt. Asbestos fibres were not detected in the soil at #11 (at the limit of laboratory detection). It is unlikely that asbestos fibres will be liberated from the soil into the air, and potentially inhaled during gardening activities.

The nature of the asbestos-containing materials identified is such that asbestos fibres are likely to be bonded within the cement or roofing felt matrix, and are therefore less likely to be present in the soil itself, as the testing at #11 indicates. While the asbestos containing materials may slowly degrade in the soil, the testing results at #11 (i.e. lack of fibres in soil matrix) provide some evidence that the risk posed to human health at both properties is not high. There are also further reasons why the use of either garden by residents is unlikely to present an unacceptable health risk:

- Digging activities in a garden, and thus potential exposure to ACM in the soil, will be relatively infrequent. Excavation beyond the topsoil is unlikely to occur very often – typically if planting a larger shrub or tree. Thus, while exposure to asbestos in the soil cannot be ruled out, the likelihood of it occurring is comparably low, compared to other activities, such as industrial exposure to asbestos containing materials in poor condition.
- A gardener digging a hole may not encounter asbestos at all –four of the six samples tested at #11 did not contain any asbestos (at the limit of the laboratory's ability to find it).
- Asbestos fibres within soil only pose a potential health risk if liberated into the air when disturbed. It is possible that if asbestos is encountered in the garden, it may not be liberated into the air, as liberation is most likely in dry and windy conditions and in soils with low clay content (as clay tends to retain fibres). While the made ground soil in the garden of #11 has only a low clay content, UK subsoils in general tend to contain a degree of moisture, which will restrict the liberation of fibres.
- The topsoil cover in planted borders and the grass / paving cover elsewhere in the gardens is likely to prevent young children playing in the garden coming into contact with any asbestos containing materials in the made ground.
- Asbestos cement is generally regarded as being a lower risk "state" of asbestos. For example, Health and Safety Executive guidance document HSG247, paragraph 2.6, indicates that the removal of asbestos cement materials does not require a licence, while most other work with asbestos is considered to be more dangerous, and hence licensable.



## Conclusion

The Council's obligation within the Environmental Protection Act 1990, Part 2A is to determine whether there is a Significant Possibility Of Significant Harm (SPOSH), in this case to the health of residents, by virtue of contaminants on, in or under the land. Considering the factors outlined above, it is unlikely that a SPOSH to health is posed by the asbestos containing material identified in either garden.

### **3.2.6 Leachability Assessment**

As the base of the made ground was not proven in the initial investigation (and hence, low permeability strata which may restrict leaching were not identified), and moderate PAH concentrations were recorded in the made ground, further soil samples were retained for leachability testing, in order to consider the potential risk to controlled waters at the site (secondary aquifer, and surface watercourse 300m from site).

Three soil samples were collected on 31<sup>st</sup> May 2011 and were submitted for soil leachate analysis (BS12457 2:1 single stage test, which supersedes the older NRA leachate test) at Alcontrol. The samples were taken from the most likely gardens to contain elevated contaminant concentrations, based upon earlier field observations and testing results, plus locations providing good site coverage. Sampling locations comprised numbers 5 and 9 Newlands Court and 1 Newlands Lane.

Table 3.3 presents a summary of the leachate analysis results. Where threshold values have been published, the testing results have been compared to the following:

- For the secondary aquifer, groundwater threshold values protective of general groundwater quality (not in a drinking water protected area) and of groundwater migrating to a surface watercourse, as quoted in the River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010 ("WFD") and, where no WFD standard exists, UK Drinking Water Standards listed in the Water Supply (Water Quality) Regulations 2000 (as amended). It is noted that such screening values are potentially very conservative, assuming there are no private water abstractions in proximity to the site (there are no public groundwater abstractions for potable use within a 1km radius)
- For the closest surface water feature, 300m downgradient, the most stringent of Environmental Quality Standards published in the from The Surface Waters (Dangerous Substances)(Classification) Regulations 1989 and amendments (from 1992, 1997 and 1998) and standards protective of inland freshwaters in the above WFD.

Full analytical testing results are included in Appendix D.

**Table 3.3 - Soil Leachate Analysis Results Summary**

Contaminant	No of Samples Tested	Minimum Value	Maximum Value	Adopted Groundwater Screening Value	Adopted Surface Water Screening Value
Arsenic	3	2.2	<b>22</b>	<b>7.5</b>	50
Boron	3	25	82	750	2000
Cadmium	3	0.11	<b>0.38</b>	3.75	<b>0.08 to 0.25**</b>
Chromium	3	3.3	<b>12</b>	50	<b>3.4 (VI) / 4.7 (III)</b>
Copper	3	12	<b>40</b>	1500	<b>1 to 28</b>
Lead	3	3.3	<b>31</b>	<b>10</b>	<b>7.2</b>
Nickel	3	3.3	5.8	15	20
Zinc	3	5.9	<b>29</b>	3750	<b>8 to 250**</b>
Mercury	3	0.02	0.04	0.75	0.05
Vanadium	3	3.5	19	n/s	20
Benzene	3	<1.3	<b>&lt;1.3</b>	<b>0.75</b>	10
Toluene	3	<1.4	<1.4	51	50
Xylenes	3	<4.2	<4.2	30	30
Benzo(a)pyrene	3	<0.009	0.00978	0.01	0.05
Naphthalene	3	<0.10	0.11	2.4	2.4
Sum of Benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene*	3	<0.08	<0.08	0.10	n/s
Sum Benzo(b)fluoranthene, benzo(k)fluoranthene	3	<0.05	<b>&lt;0.05</b>	n/s	<b>0.03</b>
Sum benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene*	3	<0.03	<b>&lt;0.03</b>	n/s	<b>0.002</b>

Values are presented as **ug/l** and are rounded as applicable to the screening values used.

**Bold values** indicate locations where observed concentrations exceed the quoted screening value.

\*There are no screening values in the WSWQ Regulations 2000 (as amended) for the remaining commonly analysed 16 PAH compounds

\*\*Dependant on hardness of receiving surface watercourse

The maximum concentrations of arsenic, lead and benzene recorded exceed the adopted groundwater screening values – in the case of benzene, only because the laboratory method detection limit was greater than the adopted screening value. Coal measures strata can contain pyrite and arsenopyrites, which may account for the recorded arsenic and lead concentrations if any mixing of solid geology and made ground has occurred. In all three cases, given the lower sensitivity of the site (assuming there are no nearby private water abstractions), the recorded contaminant concentrations in leachate are considered to be acceptable; furthermore, we consider that it is unlikely that the Environment Agency would pursue any action at this site.

The maximum concentrations of four metals and two “sum of” PAH concentrations exceed the adopted surface waters screening values – in the case of the PAHs, only because the laboratory method detection limit was greater than the adopted screening value. Given that the recorded contaminant concentrations are not especially high, the 300m distance to the nearest surface water feature will allow some dilution, and the surface water features identified may not be in hydraulic continuity with groundwater in the secondary aquifer, it is again considered that



the recorded concentrations in leachate are acceptable, and that it is unlikely that the Environment Agency would pursue any action at this site.

### 3.2.7 Ground Gas Assessment

Four rounds of ground gas monitoring were undertaken, using a Gas Data Instrument GFM435 with internal flow pod. A summary of the maximum gas monitoring results recorded at each well is presented in Table 3.4, with full monitoring data in Appendix E:

**Table 3.4 - Summary of Gas Monitoring Data**

Well	Maximum Values Recorded During Monitoring Events:					Gas Screening Value <sup>1</sup> (l/hr)	Situation "A" Characteristic Situation <sup>1</sup>
	Peak CH <sub>4</sub> (%)	Steady CO <sub>2</sub> (%)	Steady CO (ppm)	Steady H <sub>2</sub> S (ppm)	Flow (l/hr)		
WS1	0.1	0.7	0	-10	0	<0.01	1
WS2	0.1	1.6	0	-10	0.6	0.01	1
WS3	0.1	0.8	0	-10	0.1	<0.01	1
WS4	0.1	0.2	-1	-10	0.7	<0.01	1
Atmospheric Pressure:		28/01/2011			1008mb		
		11/02/2011			994mb		
		25/02/2011			1006mb		
		11/03/2011			997mb		

Readings obtained within a 3 minute measurement period, obtained with a GFM435 gas analyser.

CH<sub>4</sub> – methane; O<sub>2</sub> – oxygen; CO<sub>2</sub> carbon dioxide; CO – carbon monoxide;  
 H<sub>2</sub>S – hydrogen sulphide; mbgl – metres below ground level mb – millibars l/hr – litres per hour.

<sup>1</sup>CIRIA Characteristic Situation based on methodology presented in CIRIA Report C665, Assessing Risks Posed by Hazardous Gases to Buildings. Where the flow rate recorded in the field is zero or negative, a flow of 0.01 l/hr is assumed

The summary data presented above indicates that, in regard to methane and carbon dioxide, CIRIA characteristic situation 1 should be applied to all of the wells. This is the lowest risk category (of six) presented in CIRIA report 665, and indicates that no special gas precautions would be required in the construction of new buildings. Additionally, zero hydrogen sulphide and carbon monoxide was recorded.

Note that natural strata were not encountered in the advancement of the 4 no. window sampler holes, meaning the total depth of fill has not been investigated and the gas monitoring undertaken may not be completely representative of the whole body of fill. However, the window sampler holes gave penetrated to a depth likely to be representative of gas conditions at / below the depth of the floor slabs. Additionally, the infilling of the site occurred approximately 50 years ago, potentially allowing significant degradation of materials to occur and suggesting that the current gassing potential of the site is not high. Therefore, ground gases are unlikely to pose a risk to the housing at the site.

### 3.2.8 Safety of Water Supply Pipes

As a preliminary assessment, soil quality data was screened against WRAS guidelines<sup>6</sup> (current at the time of the initial investigation, but now superseded) and UKWIR parameters<sup>7</sup>. This preliminary assessment, included as Appendix F, indicated that the concentration of contaminants in soil could potentially permeate into water supply pipes. Note that the WRAS and UKWIR

<sup>6</sup> 9-04-03 The Selection of Materials for Water Supply Pipes to be Laid in Contaminated Land. Water Regulations Advisory Scheme, October 2002.

<sup>7</sup> 10/WM/03/21 Guidance for the Selection of Water Supply Pipes to be Use in Brownfield Sites. UK Water Industry Research, 2010 (as re-issued)

guidelines are conservative and are normally used for the selection of materials when laying new pipes.

To confirm whether the concentrations of contaminants in the shallow Made Ground pose a risk to drinking water quality at the site, samples of drinking water were collected from taps from four properties (5, 9 and 11 Newlands Court and 1 Newlands Lane) on 31<sup>st</sup> May 2011. The samples were taken from properties where the highest concentrations of contaminants were encountered in soil, i.e. at locations where the greatest risk to drinking water quality may be posed.

At the instruction of Cannock Chase Council, samples were obtained after allowing the tap to run for one minute. The samples were submitted to Alcontrol Laboratories for chemical analysis for metals and PAHs as commonly occurring contaminants and parameters for which drinking water standards can be applied. The results of the analyses are summarised in Table 3.5, along with a comparison to UK Drinking Water Standards (UKDWS) taken from the Water Supply (Water Quality) Regulations 2000 (as amended). Full testing results are included in Appendix D:

**Table 3.5- Tap Water Analysis Results**

Contaminant	No of Samples Tested	Minimum Value µg/l	Maximum Value µg/l	UKDWS µg/l
Arsenic	4	1.9	2.2	10
Boron	4	81	110	1000
Cadmium	4	0.10	0.17	5.0
Chromium	4	8.2	17	50
Copper	4	49	270	2000
Lead	4	0.05	0.27	10
Nickel	4	0.56	1.8	20
Zinc	4	6.3	95	5000
Mercury	4	<0.01	<0.01	1.0
Sum of Benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene*	4	0.08	0.08	0.10
Benzo(a)pyrene*	4	<0.009	<0.009	0.01

\*There are no screening values in the WSWQ Regulations 2010 for the remaining commonly analysed 16 PAH compounds

\*\*Limit of detection of analytical method

The maximum recorded metal and PAH concentrations within tap water did not exceed the corresponding UK Drinking Water Standards.

## 4 UPDATED CONCEPTUAL SITE MODEL

The CSM presented in the earlier Grontmij desk study report (Appendix A) has been updated, using the findings of the site investigation, as presented in the following sections.

### 4.1 Contaminants

The “contaminants” term in the conceptual model has been updated using the findings of the intrusive investigation. The following contaminants have been identified:

- Asbestos (identified as asbestos-containing material in the gardens of #6 and #11 Newlands Court)
- PAHs - six compounds were identified in WS04, 1.2-1.5m bgl at concentrations in excess of Tier 1 screening values, while benzo(a)pyrene was additionally identified in HP02 0.7m bgl and WS02 2.2-2.5m bgl at concentrations above the Tier 1 screening value.
- Leachable concentrations of arsenic, lead and benzene were recorded at concentrations above the Tier 1 screening values adopted as being protective of groundwater
- Leachable concentrations of four metals and two “summed” PAH concentrations were recorded at concentrations above the Tier 1 screening values adopted as being protective of off-site surface waters

Low concentrations of ground gases were recorded, along with low gas flow rates.

Low concentrations of contaminants were found in the samples of tap water – all concentrations were less than the adopted drinking water standards.

### 4.2 Receptors

Table 4.1 indicates the receptors considered to be present at the site. The critical human receptor is the on-site resident; while off-site residents and commercial workers are also present, the concentrations of contaminants and, in the case of commercial workers, their exposure frequency and duration, is likely to be less than on-site residents, and are not considered further.

See Appendix A (desk study report) for a detailed discussion of the receptors included in the conceptual model.

### 4.3 Pathways

Pathways (pollutant linkages) are also examined as part of Table 4.1, overleaf.

**Table 4.1 - Pollutant Linkages, Post-Site Investigation**

No.	Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage <sup>1</sup>	Probability Of Linkage Occuring <sup>1</sup>	Overall Risk <sup>1</sup>	Comments
1	Residents of properties above infilled ground (including children playing in gardens)	PAHs identified in WS04, 1.2-1.5m bgl at typically 5 x GAC (benzo (a)pyrene at 18 x GAC).  Benzo(a)pyrene in WS02, 2.2-2.5m at less than 2 x GAC	Inhalation of vapours  Dermal contact, direct or indirect ingestion, inhalation of tracked back dust	Medium	Unlikely	Low	The PAHs identified are of very low volatility (CLEA model indicates volatilisation makes <3% contribution to total exposure) and are unlikely to pose a significant volatilisation risk. Dermal, dust or ingestion exposure is not credible due to depth of contamination identified.
2	Residents of properties above infilled ground (including children playing in gardens)	Benzo(a)pyrene identified in HP02, 0.7m bgl at concentration of 1.6mg/kg (less than double the GAC)	Dermal contact and direct ingestion of soil, inhalation of dust/vapours, consumption of home-grown vegetables	Minor	Likely	Low	Concentration of benzo(a)pyrene identified is not considered to pose significant health risk on basis of similar studies at other sites (see discussion in Section 3.2.4)
3	Residents of properties above infilled ground (including children playing in gardens)	Asbestos containing material (not not fibres) identified in one sample (of seven) at #6 Newlands Court and two samples (of six) at #11 Newlands Court	Inhalation of fibres, potentially liberated by gardening activities	Medium (possibly severe, depends whether health effect viewed as chronic or acute)	Low	Low/moderate	Fibres present within bonded material, and not widespread in either garden; may not ever be liberated into air. Risk is not considered to be high (i.e. SPOSH). See discussion in Section 3.2.5.

No.	Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage <sup>1</sup>	Probability Of Linkage Occuring <sup>1</sup>	Overall Risk <sup>1</sup>	Comments
4	Residents of properties above infilled ground	Decomposition gases including methane and carbon dioxide, generated by infill material (low gas concentrations and flow rates recorded)	Movement into buildings, subsequent asphyxiation and explosion risk	Medium	Low	Low/moderate	Exploratory holes did not penetrate to base of made ground; areas of material with greater gas generation potential may exist. However, exploratory holes are likely to be representative of gas concentrations at / below depth of floor slabs. Infilling dates from nearly 50 years ago, suggesting gas generation potential is not high.
5	Subsurface services serving the buildings (principally water supply)	Although contaminant concentrations in soil at likely pipe depth (up to 1.2m bgl) exceed WRAS/UKWIR thresholds, tap samples indicate dissolved concentrations below drinking water standard.	Chemical attack and tainting of water supply could occur at high contaminant concentrations	Medium	Unlikely	Low	Testing suggests that contaminants are not causing deterioration of pipework or tainting the supply.
6	Property (Structures) – sub-surface concrete	Sulphate (preliminary testing for sulphate only suggests that AC-2s concrete should be used for materials in contact with made ground)	Contact between contaminants and concrete	Mild	Low / likely	Low to moderate	Assuming that appropriate concrete was used to construct the housing at the site (as AC-2s is not the most basic concrete specification), it is unlikely that sulphate concentrations will cause significant damage to building foundations.  Further assessment would be significantly intrusive, no residents complained of structural issues when the investigation was undertaken and no issues were noted. Thus, no further assessment proposed.

No.	Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage <sup>1</sup>	Probability Of Linkage Occuring <sup>1</sup>	Overall Risk <sup>1</sup>	Comments
7	Secondary A aquifer (Middle Coal Measures) beneath site	Leachable concentrations of arsenic, lead and benzene were recorded at concentrations above the Tier 1 screening values adopted as being protective of groundwater	Leaching of soil contaminants to aquifer	Mild	Low	Low	Benzene "failure" is only because lab detection limit exceeds Tier 1 value (i.e. significantly elevated concentration has not been recorded). Lower sensitivity of site and aquifer (secondary aquifer with no public potable abstractions within 1km) dictates concentrations are unlikely to be of concern to Environment Agency.
8	Streams and pond (closest are 300m to south and east; inferred hydraulic gradient is towards south-east)	Leachable concentrations of four metals and two "summed" PAH concentrations were recorded at concentrations above the Tier 1 screening values adopted as being protective of off-site surface waters	Leaching of soil contaminants to aquifer and subsequent off-site migration to surface waters	Medium	Low	Low / moderate	PAH "failures" are only because lab detection limit exceeds Tier 1 value (i.e. significantly elevated concentrations not recorded). Metals concentrations also judged not to be very high. Distance of study site from surface waters also mitigates risk, i.e. significant opportunity for attenuation of organics and dilution of all contaminants prior to reaching watercourses. Streams and ponds may not be in hydraulic continuity with groundwater beneath the site in the secondary aquifer (and no perched groundwater identified at site). Unlikely to be of concern to Environment Agency.

<sup>1</sup> Taken from Table 6.3, CIRIA report 552 (Contaminated Land Risk Assessment – A Guide to Good Practice. Severity classified as minor, mild, medium or severe. Probability classified as unlikely, low, likely or high. Overall risk considers both the severity and probability of the linkage (very low, low, moderate, high or very high). See Appendix G for further details

## 5 SUMMARY AND CONCLUSION

- Part 2A of the Environmental Protection Act 1990 requires local authorities to inspect land which, due to an industrial legacy, may meet the definition of Contaminated Land due to possible health risks or potential environmental pollution.
- A review of historical mapping and EA records provided to Cannock District Council, plus anecdotal evidence obtained during public consultation, identified that a parcel of land west of Fiveways, Cannock Road, Heath Hayes, Staffordshire was infilled with unknown waste material. The material potentially posed a risk to the health of residents now living at the site, and a risk to the quality of controlled waters.
- An exploratory investigation identified ground conditions comprising a maximum of 2.5m of Made Ground, which included fine to coarse ash, glass, brick and metal fragments. It was difficult to penetrate into the Made Ground, and all exploratory holes ceased in the infill. The composition of underlying natural deposits was not proven.
- Moderately elevated polyaromatic hydrocarbon (PAH) concentrations were found in the Made Ground, but generally at depths where humans are unlikely to encounter the soil. Shallower PAH concentrations were much lower, and assessed as being unlikely to pose a health risk.
- Asbestos containing concrete and roofing felt was found in two gardens. Further sampling indicated that asbestos containing materials (ACM) were not widespread. While the presence of ACM is noted, it is unlikely to pose a Significant Possibility of Significant Harm (SPOSH) to human health, which is the assessment that the local authority must consider under the Part 2A legislation.
- Leaching tests identified moderate concentrations of leachable metals and hydrocarbons, but the lower sensitivity of the groundwater, from which there are no nearby potable abstractions, and the distance to the nearest surface watercourse, some 300m away, indicate that the leachable concentrations identified are tolerable. The Council should confirm that there are no private water abstractions on record in vicinity of the site.
- Gas monitoring within four wells has identified that the concentrations and flow rates of hazardous gases beneath the site are unlikely to pose a human health or explosion risk to the housing at the site.
- The concentrations of contaminants within drinking water in four samples tested are compliant with UK drinking water standards.

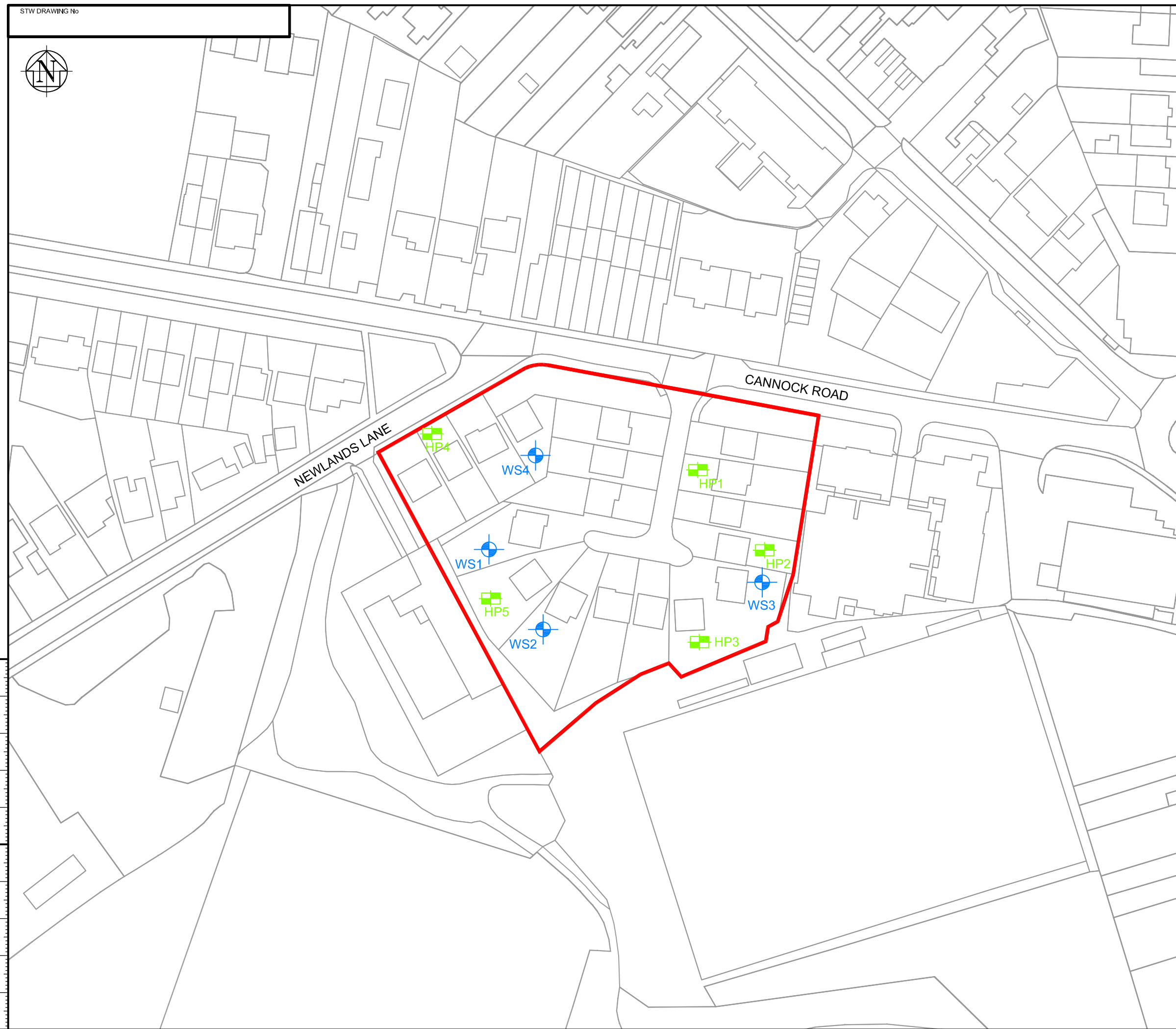
On the basis of the preceding assessment and the limitations listed in Appendix B, we do not consider that the site should be declared contaminated land under Part 2A of the Environmental Protection Act 1990. The council should confirm that there are no private water abstractions within 500m of the site boundary in order to confirm this assessment (the presence of any abstractions would not necessarily mean the site met the definition of contaminated land, but may mean that further assessment is needed). Further DQRA work to confirm the assessment could be undertaken if further assurance on human health risk is required by the Council.

# DRAWINGS





100  
90  
80  
70  
60  
50  
40  
30  
20  
10  
0



NOTES

- KEY:**
- INFERRED EXTENT OF INFILLING
  - WINDOW SAMPLER
  - WS1
  - HAND PIT
  - HP1

REV	AMENDMENTS	ORIG	CHK'D	APR'D	DATE
-					

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CLIENT

**Cannock Chase Council**

PROJECT

**FIVEWAYS**

TITLE

**EXPLORATORY HOLE LOCATION PLAN**

STATUS		
<b>FOR INFORMATION</b>		
ORIGINATOR	CHECKED	APPROVED
MIC	MJH	GVT
DATE	DATE	DATE
31/03/11	31/03/11	31/03/11
SCALE	ORIGINAL DRAWING SIZE	
<b>1:1000 @ A3</b>	297 x 420 - A3	
DRAWING No	REV.	
<b>106270-001</b>	-	

# APPENDIX A

Cannock Chase District  
Council

**Environmental Protection Act  
1990, Part IIa: Desktop Study  
and Walkover**

**Land West of Fiveways,  
Cannock Road, Heath Hayes,  
Staffordshire**

August 2010

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## **1 INTRODUCTION**

### **1.1 Terms of Reference**

In August 2010, Grontmij Limited (Grontmij) was appointed by Cannock Chase District Council (the Council) to assist in the implementation of the Council's Contaminated Land Inspection Strategy. Part IIa of the Environmental Protection Act 1990 (Part IIa) requires each local authority to inspect areas of land which it believes may comprise Part IIa Contaminated Land.

The scope of work agreed between Grontmij and the Council included:

- Prioritisation of an initial list of potentially contaminated sites for intrusive investigation work, based upon the sensitivity of each site, using existing limited desktop study data provided by the Council; and,
- Undertaking desktop reviews and walkovers, culminating in the production of reports for each priority site to improve the understanding of the sites and inform the planning of intrusive site investigations.

The prioritisation exercise identified an initial 12 sites requiring detailed desktop study and walkovers, including a former landfill site west of Fiveways, Cannock Road, Heath Hayes, Staffordshire. The site comprises an area of land previously infilled with waste material and developed with housing, and forms part of a wider area of infill. The site is considered to be sensitive as 18 residential properties with gardens overlie the inferred extent of the landfill and the site is underlain by a secondary A aquifer. Areas of the wider site have been subject to previous ground investigation which has identified evidence of infilling and has proven the presence of contaminants (see Section 2).

This report is subject to the limitations presented in Appendix A.

### **1.2 Site setting**

The setting of the site is summarised in Table 1.1. The location of the site is shown on Figure 1.1, and Drawing 1 provides surrounding land-use details.

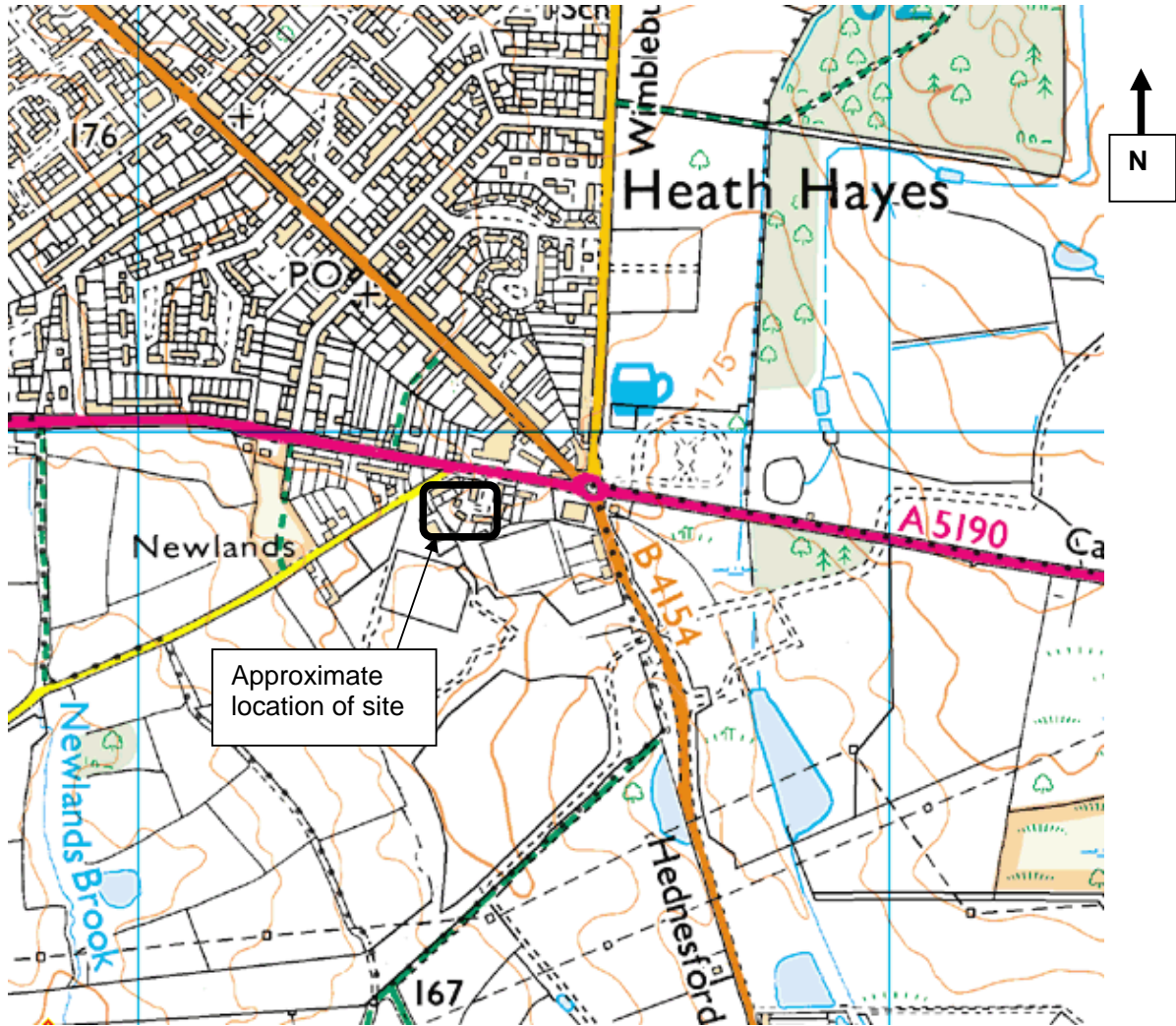
**Table 1.1 – Site Setting**

Data	Information
Address	Former landfill west of Fiveways, Cannock Road, Heath Hayes, Staffordshire, WS12 3HZ.
Current site use:	Residential houses and gardens. Houses appear to have been constructed in late 1980's/early 1990's
Grid Reference:	Centre of site located at NGR 401503,309907
Site Area:	Approximately 1.5 ha.
Topography:	Site is generally flat; surrounding area falls gently towards the south-east
Surrounding land use	North: Cannock Road adjacent, residential properties beyond East: Residential (flats) adjacent, tyre-fitting centre approx 50m South: Playing fields and open land West: Residential / telephone exchange / open land
Mapped Geology	British Geological Survey (BGS) mapping indicates that the site is underlain by glacial till over Middle Coal Measures. The likely thickness of deposits is not stated.
Hydrogeology	The Coal Measures are regarded as a secondary A aquifer by the Environment Agency.
Source Protection Zones (SPZs)	The Environment Agency website indicates that the site does not lie within a SPZ.
Surface Waters	A pond is located approximately 300m south east of the site. Streams are located approximately 300m east and 500m south west of the site.
Historical Land Use	Environment Agency records indicate that the site operated as a landfill site between 1960 and 1965, the type of waste received is unspecified. Historic mapping contained in previous reports (Section 2.1) indicate that the southern end of the site may also comprise an infilled railway cutting. The site was subsequently developed with residential properties with gardens.
Ecologically designated sites <sup>1</sup>	MAGIC search identified Biddulph's Pool and No Man's Bank SSSI, located approximately 800m to the east. The SSSI is designated due to its Dwarf Shrub Heathland habitat

<sup>1</sup> Includes sites designated as Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Special Area of Conservation (SAC, including candidate sites), Special Protection Area (SPA including potential sites), listed Wetlands of International Importance (Ramsar site) and Local Nature Reserves (LNR).



Figure 1.1 - Site Location



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Controller of HMSO, © Crown Copyright  
Plan is not to scale.



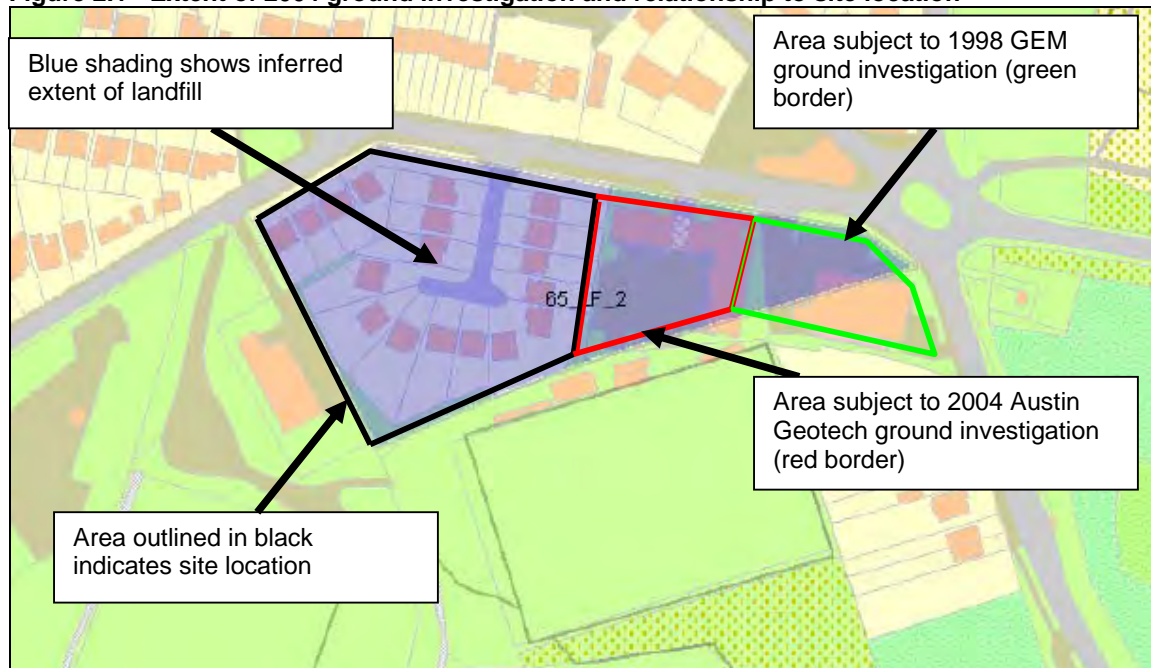
## 2 PREVIOUS INVESTIGATIONS

The wider landfilled area (comprising land to the east of the study site) has been subject to two ground investigations, as follows:

- Land immediately east of the study site, comprising a transport café and HGV parking area, was the subject of a desk study and ground investigation, undertaken in 2004 by Austin Geotech Ltd;
- Land approximately 60m east of the study site, beyond the former transport café, was investigated in 1998 by Geotechnical Environmental and Materials Services Ltd.

The extent of land investigated and its relationship to the study site is shown on Figure 1.2. Cannock Chase Council holds excerpts of the above reports in archive; these excerpts are included in Appendix B and summarised below.

**Figure 2.1 - Extent of 2004 ground investigation and relationship to site location**



### 2.1 2004 Ground Investigation

Land currently occupied by residential flats (bordered in red on Figure 2.1) was subject of a 2004 desk study and ground investigation, undertaken by Austin Geotech Ltd. A summary of the investigation is provided below:

- Inspection of historical maps identified that the Austin Geotech site {and additionally, the southern extent of the site subject to this 2010 desk study} was previously occupied by a mineral railway within a cutting. The cutting is first shown on the 1902 map, appears to be disused on the 1971 map and has been completely infilled by the time the 1992 map was created. As Coppice Colliery was located approximately 150m to the south, the material used to infill the colliery is likely to have comprised colliery spoil and other colliery waste;
- Eight machine dug trial pits were excavated to a maximum depth of 3.6 mbgl;

- The ground encountered comprised up to 2.7 m of made ground over sand and gravels, to a maximum depth of 3.6 m. The made ground included distinct layers of ash, burnt shale, concrete and brick;
- Selected soil samples were subjected to chemical analysis. A summary of analytical testing results is presented in Table 2.1.

**Table 2.1 - Summary of analytical chemistry results, 2004 Austin Geotech investigation**

Contaminant	No of Samples Analysed	Minimum Analysis Result (mg/kg)	Maximum Analysis Result (mg/kg)	SGV/GAC <sup>a</sup> using 6% SOM	GAC <sup>a</sup> using 1% SOM <sup>a</sup> value (where lower)	No. of samples exceeding SGV/GAC <sup>a</sup>
Arsenic	7	5.0	14	32	-	None
Boron	7	0.26	1.5	291	-	None
Cadmium	7	<0.50	1.2	10	-	None
<b>Chromium<sup>b</sup></b>	<b>7</b>	<b>16</b>	<b>150</b>	<b>4.3</b>	-	<b>7</b>
Copper	7	18	64	2330	-	None
Lead <sup>c</sup>	7	28	100	450	-	None
Mercury <sup>d</sup>	7	<0.10	<0.10	1	0.17	None
Nickel	7	14	31	130	-	None
Selenium	7	0.25	0.78	350	-	None
Zinc	7	75	290	3750	-	None
Phenols	7	<0.50	1.3	420	180	
<b><i>TPH (Total)<sup>e</sup></i></b>	<b><i>7</i></b>	<b><i>&lt;0.50</i></b>	<b><i>1300</i></b>	<b><i>n/s</i></b>	<b><i>n/s</i></b>	<b><i>-</i></b>
<b><i>Total PAHs<sup>e</sup></i></b>	<b><i>7</i></b>	<b><i>&lt;0.50</i></b>	<b><i>170</i></b>	<b><i>n/s</i></b>	<b><i>n/s</i></b>	<b><i>-</i></b>

All above concentrations are presented in mg/kg, correct to two significant figures (unless greater level of accuracy is possible from analysis or published as a screening value). Numbers in **bold** indicate analysis results in excess of SGV or GAC. Values in **highlights with italics** are considered to be elevated, but cannot be directly compared to current screening values due to lack of speciation

a- Soil Guideline Values (SGV) published by DEFRA (see Environment Agency website) or Generic Assessment Criteria (GAC) published by Land Quality Management or derived internally by Grontmij using the latest version of the CLEA model.

b -Testing results are for total chromium, whereas quoted GAC is value for chromium(VI). The GAC for chromium (III) is 3000 mg/kg

c- SGV quoted was generated by DEFRA using earlier version of CLEA. DEFRA is currently evaluating the methodology used to define and measure acceptable human intake of lead. The outcome of this decision is needed in order to calculate a GAC using the latest version of CLEA, therefore in the meantime, the "old" lead SGV has been adopted

d -Testing results are for total mercury, while SGV/GAC for elemental mercury are presented (the most stringent of the elemental, inorganic and methyl mercury SGVs)

e -There are no SGV's or GAC values for total TPH's or PAH's only speciated. Therefore speciated analysis is required to ascertain any exceedence.

The chemical analysis included testing for total chromium; it is not known whether the chromium identified is present as Cr(III) or Cr(VI), and as such, it has to be assumed that the recorded concentration of chromium may exceed the current Cr(VI) SGV.

Additionally, Total Petroleum Hydrocarbons (TPH) and total Polyaromatic Hydrocarbons (PAH) analyses were scheduled, and potentially elevated results obtained. Current best practice requires comparison to SGVs or GAC derived for individual aromatic and aliphatic TPH bands and against individual PAH compounds. Therefore, while it is likely that banded TPH and individual PAH screening criteria may have been exceeded, a conclusion cannot be drawn.

## 2.2 1998 Ground Investigation

An investigation of the land currently occupied by a tyre fitting centre (bordered in green on Figure 2.1) was undertaken in 1998 by Geotechnical Environmental and Materials Services Ltd (GEM). The remit of the investigation appears to have been geotechnical, as no contamination assessment was undertaken. A summary of the investigation is provided below:

- The investigation consisted of five machine excavated trial pits and two cable percussive boreholes to a maximum depth of 9.6 mbgl;
- The ground conditions encountered comprised up to 6.9 m of made ground overlying superficial clays (possible glacial till) which in turn overlie weathered Coal Measures strata (weathered residual clays grading into mudstone and sandstone). The made ground comprised a mixed fill material containing colliery shale (burnt shale), coal, cinders and coke, crushed brick, stones and concrete, tarmac, ash (locally abundant), crushed limestone and some wood (locally abundant), rags, plastic and metal;
- Perched groundwater was encountered towards the base of the made ground (3.1m bgl to 5.0m bgl, and subsequent resting depths of 2.9m bgl to 4.3m bgl were recorded. Additional minor strikes were encountered in the underlying superficial clay, within sandier horizons.

Cannock Chase Council holds copies of Environment Agency correspondence, apparently as part of a planning consultation process. The report from the above investigation appears to have been submitted to the Agency for comment. The Agency recommended that a contaminated land desk study, soils investigation (to include leachability testing in regard to the underlying aquifer) and gas monitoring exercise should be undertaken. The Agency also noted the proximity of recorded landfill sites to the proposed tyre centre.

It is unclear whether a soils investigation was undertaken, as no records are held on file. GEM did, however, undertake ground gas monitoring of wells installed within the two original cable percussive boreholes. The monitoring detected carbon dioxide concentrations of up to 0.2%. Flow rates were noted to be 0 l/hr and methane was not detected at concentrations greater than the detection limit of the gas analyser.

## 2.3 Summary

The findings of the 1998 and 2004 ground investigation indicate that the landfill material across the wider site, including the subject site, is likely to contain material such as ash, burnt shale, metal and plastic suggesting that elevated concentrations of contaminants including metals and PAHs may be present.

Furthermore, the 2004 chemical analysis results indicate that the made ground across the wider site contains potentially elevated concentrations of chromium, hydrocarbons and PAHs, which may exceed current screening criteria adopted for residential properties with gardens.

As the subject site is located above the same inferred extent of landfill as the areas investigated in 1998 and 2004, it is likely that similar (or worse) conditions could be encountered beneath the subject site.

## 2.4 Walkover

The site has been subject of a walkover. No obvious evidence of contamination was identified during the inspection, carried out from the public highway, but such evidence is unlikely to be uncovered by the visual inspection of land occupied by residential properties.



### 3 PRELIMINARY CONCEPTUAL MODEL

#### 3.1 Introduction

This section of the report presents a preliminary contaminated land assessment, on the basis of the available desktop data, previous reports and information gathered during the walkover. The assessment presents an evaluation of the potential risks posed, should contaminants be present in the soil or groundwater beneath the site.

In the context of the Environmental Protection Act 1990 (EPA90), the Water Act 2003 and associated guidance<sup>2,3</sup>, a preliminary (contaminated land) risk assessment should focus on whether the land at a subject site meets the statutory definition of Contaminated Land. Part IIA of the EPA90, as amended by the Water Act 2003, defines Contaminated Land as:

*“any land which appears to the local authority in whose area it is situated to be in such condition by reason of substances in, on or under the land, that:*

*significant harm is being caused or there is a significant possibility of significant harm being caused; or*

*significant pollution of controlled waters is being caused or there is significant possibility of such pollution being caused”.*

The procedure for assessing contaminated land involves the development of a Conceptual Site Model (CSM) comprising the assessment of potential contaminants, pathways and receptors.

##### 3.1.1 Sources of Contaminants

The “contaminants” term in the conceptual model has been evaluated by inspection of existing desktop study data provided by the Council, and a preliminary site walkover. The following potential sources of contaminants have been identified:

- An infilled area of land which could contain contaminants including but not limited to metals, hydrocarbons, PAHs, volatile and semi-volatile organic compounds (VOCs and SVOCs); and,
- Methane and carbon dioxide gas, from the decomposition of biodegradable landfilled material beneath the site.

##### 3.1.2 Receptors

DEFRA Circular 02/2006 defines a Receptor as:

*“either (a) a living organism, a group of organisms, an ecological system or a piece of property which (i) is in a category listed in Table A as a type of receptor, and (ii) is being, or could be, harmed, by a contaminant; or (b) controlled waters which are being, or could be, polluted by a contaminant”.*

Table 2.1 lists all of the receptors to be considered by a Part IIA or PPS23<sup>4</sup> assessment, and assesses whether the receptors are likely to be present at the site.

<sup>2</sup> CLR11 Model Procedures for the Management of Land Contamination (EA & DEFRA September 2004)

<sup>3</sup> DEFRA Circular 02/2006, Environmental Protection Act 1990: Part IIA Contaminated Land, September 2006.

<sup>4</sup> Planning Policy Statement (PPS) 23: Planning and Pollution Control, Annex 2: Development on Land Affected by Contamination

**Table 3.1 - Potential Receptors**

Receptor Type	Receptors	Present (✓/✗)	Notes
Humans	On-site residents	✓	Residential properties (houses and gardens) above indicative extent of landfill. Gardens assumed to be used for growing food crops.
	Construction staff and site investigation personnel.	✗	No known redevelopment proposed.
	Future occupants of the site	✓	Level of risk same as current residents so not considered further.
	Off site commercial workers or residents	✓	Possibly exposed to gases of leachable contaminants migrating off-site through permeable strata. Level of risk is inferred to be lower than that posed to on-site residents, and is not assessed further
Ecosystems	Any designated ecological system <sup>5</sup> , or living organism forming part of such a system	✗	The closest designated site is Biddulph's Pool and No Man's Bank SSSI, located approximately 800m to the east. The distance of the SSSI from the study site indicates that the SSSI is unlikely to be adversely affected by leachate or ground gas originating from the study site
Property (Flora and Fauna)	Crops, including timber	✗	Not present.
	Produce grown domestically, or on allotments for consumption	✓	Gardens assumed to be used for growing food crops. Risk posed is considered to be covered by human health (residential with gardens) pathway and is not considered further.
	Livestock	✗	Not present.
	Other owned or domesticated animals	✓	Pets in residential properties. Risk posed is considered to be similar to that posed to on-site residents, and is not examined further
	Wild animals which are the subject of shooting or fishing rights	✗	Not present.
Property (Buildings & Structures)	A 'building' means any structure, including any part below ground level, but does not include plant or machinery within a building.	✓	Residential houses (and in particular, water service pipes and foundations) above indicative extent of landfill.
Controlled Waters <sup>6</sup>	Territorial waters	✗	None feasibly close enough to be affected.
	Coastal waters	✗	None feasibly close enough to be affected.
	Inland Freshwaters	✓	A pond is located approximately 300m south east of the site. Streams are located approximately 300m east and 500m south west of the site. The likely hydraulic gradient, based upon surface topography, is towards the south-east
	Groundwater	✓	Secondary A aquifer beneath site.

<sup>5</sup> Includes sites designated as Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Special Area of Conservation (SAC, including candidate sites), Special Protection Area (SPA including potential sites), listed Wetlands of International Importance (Ramsar site) and Local Nature Reserves (LNR).

<sup>6</sup> As defined in the Water Resources Act 1991 (Part III, Section 104). Generally includes most surface water bodies excluding drains which discharge into sewers.

### **3.1.3 Pathways**

DEFRA Circular 02/2006 defines a Pathway as:

*“one or more routes or means by, or through, which a receptor: (a) is being exposed to, or affected by, a contaminant; or (b) could be exposed or affected”*

Pathways are examined as part of Table 2.2.

### **3.1.4 Potential Pollutant Linkages**

The pollutant linkages identified are presented in Table 2.2.



**Table 3.2 - Potential Pollutant Linkages**

No.	Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage <sup>1</sup>	Probability Of Linkage Occuring <sup>1</sup>	Overall Risk <sup>1</sup>	Comments
1	Residents of properties above infilled ground (including children playing in gardens)	Contaminants including (but not limited to) metals, hydrocarbons, (including PAHs), VOCs and SVOCs) and asbestos within landfill material and associated with use of former mineral railway. Off-site analysis has identified potentially elevated metals, TPH and PAH concentrations	Dermal contact and direct ingestion, inhalation of dust/vapours, consumption of home-grown vegetables	Medium	Likely	Moderate	Grass and/or topsoil coverage likely to mitigate risk to an extent – risk is greatest where possibly impacted soils are exposed or could be encountered, for example, when digging a vegetable patch or when children play outdoors. Properties are constructed directly above a potentially significant contamination source. Sample collection and analysis required to enable application of statistics, speciate TPH and PAH results, and refine conclusion on risk
2	Residents of properties above infilled ground	Methane and carbon dioxide from decomposition of deleterious elements of landfill material	Movement into buildings, subsequent asphyxiation and explosion risk	Medium	Likely	Moderate	Installation and monitoring of wells for gases and flow rates is required to refine conclusion on risk
3	Subsurface services serving the buildings (principally water supply)	Contaminants including (but not limited to) metals, hydrocarbons, (including PAHs), VOCs and SVOCs) within landfill material and associated with use of former mineral railway.	Chemical attack and tainting of water supply could occur at high contaminant concentrations / severe pH levels	Mild	Likely	Low to moderate	Further investigation data needed to refine assessment/CSM
4	Property (Structures) – sub-surface concrete	Sulphate and pH	Contact between contaminants and concrete	Mild	Likely	Low to moderate	Further investigation data needed to refine assessment/CSM

No.	Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage <sup>1</sup>	Probability Of Linkage Occuring <sup>1</sup>	Overall Risk <sup>1</sup>	Comments
5	Secondary A aquifer (Middle Coal Measures) beneath site	Contaminants including (but not limited to) metals, hydrocarbons, (including PAHs), VOCs and SVOCs within landfill material and associated with use of former mineral railway.	Leaching of soil contaminants to aquifer	Mild	Unlikely	Very low	Cable percussive BHs advanced at site 60m to east of the study site generally encountered layers of competent clay and mudstone prior to encountering a sandstone layer. Thus, leaching to the minor aquifer is unlikely
6	Streams and pond (closest are 300m to south and east; inferred hydraulic gradient is towards south-east)	Contaminants including (but not limited to) metals, hydrocarbons, (including PAHs), VOCs and SVOCs within landfill material and associated with use of former mineral railway.	Leaching of soil contaminants to aquifer and subsequent off-site migration to surface waters	Medium	Unlikely	Low	Cable percussive BHs advanced at site 60m to east of the study site generally encountered layers of competent clay and mudstone prior to encountering a sandstone layer. Thus, leaching to the minor aquifer is unlikely. Aquifer also likely to be too deep to be in continuity with surface watercourses. Distance of study site from surface waters also mitigates risk, i.e. significant opportunity for attenuation of contaminants prior to reaching watercourse
7			Direct migration to surface waters within perched groundwater unit at c. 3m bgl	Medium	Unlikely	Low	Unlikely that the perched groundwater unit extends beyond the extent of landfilling and thus, the water would not be in continuity with the off-site watercourses

<sup>1</sup> Taken from Table 6.3, CIRIA report 552 (Contaminated Land Risk Assessment – A Guide to Good Practice. Severity classified as minor, mild, medium or severe. Probability classified as unlikely, low, likely or high. Overall risk considers both the severity and probability of the linkage (very low, low, moderate, high or very high). See extract in Appendix C

#### **4 CLOSING REMARKS**

Potential pollutant linkages affecting the health of on-site residents and property have been identified, and therefore an initial intrusive investigation should be carried out to examine the likelihood of significant pollutant linkages existing at the site.

# APPENDIX A

## Appendix A: Limitations Statement

1. This report has been prepared for the exclusive use of Cannock Chase District Council and copyright subsists with Grontmij Limited. Prior written permission must be obtained to reproduce all or part of the report.
2. This report and/or opinions have been prepared for the specific purpose stated in the document. The recommendations should not be used for other schemes on or adjacent to the site without further reference to Grontmij Limited.
3. Observations were made of the site and of structures on the site as indicated within the report.
4. This report targets a parcel of land previously identified as potentially contaminated land by the Cannock Chase District Council, and does not seek to render an opinion on the quality of land outside the study area.
5. Our interpretation of any regulatory database information (including the MAGIC and British Geological Survey websites) assumes that the data provided is accurate. A disclaimer provided by database search companies is as follows: *'...the data is derived from historical sources or information available in public records or from third parties and is supplied to us without warranty by data suppliers and we cannot warrant the accuracy or completeness of the data or the reports.'* We cannot therefore accept any responsibility for the accuracy of the data used in this study, only that its interpretation has been carried out with due skill, care and diligence.
6. The scope of this study, as agreed with Cannock Chase Council, comprised a review of available information, and data was not purchased from a proprietary database.

## APPENDIX B



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Report

Site Investigation at  
Former Four Wynds  
Café, Heath Hayes,  
Cannock

July 2004



# Site Investigation at Former Four Wynds Café Heath Hayes, Cannock

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Report

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## **1. Introduction**

### **1.1 Background**

Fresh Space Limited have instructed a site investigation to be carried out on property at the former Four Wynds Cafe, Heath Hayes which is to be developed with apartments and car parking. This work has been carried out to assess the potential mining and environmental aspects of the site and to propose a foundation solution.

This report sets out the information obtained in relation to the proposed development.

### **1.2 Objectives of the Study**

The purpose of this report is fourfold:

- Confirm the development history of the site and in particular whether contaminative activities may have taken place;
- To establish the ground conditions for foundation design;
- Analyse for potential contamination;
- To describe the mining setting and extent of any stabilisation works required.

### **1.3 Components of the Work**

This report is based on a number of sources of information including the following:

- Past editions of the Ordnance Survey;
- The British Geological Survey mapping;
- "Sitescope" database, containing information on the site and surroundings for pollution, industrial use of land, and other environmental data;
- Excavation of trial pits;
- Contamination test results;
- Percolation Tests.

## **2. Site Location & Description**

### **2.1 Site Location**

The site, comprising a cafe building and car parking, together with an adjacent house, may be located from National Grid Reference SK 016 099. A site plan is presented as Figure 1.

## **2.2 Site Description**

The site is a trapezoidal parcel of land some 0.3ha in area. The land falls gently southwards and lies south of Cannock Road from which access is obtained.

The western margin of the site is presently occupied by a private house and garden. Adjacent to it, in the north western corner of the remainder, is the location of the café building. The balance of the site, including the frontage with Cannock Road, the entire eastern half of the site and the central southern area, is car parking. This is paved with concrete which, in the southern half of the site is poorly finished.

The site is bounded to the south by sports ground and to the east by a tyre depot. To the west the site is bordered by housing. Beyond Cannock Road to the north is recent housing and the Five Ways public house.

## **3. Geology and Mining**

### **3.1 Published Geology**

The geology has been assessed from the 1: 63,360 scale Geological Map of Lichfield. This map indicates that the site is underlain by Boulder Clay which is underlain in turn by the Coal Measures. These strata dip gently towards the south west. The Coppice Colliery is shown immediately south of the site and several more are located a short way to the north east. In view of the presence of the former colliery there is a probability that mining has taken place at moderate to great depth.

### **3.2 Mining**

The Coal Authority Mining Report is included as Appendix 1. Mining activity is common in this area. This report indicates that the site has been undermined at depths of 70m to 300m in seven seams, most latterly in 1962. Based upon the 1: 10,560 scale geological map the site is underlain at moderate depth by the Brooch Coal. At these depths any old workings are unlikely to affect the proposed dwellings. We understand that the site to the north has been recently developed and that investigation holes were drilled to establish whether there were any coal seams at significantly shallow depths. It is our understanding that shallow coal, and therefore workings, were absent.

### **3.3 Mine Shafts**

The mining report confirms the absence of recorded shafts in, or within influencing distance of, the site.

## **4. Site Development and Environmental Setting**

### **4.1 Site History**

#### **4.1.1 Past Editions of the Ordnance Survey**

These old maps are presented as Figures 2 to 8 and are to 1: 2,500 scale. The earliest available edition of the Ordnance Survey is dated 1884. This shows that there is no development at the site but by 1902 the rear of the site was occupied by a railway cutting deep enough to pass below Hednesford Road to the east. The site remains unchanged in both the 1918 and 1939 editions. By 1962 the café building and house are shown as is the playing field to the south. Little change is evident on the 1977 map other than the construction of a small outbuilding in the west of the site and the removal of the railway lines from the cutting. The 1992 map indicates that the railway cutting has been infilled. On this edition the houses located to the west are first shown but the land to the east is still undeveloped at this time.

### **4.2 Environmental Information**

The STL/Sitescope report indicates that the site is not within the proximity of any landfill or other environmental hazard. The summary of this report is given in Appendix 2.

### **4.3 Radon**

Reference to the DETR / BRE publication - *Radon: guidance on protective measures for new Dwellings 1999* indicates that the site is not in an area where precautions against radon are automatically required. Neither is it in an area where a Geological Assessment is recommended.

## **5. Environmental Assessment**

### **5.1 Introduction**

Within the UK the assessment of soil borne contamination is now compared with the CLEA soil guidelines, which are based on the Contaminated Land Exposure Assessment Model 2002, for the available contaminant types. This model forms a technical basis for modelling exposure based on toxicological data and intake values for humans. It takes account of the most important exposure pathways for four different types of usage including domestic gardens with and without plant uptake. In this case there are no gardens and the site is to be hard surfaced throughout. It is important to check that the conceptual CLEA Model is appropriate to the conditions at the site, particularly in terms of soil type which influences contaminant retention and dust emission. However, the default parameters are set to reflect typical site conditions and

the algorithms used for the model are provided so that adjustments can be made as necessary. It also has the advantage that other contaminants, not yet covered, can be dealt with provided a Tolerable Daily Intake or Index Dose can be derived from toxicological data.

For most other contaminants the assessment should no longer be carried out using generic guidelines published by the Department of the Environment Interdepartmental Committee for the Redevelopment of Contaminated Land, ICRCL Guidance Note 59/83. These guidelines have now been withdrawn.

Inevitably there are contaminants which are not covered by any UK standard appropriate to soil. In most cases in the past practitioners adopted Dutch guidelines, which are much more comprehensive for organic chemicals, for instance. The Dutch guidelines have a Target Level for contaminants and an Action Level. The Target Level is really an aspirational level, and is often set at concentrations which are difficult to analyse. The Action Level is a more realistic value based on health risk criteria. However, we are informed that these Dutch guidelines are now considered inappropriate and that any such guideline values should be derived from the CLEA model using available toxicological data. In practice this toxicological data is seldom available from sources which have currency in the UK. The only available data are often the UK Drinking Water Standards but these are not necessarily appropriate to other uptake paths and are conservative.

## 5.2 Risk Assessment Criteria

The presence of contaminated land is only of concern if there exists an actual or potentially unacceptable risk of harm either to humans, ecosystems, the water environment or the built environment.

The concept requires consideration of 'risk' and the evaluation of harm, either actual or potential, through the process of 'risk assessment'. Risk assessment is an iterative process involving the consideration of hazard assessment and evaluation, and risk assessment and evaluation. The critical component to risk assessment is the identification of so called *pollutant linkages* whereby the potential for harm to occur requires three conditions to be satisfied:

- The presence of substances that may cause harm (Source);
- The presence of a receptor which may be harmed, e.g. potable groundwater, including wells and the canal, or humans (Target); and
- The existence of a linkage between the source and the target (Pathway)

Without a pollutant linkage there is no risk. Therefore the presence of measurable concentrations of contamination within the ground does not automatically imply that a contamination problem exists and contamination must be defined in terms of pollutant linkages and unacceptable risk. The nature and importance of both the targets and pathways which are relevant to any particular site will vary according to its characteristics, the intended use of the site and its surroundings.



In this case the proposed use of the site is for apartments and car parking with only limited landscaped beds. Therefore it is reasonable to use the CLEA SGVs for a Residential Use without Plant Uptake.

### **5.3 Possible Contaminants on the Site**

Based upon the sources listed above the known potential sources of contamination which can be identified at the site are limited to the fills which have been deposited, as a result of the infilling of the railway cutting from the colliery. These appear to comprise sands and clays with a small rubble content.

The use of the property for vehicle parking could have brought with it the risk of hydrocarbon contamination.

## **6. Site Investigation**

The near surface ground conditions have been investigated by 8 machine dug trial pits from which samples were taken for testing. Percolation tests were carried out in two of these, TPS 1 and TPS 2, by Sub Surface Midlands Limited. Trial Pits 1 to 4 were excavated by Austin Geotech Limited whilst a further 2 were excavated by Sub Surface Midlands. The locations of the pits are given on Figure 1. The records of the trial pits are included as Appendix 3. The results of the 7 contamination tests are included in Appendix 4.

### **6.1 Ground Conditions**

The trial pits revealed fills throughout the site varying in depth from 0.7m to 2.7m. Beneath concrete Trial Pits 5,6 and S 1 and S2 revealed regulating layers of ash and burnt shale. At the margins of the site and below these layers, the site appeared to have been filled with a variety of materials including sands and gravel with quantities of building rubble. Two of the trial pits encountered pipes, preventing further investigation.

Natural ground comprised moderately compact red or orange brown sand and gravel to the full depths investigated of up to 3.1m.

### **6.2 Contamination Testing**

Seven samples were tested for the ICRCL suite of chemicals. The results are presented in Appendix 3.

These results indicate that there was little contamination. However, one sample indicated an elevated level of TPH, in excess of 1,000mg/kg and two samples contained significant concentrations of PAH. These potential contaminants are discussed below.

File



# Memorandum

**To:** Jackie Dryhurst  
Property Services

**From:** John Ness  
Environmental Health

**Ref:** JN

**Cc:**

**Phone:** 4264

**Date:** 12 August, 2004

**Subject:** CH/04/0417 Site Investigation For Wynds Café, Heath Hayes

Thank you for forwarding the above mentioned site report (ref gaR2210) from Austin Geotech Ltd.

I have perused the report which has identified contamination of the site ubiquitously with petroleum hydrocarbons, and also in part, poly aromatic hydrocarbons.

I would concur with the proposals given in sections 7.4 – 7.6 for protection against ingress of soil gases, principally carbon dioxide in this instance.

The remediation of contamination is discussed in section 7.7. I agree with the view that the provision of hard surfacing of the site will break potential source to receptor pathways. For landscaped areas, the compaction of fill together with the provision of 450mm of clean cover is considered to be an appropriate way forward.

Confirmation as to how the hydrocarbon contamination at TPS 1, together with contingency plans detailing how contaminated ground discovered during the redevelopment process will be dealt with should be required.

Signed  .....

Tel call from Graham Fergus - Firsh City. (Ayring)  
 requirements for acoustic protection. 01902 710799  
 graham@firshcity.co.uk.

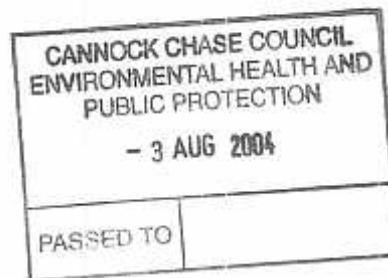
# Memorandum



From: Mrs. J. Dryhurst (Planning) To Mr. J. Ness  
Ref: CH/04/0417 Ref:  
Phone:  
E-mail: [Jacqueline.dryhurst@cannockchasedc.gov.uk](mailto:Jacqueline.dryhurst@cannockchasedc.gov.uk)  
Date: 2<sup>nd</sup> August 2004  
Subject: 4Wynds Caf , Heath Hayes

Please find attached a site investigation report in respect of the above site. The report was required prior to the application being determined. I would be obliged for your comments.

*J Dryhurst*



#### 6.2.1 Poly Aromatic Hydrocarbons (PAH)

Two samples exceeded the former ICRL level for PAH. There is no CLEA guideline for PAH, the ICRL values have been withdrawn and the Dutch Guidelines have been declared invalid by Defra. Given that the site has been filled with a variety of materials including rubble this may have been caused by fragments of tarmac with the likelihood that at least some of it derives from fuel spillage.

#### 6.2.2 Total Petroleum Hydrocarbons

One sample contained significantly high levels of TPH, namely 1,300mg/kg, in TS1 at 0.5m. Most other samples contained significant TPH levels between 210mg/kg and 600mg/kg. These are most likely to be the result of fuel spillage due to the past use.

#### 6.2.3 General

Although the use of the site as a transport café with the consequent numbers of parked vehicles brings with it the risk of fuel spillage, vehicles do not leak intentionally and most car/lorry parks are not contaminated in this way. The almost universal presence of TPH could indicate that the imported fills were brought to site in a contaminated state.

Hydrocarbons in these sorts of concentrations are usually attached to soils particles and unless there is free product it is most unlikely that migration would be an issue.

## 7. Comments on the Ground Conditions in relation to Foundation Design

### 7.1 Constraints to Development

These may be listed as follows:

- Made Ground with fill up to 2.7 metres thick;
- Possibility of low level soil gas from fill;
- Hydrocarbon contamination of fills;
- Possible mining at moderate depth.

These constraints are considered below and recommendations are made to address the contamination issues and foundation considerations.

### 7.2 Mining

The depth of the mined seams appears to be sufficiently deep not to pose a risk from void migration. General settlements should have ceased by now. The development across the road has similar geology and we understand that the investigation of that site concluded that the mined seams were too deep to affect the development.

However, if pile foundations were proposed then it would be advisable to check the geology by drilling at least 3 rotary holes to check seam depths.

### **7.3 Mine Shafts**

The Coal Authority Mining Report does not indicate the presence of any shaft within or within influencing distance of the site.

### **7.4 Soil Gases**

The on site fills, particularly ash and coaly deposits are a potential source of soil gases, specifically low level Carbon Dioxide caused by oxidation of carbon in the fill. Hydrocarbon vapours are also a risk.

It is recommended that a 2000 gauge damp proof membrane is adopted throughout for the dwellings. This should extend across the cavities and all joins and service penetrations should be sealed using butyl tape. In addition it would be advisable to adopt a method of floor slab construction which permits a void beneath the slab to facilitate the venting of any gases.

### **7.5 Foundations General**

The exploratory holes revealed fills to depths between 0.7m and 2.7m in depth. If the ground levels are to be raised to a level compatible with Cannock Road then the deeper fills would be considerably deeper still.

The fills are judged to be incapable of supporting foundation loadings even if rafts were to be adopted. This is because of the variability of the density and depth of the material. For a building of this complexity rafts would be unlikely to be economic in any case.

Therefore the foundations should be taken below the fills to bear on the underlying red or orange brown sands and gravels. An allowable net bearing pressure of 120kPa should be achievable for design purposes. If the fill/foundation depths are very variable then it would be prudent to lightly reinforce these foundations to bridge any inconsistencies. Based upon the proposed layout most of the structure would be constructed in the northern margin of the site where the fills are least deep.

Alternatively, it may be economic to adopt pile foundations. These would have the advantage of minimising excavation of the deeper fills and would be capable of supporting the relatively high structural loadings of three storey apartments.

If these foundations were considered then it would be necessary to drill rotary holes to ensure that the shallowest coal seam was sufficiently deep to pose no significant risk from void migration. Otherwise stabilisation works could be required.

## **7.6 Ground Floor Slabs**

Ground floor slabs should be of suspended construction in view of the depth of fill. If precast construction were adopted then this would bring the added benefit of providing more robust precautions against landfill gases, provided that the under slab void is adequately vented.

## **7.7 Remediation of Contamination**

As described above the levels of hydrocarbon contaminants give rise to concern that there may be a significant risk to human health from Total Petroleum Hydrocarbons (TPH) and Polyaromatic Hydrocarbons (PAH).

By way of mitigation, the majority of the site which is not built over will be hard surfaced. Neither does the development include gardens and vegetable plots and this will prevent uptake of contaminants via the consumption of vegetables as discussed above. Without pollution linkages there is no risk to end users. Nevertheless a sufficient depth of clean cover should be adopted in the landscaped areas to prevent contact with contaminated soils and the nuisance of potential vapours.

However, before the remediation requirements can be agreed with the Local Authority it will be necessary to carry out further investigation after the site has been demolished and cleared. The hydrocarbon concentrations are significant and the contamination found in TS 1 is sufficient to be regarded as a hotspot of contamination. More detailed examination of the ground without the constraints imposed by the presence of buildings and the concrete surfacing could reveal hotspots of greater contamination. Moreover, the house forming the western margin of the site has yet to be investigated.

Based on current data, it is recommended that all garden areas are blanketed with at least 450mm depth of clean cover to prevent ingestion of contaminants via dust and direct ingestion. It is also recommended that the surface of the fill beneath the clean cover is compacted to discourage hand excavation and root penetration. In practice the raising of levels will provide adequate clean cover to the southern areas of the site.

This approach will need to be agreed with the Local Authority and NHBC, however.

## **8. Surface Drainage**

Percolation tests were carried out in pits TS 1 and TS 2 by Sub Surface Midlands Limited. The results are presented in Appendix 5. These show that percolation was feasible for soakaways placed at the front of the site but the test to the rear did not soak away appreciably.

## 9. Summary and Conclusions

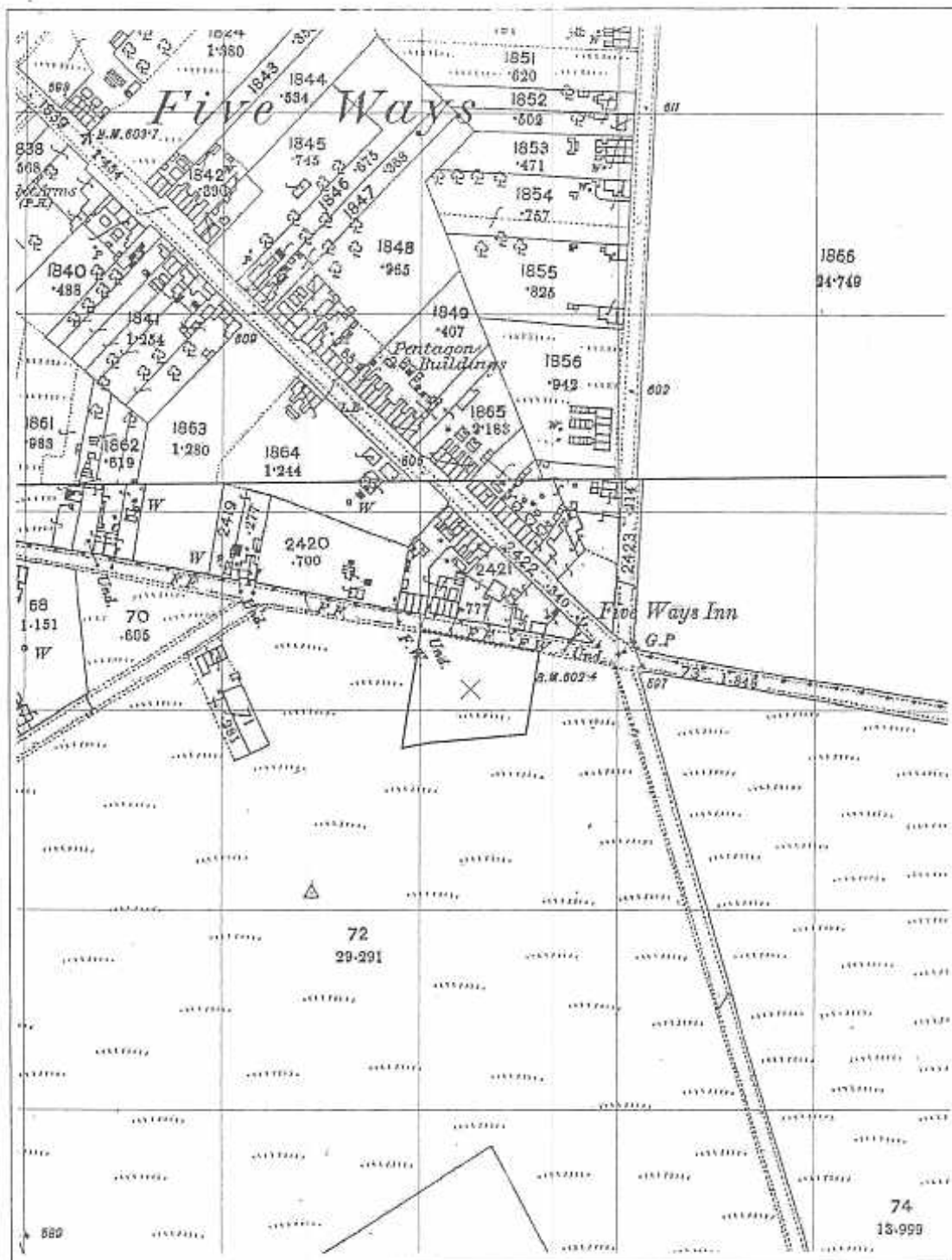
- The site has been in use firstly, as open land crossed by a railway cutting and secondly, as a transport café, for a combined total of over 100 years;
- There is no evidence of any potentially contaminative activity at the site apart from the deposition of fill in the former cutting and vehicle parking. This filling has resulted in a depth of fill typically of up to 2.7m;
- In view of the type of fill there is a slight risk of Carbon Dioxide emission. It would nevertheless be prudent to take appropriate precautions to prevent ingress;
- The geological map indicates that there are seams of coal at moderate to great depth. However, the risk from void migration from those seams is considered to be insignificant. If pile foundations were to be adopted it would be necessary to drill exploratory rotary holes, however;
- If strip or trench fill foundations are adopted, these must be lightly reinforced. This will also reduce the risk from potential residual ground movements due to past mining;
- There is some hydrocarbon contamination and a clean cover layer should be applied to garden areas to prevent a risk to end users, subject to approval by the regulatory bodies.





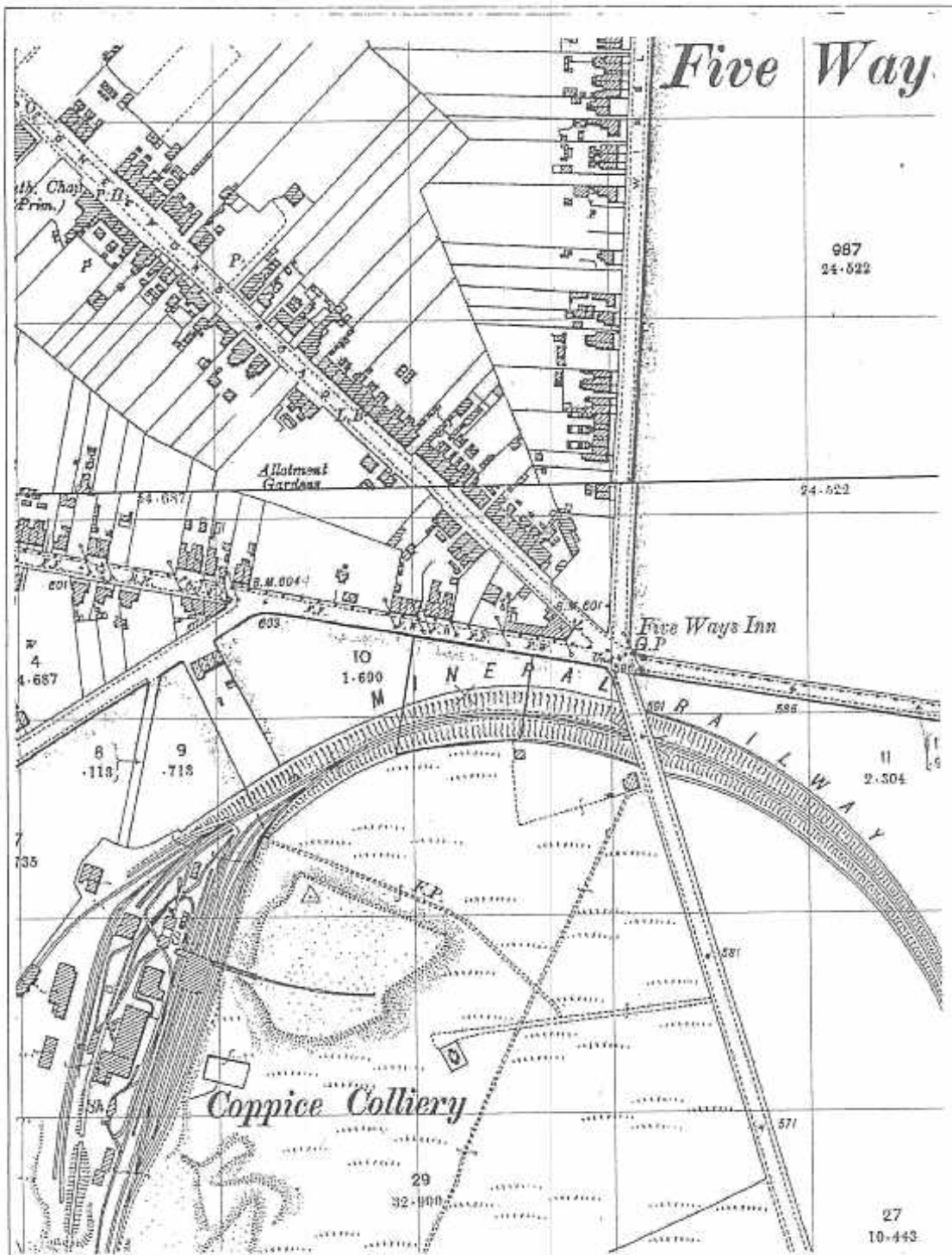
<b>Austin Geotech</b> Geo-Environmental Engineering Ltd	Project	Former Four Wynds Heath Hayes	
Client	Freshspace Developments Limited	Scale	c1: 500
Title	Site Plan Showing Trial Pit Locations	Figure	1

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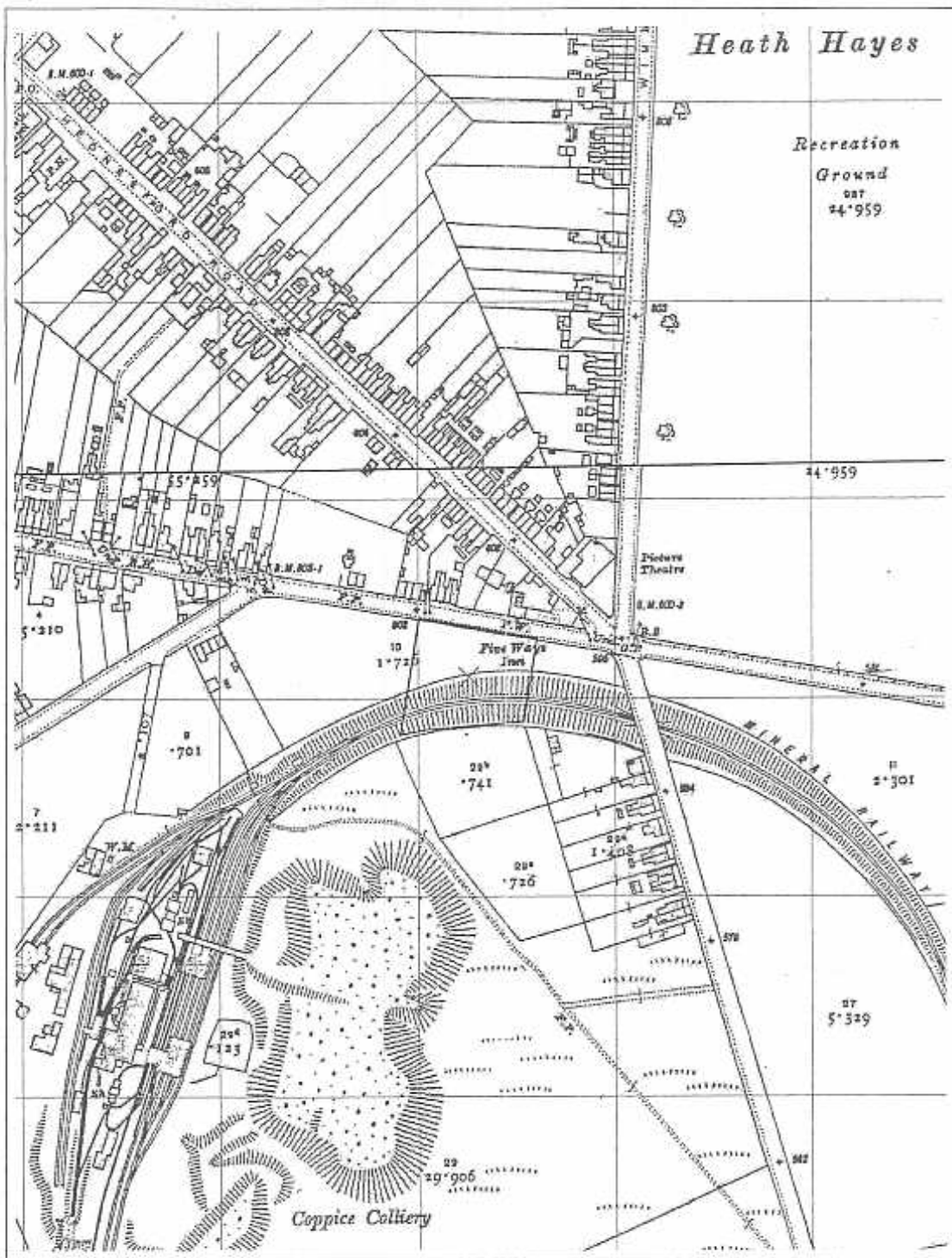
<b>Austin Geotech</b> Geo-Environmental Engineering Ltd		Project	Former Four Wynds Heath Hayes
Client	Freshspace Developments Limited	Scale	c1: 2,500
Title	Ordnance Survey - 1884	Figure	2

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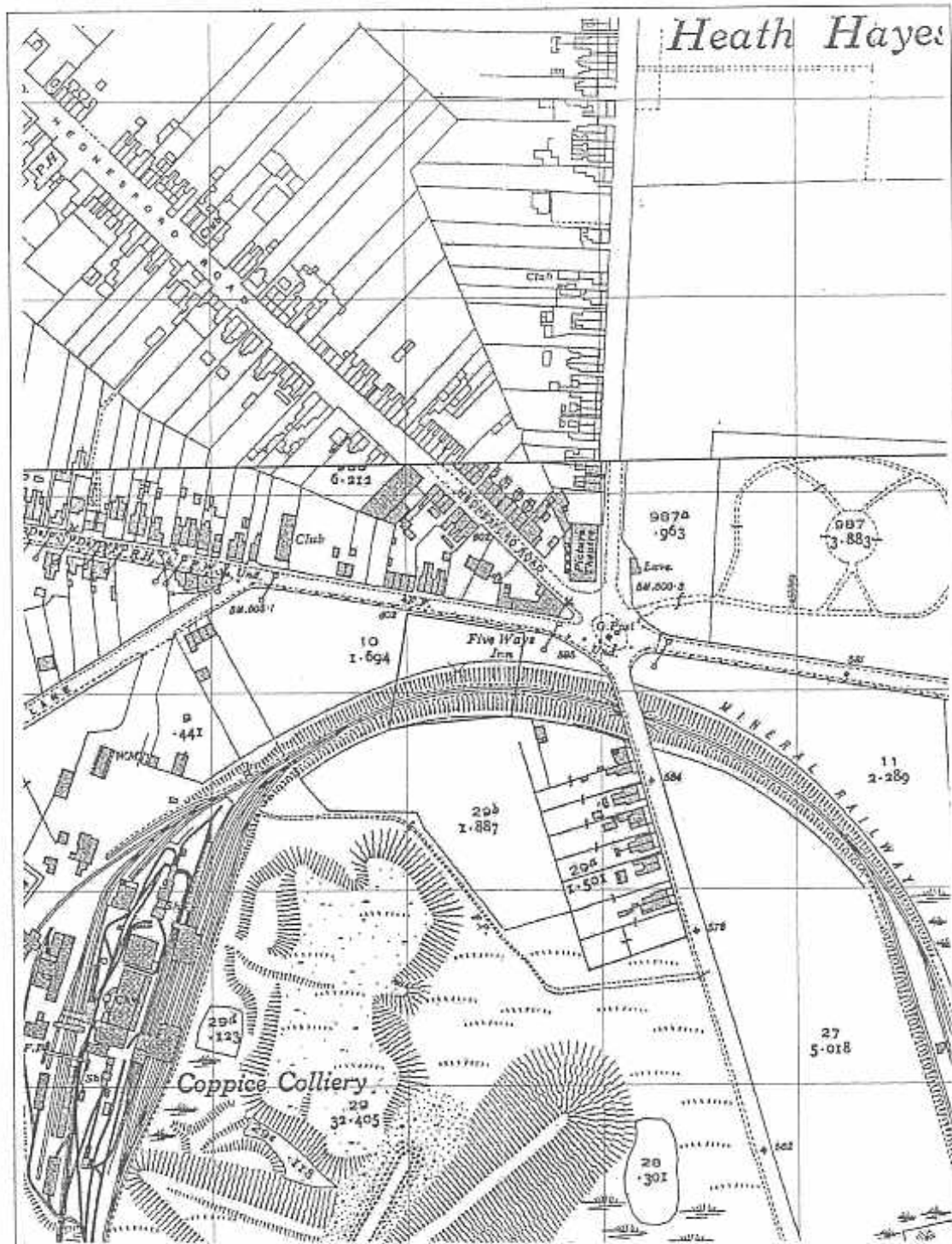
<b>Austin Geotech</b> Geo-Environmental Engineering Ltd		Project	Former Four Wynds Heath Hayes
Client	Freshspace Developments Limited	Scale	c1: 2,500
Title	Ordnance Survey - 1902	Figure	3

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<b>Austin Geotech</b> Geo-Environmental Engineering Ltd		Project	Former Four Wynds Heath Hayes
Client	Freshspace Developments Limited	Scale	c1: 2,500
Title	Ordnance Survey - 1918	Figure	4

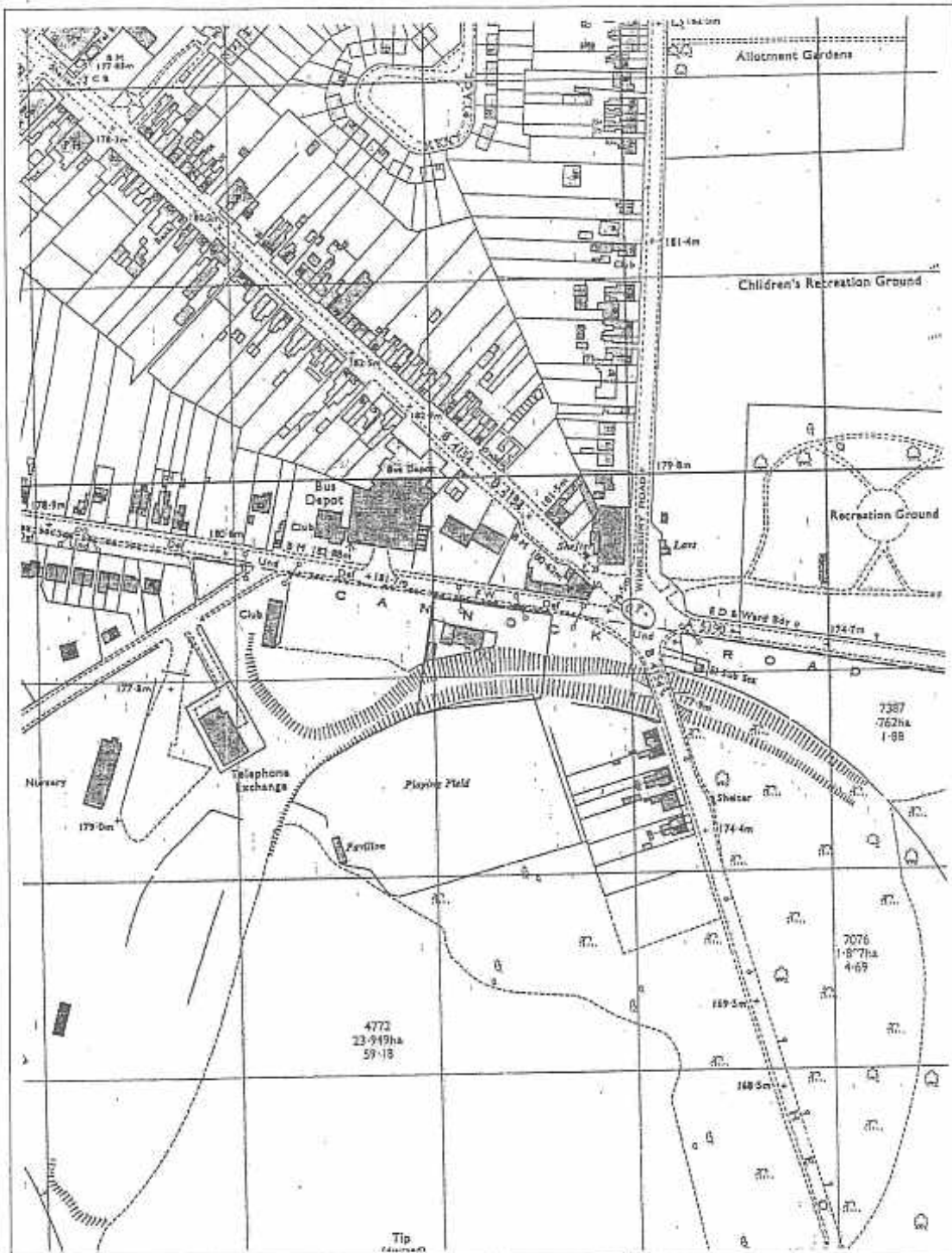
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<b>Austin Geotech</b> Geo-Environmental Engineering Ltd		Project	Former Four Wynds Heath Hayes
Client	Freshspace Developments Limited	Scale	c1: 2,500
Title	Ordnance Survey - 1939	Figure	5

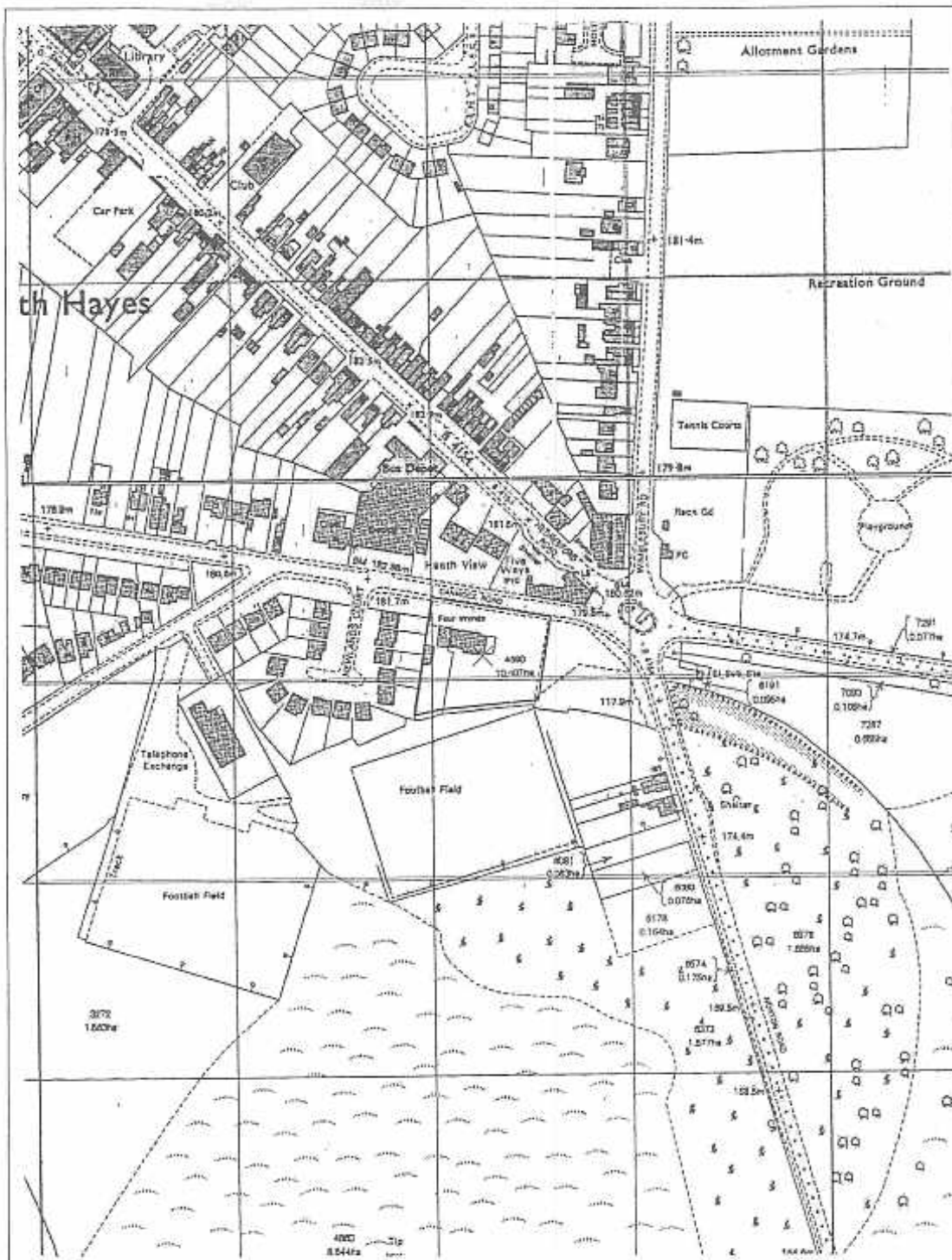
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<b>Austin Geotech</b> Geo-Environmental Engineering Ltd		Project: Former Four Wynds Heath Hayes
Client	Freshspace Developments Limited	Scale: c1: 2,500
Title	Ordnance Survey - 1971	Figure: 7

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<b>Austin Geotech</b> Geo-Environmental Engineering Ltd	Project	Former Four Wynds Heath Hayes	
Client	Freshspace Developments Limited	Scale	c1: 2,500
Title	Ordnance Survey - 1992	Figure	8

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**Appendix 1**

Coal Authority Mining Report





The Coal Authority	
Cost	£38.50
Price V.A.T.	£6.70
Total Retail	£45.20
V.A.T. Ref Number	596 3830 68

BURRELL DAVIS,  
SOLICITORS,  
DX 16087 CANNOCK

This matter is being dealt with by Keith Pennington

Our Ref: 496130-03

Your Ref: WJV SMARTS

Electronic Ref:

Date: 30 October 2003

Dear Sir,

**Coal Mining Report**  
**FOUR WYNDS CAFE, CANNOCK ROAD, HEATH HAYES, CANNOCK,**  
**STAFFORDSHIRE, WS12 3HG**

I refer to the enquiry dated 28th October 2003, received 29th October 2003, in connection with the above.

This report is based on and limited to the records in the possession of The Coal Authority at the time the search is answered.

Ordnance Survey (O.S.) is undertaking a Positional Accuracy Improvement Programme of its mapping data. The Coal Authority (CA) has no control over the timing of issue of Positionally Improved mapping data by O.S. or over users of that data. In some instances the relative position between surface features and coal mining features may alter as a consequence of this programme. The CA will ensure that the integrity of its database is maintained by replotting some mining information to sustain the relationship between that mining information and the improved O.S. surface positions, some of which are now being released. However, mining reports are currently being produced against pre improved O.S. mapping whilst the Authority updates its database in line with the O.S. changes.

**Past Underground Mining**

The property is within the likely zone of influence on the surface from workings in 11 seams of coal at 70m to 300m depth, the last date of working being 1962.

Ground movement from the above mentioned past coal workings should by now have ceased.

**Present Underground Mining**

The property is not within the zone of likely physical influence on the surface from any present underground coal workings.

**Future Underground Mining**

The property is not within a geographical area for which a licence to extract coal by underground methods is awaiting determination by the Coal Authority.

The property is not within a geographical area for which a licence to extract coal by underground methods has been granted.

The property is not within the zone of likely physical influence at the surface from plans of future workings in our possession.

However reserves of coal exist in the locality which could be worked at some time in the future subject to feasibility, licences, and planning consents.

We have no record of any notice of the risk of the land being affected by subsidence being given under S.46 of the Coal Mining Subsidence Act 1991.

#### **Shafts and Adits**

We have no knowledge of any mine entries within, or within 20 metres of, the boundary of the property.

The records held by the Coal Authority may be incomplete. Consequently, there may exist in this locality mine entries of which we have no knowledge.

#### **Surface Geology**

Records in our possession do not disclose any fault or other line of weakness at the surface as having affected the stability of the property.

#### **Past Opencast Mining**

The property is not located within the geographical boundary of an opencast site from which coal has been extracted by opencast methods.

#### **Present Opencast Mining**

The property does not lie within 200 metres of the geographical boundary of an opencast site within which coal is being extracted by opencast methods.

#### **Future Opencast Mining**

The property is not within 800 metres of the geographical boundary of an opencast site for which a licence to extract coal by opencast methods is awaiting determination.

The property is within 800 metres of the geographical site boundary of the Bleak House Residual prospective opencast site for which a licence to extract coal by opencast methods was granted in October 1994. The grant of this licence is conditional on the applicant securing any other rights, permissions (including planning permissions) and consents to enable him to carry out his operations.

The property is within 800 metres of the geographical site boundary of the Bleak House Residual prospective opencast site for which a licence to extract coal by opencast methods was granted in October 1994. The grant of this licence is conditional on the applicant securing any other rights, permissions (including planning permissions) and consents to enable him to carry out his operations.

#### **Subsidence**

The records in our possession do not disclose any damage notice or claim having been given, made or pursued in respect of the property since 1 January 1984.

The records in our possession do not disclose any current "Stop Notice" affecting the property.

The records in our possession do not show any request having been made to execute preventative works under S.33 of the Coal Mining Subsidence Act 1991.

**Withdrawal of Support**

The property lies within a geographical area in respect of which a notice of entitlement to withdraw support was published in 1945.

The property does not lie within a geographical area in respect of which a notice has been given under S.41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

**Working Facilities Orders**

The property is not within a geographical area that is the subject of an Order made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

**Payments to Owners of Former Copyhold Land**

The property is not within an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

**Additional Remarks**

These replies are prepared in accordance with the 2003 editions of the Coal Authority's Terms and Conditions, User Guide and the Law Society's Guidance Notes.

Copyright in coal mining reports and certificates and the information contained therein is with the Coal Authority. All rights are reserved and unauthorised use is prohibited. Copyright and other Intellectual Property is not transferred to external parties by possession of a mining report or certificate.

We acknowledge the receipt of your remittance in payment of our fee.

Yours faithfully



Albert Schofield

Director of Mining Information and Services



Crown Copyright. Quoted scale is approximate.  
SCALE: 1:2500

This map is reproduced from the Ordnance Survey material by The God Authority [or division thereof] with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number: AL500604001.

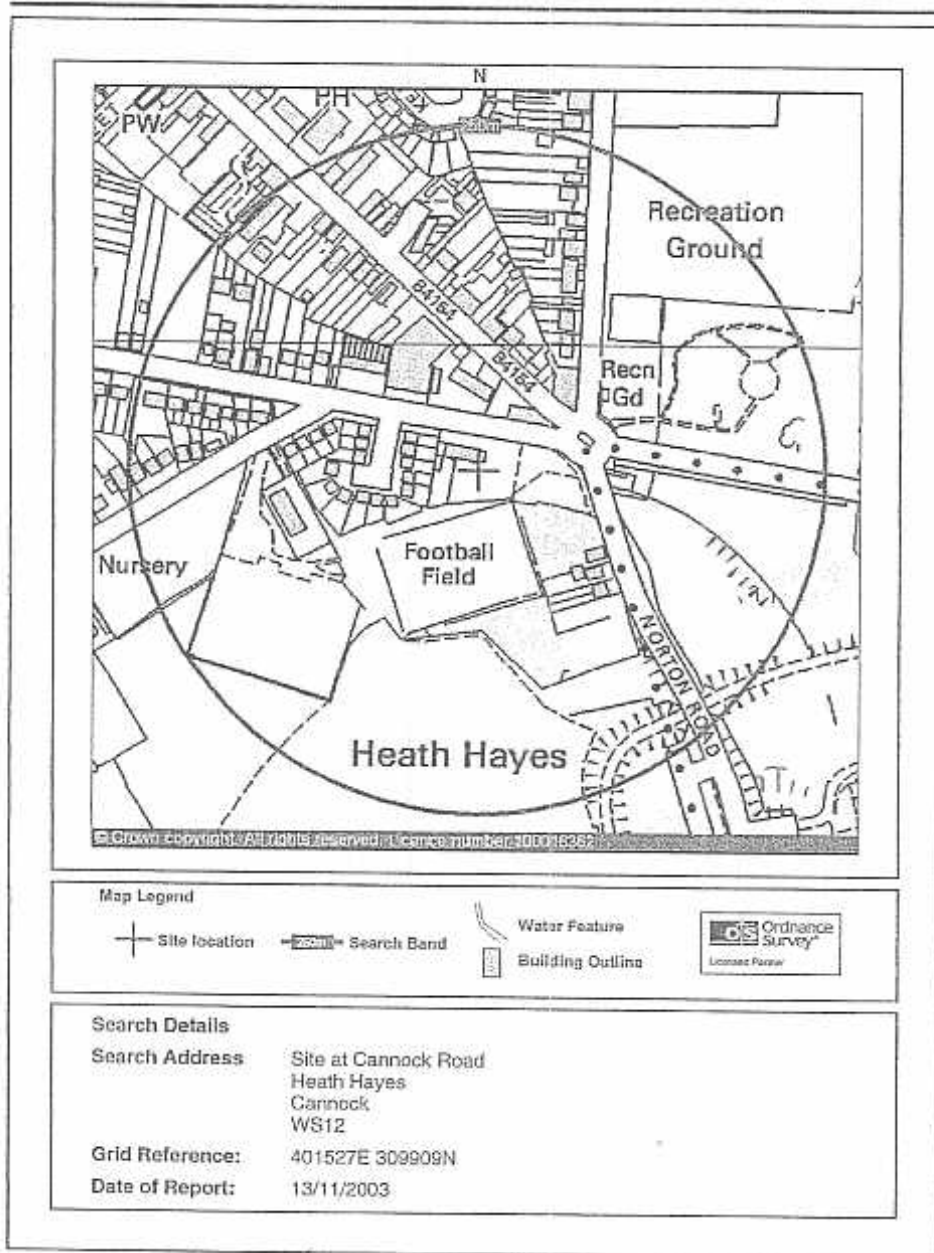
This is a plan of the boundaries of the property in respect of which this report has been prepared. It is the responsibility of the user to ensure that the boundaries shown correspond with those of the property.

APPROXIMATE POSITION OF ENQUIRY BOUNDARY SHOWN

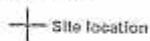


Appendix 2

Summary of Environmental Report



Map Legend



Site location



Search Band



Water Feature



Building Outline



Search Details

Search Address: Site at Cannock Road  
Heath Hayes  
Cannock  
WS12

Grid Reference: 401527E 309909N

Date of Report: 13/11/2003

## Section A - Enquiries of Statutory Registers

Enquiry	Reply			
<b>LANDFILL AND WASTE</b>				
<b>Landfill Sites</b>				
<b>A.1</b>	Are there any landfill sites licensed by the Environment Agency under Part II of Environmental Protection Act 1990	<b>0-250m</b> No	<b>250-500m</b> No	<b>500-1000m</b> No
<b>Scrapyards</b>				
<b>A.2</b>	Are there any scrapyards licensed by the Environment Agency under Part II of Environmental Protection Act 1990	<b>0-250m</b> No	<b>250-500m</b> No	<b>500-1000m</b> No
<b>Waste Treatment and Disposal</b>				
<b>A.3</b>	Are there any other sites licensed by the Environment Agency under Part II of Environmental Protection Act 1990 to treat, keep, or dispose of controlled waste	<b>0-250m</b> No	<b>250-500m</b> No	<b>500-1000m</b> No
<b>REGULATED INDUSTRIES</b>				
<b>IPC and IPPC Regulations</b>				
<b>A.4</b>	Are there sites authorised by the Environment Agency under Part I of the Environmental Protection Act 1990 to carry out processes subject to Integrated Pollution Control (IPC) and/or Integrated Pollution Prevention and Control (IPPC)	<b>0-250m</b> No	<b>250-500m</b> No	<b>500-1000m</b> No
<b>Keeping of Radioactive Substances</b>				
<b>A.5</b>	Are there any sites registered by Environment Agency under the Radioactive Substances Act 1993 to keep or use radioactive materials	<b>0-250m</b> No	<b>250-500m</b> No	<b>500-1000m</b> No
<b>Storage of Hazardous Substances</b>				
<b>A.6</b>	Are there any sites subject to hazardous substances consents granted by the relevant local authority under the Planning (Hazardous Substances) Act 1990	<b>0-250m</b> No	<b>250-500m</b> No	<b>500-1000m</b> No
<b>Storage of Dangerous Substances</b>				
<b>A.7</b>	Are there any sites regulated by the Health and Safety Executive for storing specific dangerous substances under the NIHS Regulations 1982	<b>0-250m</b> No	<b>250-500m</b> No	<b>500-1000m</b> No
<b>Control of Major Accident Hazards</b>				
<b>A.8</b>	Are there any sites regulated by the Health and Safety Executive under the Control of Major Accident Hazards (COMAH) Regulations 1999	<b>0-250m</b> No	<b>250-500m</b> No	<b>500-1000m</b> No

**AIR****Emissions to Air**

		<b>0-250m</b>	<b>250-500m</b>	<b>500-1000m</b>
<b>A.9</b>	Are there any sites subject to local air pollution control (LAAPC) under Part I of the Environmental Protection Act 1990	No Coverage	No Coverage	No Coverage

**WATER ABSTRACTION AND DISCHARGES****Abstraction Licences**

		<b>0-250m</b>	<b>250-500m</b>	<b>500-1000m</b>
<b>A.10</b>	Details of abstraction licences issued by the Environment Agency in accordance with the Water Resources Act 1991 (as amended or prescribed by Statutory Instrument or other notice)	No	No	No

**Discharges to Water**

		<b>0-250m</b>	<b>250-500m</b>	<b>500-1000m</b>
<b>A.11</b>	Are there any authorisations issued by the Environment Agency (and its predecessor, the National Rivers Authority) to discharges to the watercourse from non-IPC processes in accordance with the Water Resources Act 1991 (as amended or prescribed by Statutory Instrument or other notice)	No	No	Yes
		Please refer to the Additional Information section for details of records found.		

**Footnotes:**

Question A.1 The boundaries for current landfill sites have been digitised by the Environment Agency and have a precision of 5 metres. The boundaries of older Landfill Sites have been digitised by Sitescope. Because the records are older they generally have a precision of 25m. Where because of the age of the landfill we have not been able to precisely locate the extent of the landfill site we have created a 200m buffer around the grid reference assigned by the Environment Agency.

Question A.5 The response to this question is based on data supplied by the Department of Environment Transport and the Regions which has been collected by Local Planning Authorities.

Question A.10 The response to this question is based on details of abstraction licences issued by the Environment Agency (and its predecessor, the National Rivers Authority).

Question A.11 The response to this question is based on details of consents issued by the Environment Agency (and its predecessor, the National Rivers Authority) to discharges to the watercourse from non-IPC processes.

Questions A.1, A.2, A.3, A.4, A.5, A.10, A.11 This data has been supplied by the Environment Agency. Where records are deemed to be inaccurate or incomplete Sitescope Ltd has updated them accordingly.



Section B - Enquiries Concerning Site History

Enquiry	Reply			
<b>INDUSTRIAL LAND USE</b>				
<b>Past Industrial Land Use</b>				
<b>B.1</b>	Are there any industrial sites (indicating potentially contaminative land use) shown on historical Ordnance Survey maps	<b>0-250m</b> Yes	<b>250-500m</b> Yes	<b>500-1000m</b> N/A
Please refer to the Additional Information section for details of records found.				
<b>Current Industrial Land Use</b>				
<b>B.2</b>	Are there any industrial sites (indicating potentially contaminative land use) in Trade Listings	<b>0-250m</b> Yes	<b>250-500m</b> Yes	<b>500-1000m</b> N/A
Please refer to the Additional Information section for details of records found.				

Footnotes:

Question B.1 The response to this question is based on Historical Industrial Land Use data which are the result of a systematic analysis of Ordnance Survey maps dating from the 1880s, as well as more recent editions of the Ordnance Survey National Grid Series.

Evidence of past contamination is drawn from at least 4, and up to 6 historic map editions. The first of these editions will be the earliest County Series maps, which date from between 1800 and 1830 and are to a scale of 1:10,560. The second edition of County Series maps dates from circa 1900, and the third circa 1930.

Question B.2 The replies to this question are based on industrial uses identified from the 1995 Ratings List compiled by the Valuation Office Agency (VOA), as supplied by the VOA to local authorities responsible for the billing and collection of business rates ("Billing Authorities").

Agency

---

**Footnotes:**

Question C.1 Details taken from National Rivers Authority 1:100,000 mapping, as digitised for the Environment Agency. The information is supplied to Steeple by the Environment Agency in accordance with its licensed data reseller agreement.

Question C.2 These groundwater sources include private wells and boreholes that supply water fit for human consumption.

Question C.3 Source Protection Zones relate to groundwater flow below the water table and measure the likely travel time of pollutants which could impact on a groundwater source, as determined by the Environment Agency.

Question C.4 The General Quality Assessment scheme (GQA) is the Environment Agency's national method for classifying water quality in rivers and canals. The Chemistry GQA scheme has over 7,000 sampling sites which provide information for approximately 40,000 km of watercourses.

## Section D - Enquiries Concerning Environmental Setting

Enquiry	Reply			
<b>ENVIRONMENTALLY SENSITIVE AREAS</b>				
<b>Nitrate Sensitive Areas</b>				
D.1	Are there any areas where sources of public drinking water contain high nitrate concentrations (Nitrate Sensitive Areas) or where the Department for Environment, Food and Rural Affairs (DEFRA) has imposed mandatory requirements from 1999 (Nitrate Vulnerable Zones)	0-250m No	250-500m No	500-1000m No
<hr/>				
<b>Sites of Special Scientific Interest</b>				
D.2	Are there any sites notified as Sites of Special Scientific Interest under section 28 of the Wildlife and Countryside Act 1981	0-250m No	250-500m No	500-1000m Yes
No further details available				
<hr/>				
<b>Special Areas of Conservation</b>				
D.3	Are there any sites nominated for designation as Special Areas of Conservation under the Conservation (Natural Habitats, etc.) Regulations 1994	0-250m No	250-500m No	500-1000m No
<hr/>				
<b>Special Protection Areas</b>				
D.4	Are there any sites nominated for designation as Special Protection Areas under the European Communities Council Directive (79/409/EEC) on the Conservation of Wild Birds	0-250m No	250-500m No	500-1000m No
<hr/>				
<b>Environmentally Sensitive Areas</b>				
D.5	Are there any areas of high environmental value designated by the Department for Environment, Food and Rural Affairs (DEFRA) within which farmers are encouraged to respect the environment by the adoption of certain agricultural practices	0-250m No	250-500m No	500-1000m No
<hr/>				
<b>Areas of Outstanding Natural Beauty</b>				
D.6	Are there any areas designated as Areas of Outstanding Natural Beauty under the National Parks and Access to the Countryside Act 1949	0-250m No	250-500m No	500-1000m No
<hr/>				
<b>National Parks</b>				
D.7	Are there any National Parks designated under the National Parks and Access to Countryside Act 1949	0-250m No	250-500m No	500-1000m No

<b>National Nature Reserves</b>		<b>0-250m</b>	<b>250-500m</b>	<b>500-1000m</b>
<b>D.8</b>	Are there any sites designated as National Nature Reserves under Section 19 of the National Parks and Access to the Countryside Act 1949 or Section 35 of the Wildlife and Countryside Act 1981	No	No	No

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<b>RAMSAR Sites</b>		<b>0-250m</b>	<b>250-500m</b>	<b>500-1000m</b>
<b>D.9</b>	Are there any sites designated as Ramsar Sites in accordance with the Convention on Wetlands of International Importance, Especially as Waterfowl Habitat (commonly referred to as the Ramsar Convention)	No	No	No

---

## Section E - Enquiries Concerning Land Instability

Enquiry	Reply						
<b>SUBSIDENCE</b>							
<b>Natural Subsidence Risk</b>							
<b>E.1</b> What is the risk to the property from natural subsidence?	<p>There is very low risk of foundation damage to properties from natural subsidence hazards.</p> <p>Please refer to the Additional Information section for full details of how natural subsidence hazard is broken down into its component hazards, namely swelling clay, landslip, gulls &amp; cambering, ground dissolution and compressible ground. These are described below. Each hazard is rated here according to its contribution to the overall level of hazard in the postcode.</p>						
<b>MINING AND MINERAL EXTRACTION</b>							
<b>Shallow Mining</b>							
<b>E.2</b> What is the risk to the property from shallow mining?	<p>The risk of shallow mining is assessed to be low.</p> <p>Where the risk is moderate or above this does not necessarily mean that there is any risk of foundation damage as this also depends on the type of mining and the type of property involved. However we would recommend that specific advice is commissioned from a qualified member of the RICS.</p>						
<b>Coal Mining Areas</b>							
<b>E.3</b> Is the property in a coal mining area or in an area (without past or present, deep or open-cast, coal mining activity) in which coal bearing strata are known or expected to be present?	<p>The postcode is in or near the South Staffs Coal Area</p> <p>A coal mining search may be required.</p>						
<b>Mineral Extraction and Quarrying</b>							
<b>E.4</b> Are there sites where quarrying or mineral extraction activity is currently being carried out?	<table border="1"> <thead> <tr> <th>0-250m</th> <th>250-500m</th> <th>500-1000m</th> </tr> </thead> <tbody> <tr> <td>No</td> <td>No</td> <td>No</td> </tr> </tbody> </table>	0-250m	250-500m	500-1000m	No	No	No
0-250m	250-500m	500-1000m					
No	No	No					

## Footnotes:

Question E.1 This assessment is based on postcode geohazard information supplied by the BGS. A postcode unit contains on average 15 properties.

Question E.2 This assessment is based on information supplied by the BGS and takes into account many types of mining in addition to coal, such as ironstone or limestone extraction. Shallow mine workings less than 40 metres below the ground surface are considered to cause a particular subsidence hazard as they can sometimes produce potentially damaging surface collapses. This assessment takes into account many types of mining in addition to coal, such as ironstone or limestone extraction. This shallow mining search does not take into account deeper mining, which can be assessed through a Coal Authority mining search described at E.3

Question E.3 The reply to this question is based upon 1 km square areas.

Question E.4 The reply to this question is based upon the BGS compendium of mines, quarries and mineral sites operating commercially in England and Wales since 1993. The original data was compiled by BGS in 1993-94 (primarily from BGS records and from information supplied by local authorities).

Appendix 3

Records of Trial Pits

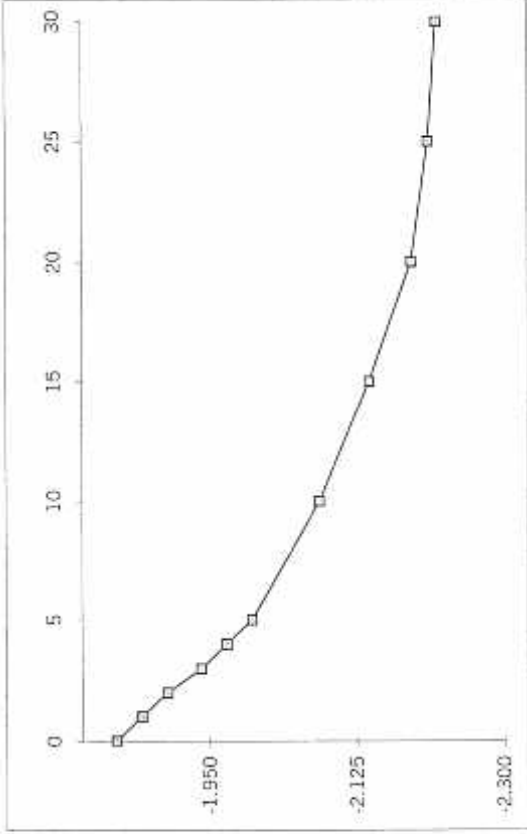
TRIAL PIT S1  
TEST 1

JOB NO. M2453 DATE 25/05/04  
SITE Four Winds, Heath Hayes, Cannock

PIT DETAILS

width 0.65  
length 1.95  
depth 2.28  
free space (%) 30

time/min	depth/m
0	-1.840
1	-1.870
2	-1.900
3	-1.940
4	-1.970
5	-2.000
10	-2.080
15	-2.140
20	-2.190
25	-2.210
30	-2.220



Strata details

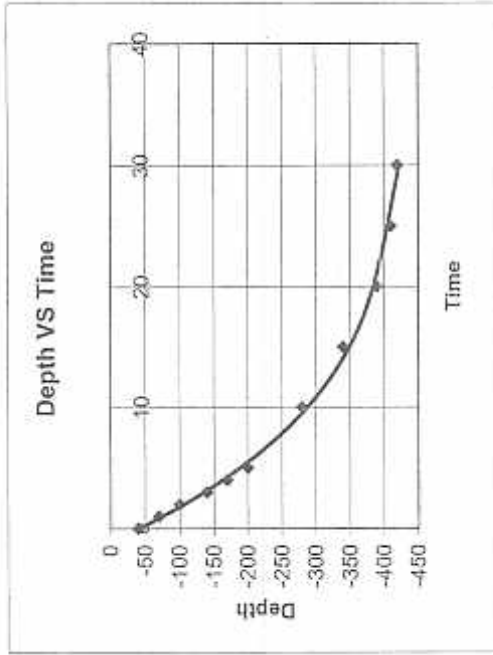
From GL	To	Description
0.05	0.06	MADE GROUND: bituminous macadam surfacing
0.4	0.4	MADE GROUND: Moderately dense dark grey silty angular sand to medium gravel sized ash
0.4	0.7	MADE GROUND: Loose red brown silty angular fine to coarse gravel sized fragments of burnt shale
0.7	1.2	Moderately dense red brown slightly silty gravelly fine to medium SAND. Gravel is rounded fine to coarse quartz.
1.2	2.2	Moderately dense red brown mottled light grey slightly silty slightly clayey gravelly fine to coarse SAND. Gravel is rounded fine to coarse quartz.

comments:  
Water level monitored in slotted pipe  
10mm pea gravel used as filter  
medium to eliminate pit wall spalling.  
Former foundation exposed in SE face of pit  
Pit walls remained vertical and stable during excavation  
Pit remained dry prior to commencing test

**Four Wynds, Heath Hayes  
Soakaway 1, First Test**

Pit Dimensions: 0.65m x 1.95m x 2.28m depth Free space (gravel filled) = 30%

Mins	Depth mm
0	-40
1	-70
2	-100
3	-140
4	-170
5	-200
10	-280
15	-340
20	-390
25	-410
30	-420



$$v_p 75-25 = 0.65 \times 1.95 \times 0.3 \times (0.40 - 0.25)^2 / 2 = 0.029 \text{ m}^3$$

$$a_p 50 = (2 \times 0.65 \times 0.65) + (2 \times 1.95 \times 0.65) + (0.65 \times 1.95) = 5.6 \text{ m}^2$$

$$t_p 75-25 = 1.5 \text{ min}$$

$$f = v_p 75-25 / a_p 50 \times t_p 75-25 \times 60 = 5.7 \text{ E-06 m}^3/\text{s}$$



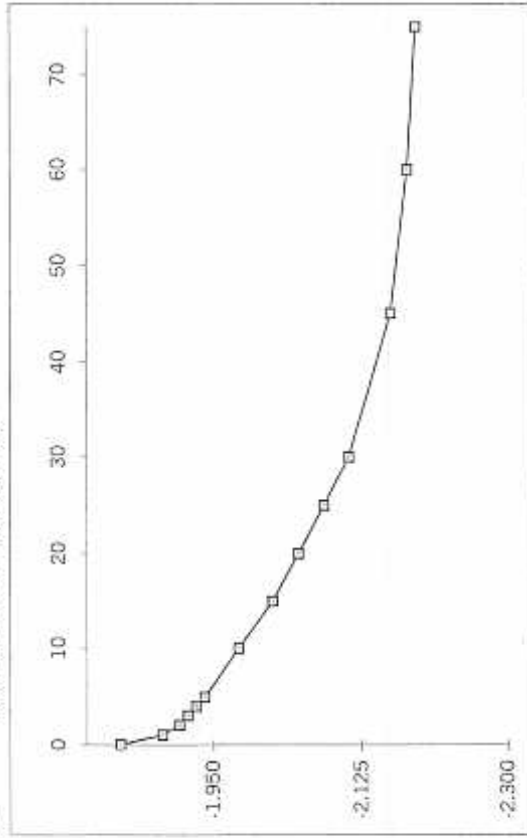
TRIAL PIT S1  
TEST 2

JOB NO. M2453 DATE 25/05/04  
SITE Four Winds , Heath Hayes, Cannock

PIT-DETAILS

width 0.6G  
length 1.96  
depth 2.28  
free space (%) 30

time/min	depth/m
0	-1.840
1	-1.890
2	-1.910
3	-1.920
4	-1.930
5	-1.940
10	-1.980
15	-2.020
20	-2.060
25	-2.080
30	-2.110
45	-2.160
60	-2.190
75	-2.19



Strata details

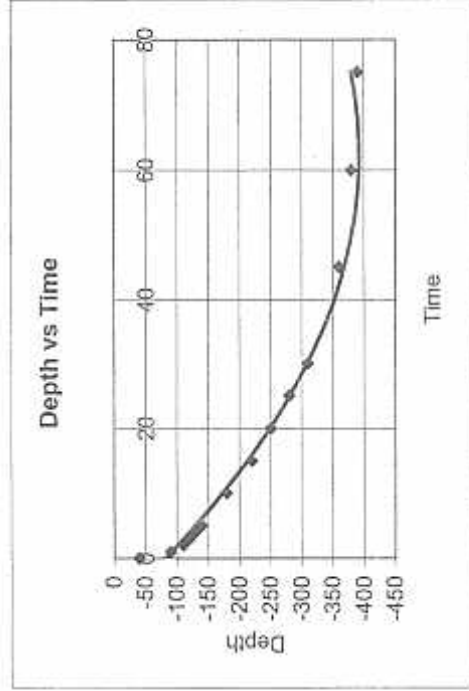
From GL	To	Description
0.05	0.05	MADE GROUND: bituminous macadam surfacing
0.4	0.4	MADE GROUND: Moderately dense dark grey silty angular sand to medium gravel sized ash
0.7	0.7	MADE GROUND: Loose red brown silty angular fine to coarse gravel sized fragments of burnt shale
0.7	1.2	Moderately dense red brown slightly silty gravelly fine to medium SAND: Gravel is rounded fine to coarse quartz.
1.2	2.2	Moderately dense red brown mottled light grey slightly silty clayey gravelly fine to coarse SAND. Gravel is rounded fine to coarse quartz.

comments:  
Water level monitored in slotted pipe  
10mm pea gravel used as filter  
medium to eliminate pit wall spalling.  
Former foundation exposed in SE face of pit  
Pit walls remained vertical and stable during excavation  
Pit remained dry prior to commencing test

Four Wynds, Heath Hayes  
Soakaway 1, Second Test

Pit Dimensions: 0.65m x 1.95m x 2.28m depth Free space (gravel filled) = 30%

Mins	Depth mm
0	-40
1	-90
2	-110
3	-120
4	-130
5	-140
10	-180
15	-220
20	-250
25	-280
30	-310
45	-360
60	-380
75	-390



$$v_p 75-25 = 0.65 \times 1.95 \times 0.3 \times (0.37 - 0.23) / 2$$

$$= 0.027 \text{ m}^3$$

$$a_p 50 = (2 \times 0.65 \times 0.67) + (2 \times 1.95 \times 0.67) + (0.65 \times 1.95)$$

$$= 5.69 \text{ m}^2$$

$$t_p 75-25 = 38 \text{ min}$$

$$f = v_p 75-25 / a_p 50 \times t_p 75-25 \times 60 = 2.06 \text{ E-06 m}^3/\text{s}$$

**SUB SURFACE MIDLANDS LIMITED**  
**GEOTECHNICAL AND GEOENVIRONMENTAL**  
**SITE INVESTIGATION SPECIALISTS AND CONSULTANTS**

**Trial Pit Record Sheet**

Job No.	M2453
Site	Four Winds Café, Cannock Road, Heath Hayes, Staffordshire
Date	25/05/04
Pit No.	TP5
Weather	Dry

DEPTH	DESCRIPTION	SAMPLES		
GL - 0.2	MADE GROUND: Concrete.			
0.2 - 2.1	MADE GROUND: Loose dark grey silty fine to medium sand with many angular fine to coarse gravel sized fragments of concrete, brick and ash.  ...occasional whole brick and cobbles of masonry below 0.8m  ...concrete boulder at 0.9m	Jar Bulk Jar	0.3 0.8 1.5	862 863 864
2.1 - 3.6	Moderately dense red brown mottled light grey silty gravelly fine to medium SAND. Gravel is rounded fine to coarse quartz.	Jar Bulk Jar	2.2 2.5 3.0	865 866 867

**Notes:**  
 Excavated using JCB 3CX excavator with toothless bucket.  
**END @ 3.6m**

Water	Pit dry
Stability	Pit walls vertical and stable during excavation
Dim.	0.65 x 3.0 x 3.6
Orient	330°

**Sketches: (none)**

**SUB SURFACE MIDLANDS LIMITED**  
 GEOTECHNICAL AND GEOENVIRONMENTAL  
 SITE INVESTIGATION SPECIALISTS AND CONSULTANTS

**Trial Pit Record Sheet**

Job No.	M2453
Site	Four Winds Café, Cannock Road, Heath Hayes, Staffordshire
Date	25/05/04
Pit No.	TP6
Weather	Dry

DEPTH	DESCRIPTION	SAMPLES		
GL - 0.05	MADE GROUND: Tarmacadam surfacing.			

**Notes:**

Strong gas odour on removal of tarmacadam surfacing  
 Hand excavation to 0.12 revealed metal duct containing yellow gas pipe.  
 Hissing gas  
 Reported to Engineer, instructed to backfill excavated pit. ?

END @ 0.1m

Water	
Stability	
Dim.	
Orient	

Sketches: (none)

11-5-04; 15.30  
 Rang Graham Butler. Leak reported to B. Gas by  
 Rob Rafferty. Gas found @ roadway as premises void  
 Will be resolved during redevelopment.

9.30 12-5-04 } Discovered -  
 Michael Crome

Rang 15.26  
 11-8-04 left message  
 Matthew Luck

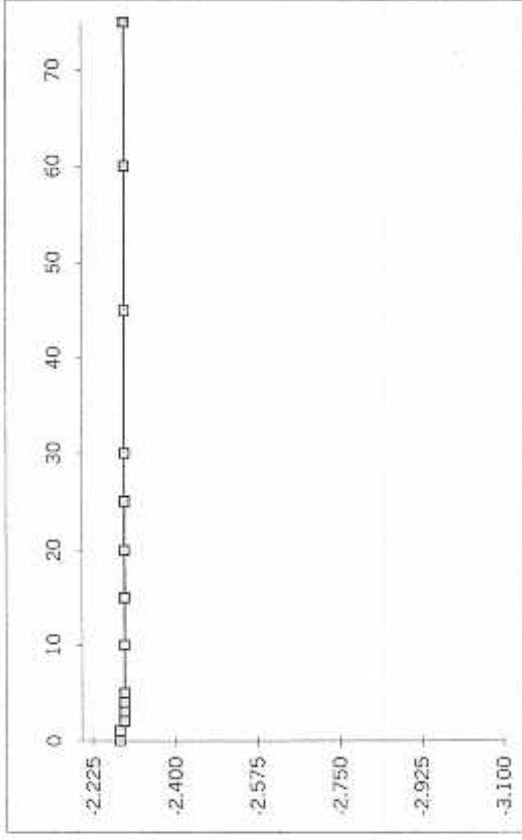
TRIAL PIT S2  
TEST 1

JOB NO. M2453 DATE 25/05/04  
SITE Four Winds, Heath Hayes, Cannock

PIT DETAILS

width 0.65  
length 1.80  
depth 3.10  
free space (%) 30

time/min	depth/m
0	-2.280
1	-2.280
2	-2.290
3	-2.290
4	-2.290
5	-2.290
10	-2.290
15	-2.290
20	-2.290
25	-2.290
30	-2.290
45	-2.290
60	-2.290
75	-2.29



Strata details

From GL	To	Description
0.1	0.1	MADE GROUND: Concrete
0.3	0.3	MADE GROUND: Moderately dense dark grey silty angular sand to medium gravel sized ash
0.9	0.9	MADE GROUND: Loose grey organic silty clayey gravelly fine to medium sand with some angular gravel to cobble sized fragments of brick, concrete and burnt
0.9	2.1	MADE GROUND: Soft to firm red brown to brown slightly sandy slightly gravelly clay with some angular gravel to cobble sized fragments of brick and concrete
2.1	3.1	Loose orange brown silty gravelly fine to medium SAND. Gravel is rounded fine to coarse quartz, (poss. Made Ground)

comments:  
Water level monitored in slotted pipe  
10mm pea gravel used as filter  
medium to eliminate pit wall spalling.  
Former foundation exposed in SE face of pit  
Pit walls remained vertical and stable during excavation  
Water seepage below 2.8m

Appendix 4

Results of Laboratory Testing

9 July 2004

Dr G Austin  
Austin Geotech  
Geo-Environmental Engineering  
16 Park Lanes  
Kingswinford  
West Midlands  
DY6 8AT

Test Report : AG /98861

Dear Dr Austin

Please find enclosed the results of the analysis carried out on the samples submitted from Four Wynds Heath Hayes Cannock on 02 July 2004.

I trust you will find these satisfactory but should you have any queries please contact customer services.

Yours sincerely



*K Burrell*



K Burrell  
AUTHORISED SIGNATORY



Determinations marked \* in this certificate are not included in the UKAS accreditation schedule for our laboratory. Opinions and interpretations expressed herein, and marked #, are outside the scope of UKAS accreditation. Determinations marked \$ were subcontracted. Unless otherwise stated, CAS Ltd was not responsible for sampling. Information about methods and performance characteristics of the determinations are available on request. Unless otherwise agreed, as received soils will be disposed of after 30 days, dried soils after 30 days and water/leachates after 10 days from the issue of the final report. Soil analysis is carried out on air-dried and ground test portion of the sample.



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Rayner House, 80 Lockhurst Lane, Coventry CV6 5PZ  
Tel +44 (0)24 7658 4800 Fax +44 (0)24 7658 4848 • info@cityanalytical.co.uk

## Soil Analysis

PAGE 3 OF 3

AG /98861  
 Four Wynds Heath Hayes Cannock  
 Your Reference:-  
 Your Order:- AG/001

CAS Number:			527011	527012	527016
Sample Ref			TS1	TS2	TS2
Detname	Method	Units	0.50m	0.40m	0.60m
Arsenic (Total)	30/30C	mg/kg	14	5	6.7
Boron (Soluble)	6	mg/kg	1.3	0.98	1.5
Cadmium (Total)	30	mg/kg	1	< 0.50	0.88
Chromium (Hexavalent)	30B	mg/kg	N/S	N/S	N/S
Chromium (Total)	30	mg/kg	23	16	16
Copper (Total)	30	mg/kg	37	18	26
Lead (Total)	30	mg/kg	52	28	88
Mercury (Total)	30C	mg/kg	< 0.10	< 0.10	< 0.10
Nickel (Total)	30	mg/kg	31	15	16
Selenium (Total)	30C	mg/kg	0.78	0.28	0.37
Zinc (Total)	30	mg/kg	160	75	160
Cyanide (Total)	14	mg/kg	< 0.50	< 0.50	< 0.50
Phenols (Total)	40A	mg/kg	1.3	< 0.50	< 0.50
Sulphate (Total) as SO <sub>3</sub>	45	%	0.29	0.04	0.06
Sulphide as S	47	mg/kg	< 5.0	< 5.0	< 5.0
pH	39	pH units	7.8	7.6	7.9
TPH (Total)	317	mg/kg	1300	210	600
Sulphur (Elemental)	51	mg/kg	< 100	< 100	< 100
PAH (Total)	307	mg/kg	170	7	6



Key

N/S - Not Scheduled

I/S - Insufficient Sample



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## Soil Analysis

PAGE 2 OF 3

AG /98861  
 Four Wynds Heath Hayes Cannock  
 Your Reference:-  
 Your Order:- AG/001

CAS Number:			527007	527008	527009	527010
Sample Ref			TP1	TP3	TP4	TP5
Detname	Method	Units	0.30m	0.20m	0.30m	0.80m
Arsenic (Total)	30/30C	mg/kg	7.2	5.4	5.1	14
Boron (Soluble)	6	mg/kg	0.57	0.26	0.33	1.5
Cadmium (Total)	30	mg/kg	0.63	1.2	0.68	0.72
Chromium (Hexavalent)	30B	mg/kg	< 0.10	< 0.10	2.2	< 0.10
Chromium (Total)	30	mg/kg	32	55	150	66
Copper (Total)	30	mg/kg	37	27	64	63
Lead (Total)	30	mg/kg	60	36	79	100
Mercury (Total)	30C	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10
Nickel (Total)	30	mg/kg	17	21	14	28
Selenium (Total)	30C	mg/kg	0.41	0.38	0.25	0.68
Zinc (Total)	30	mg/kg	130	83	290	200
Cyanide (Total)	14	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50
Phenols (Total)	40A	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50
Sulphate (Total) as SO <sub>3</sub>	45	%	0.05	0.06	0.03	0.23
Sulphide as S	47	mg/kg	< 5.0	< 5.0	< 5.0	< 5.0
pH	39	pH units	8	7.6	10.1	8
TPH (Total)	317	mg/kg	290	400	< 50	260
Sulphur (Elemental)	51	mg/kg	< 100	< 100	< 100	< 100
PAH (Total)	307	mg/kg	63	13	19	17



## Key

N/S - Not Scheduled  
 I/S - Insufficient Sample



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 Registered in England 2810081

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*Development Landscape and Conservation Manager  
John Heminsley BA(Hons) MRTPI*

Civic Centre  
PO Box 28  
Beecroft Road  
Cannock  
Staffordshire  
WS11 1BG

Tel. (01543) 462621  
Fax (01543) 464512  
DX 16095

APPLICATION NO: CH/99/0092

## TOWN AND COUNTRY PLANNING ACT 1990

### PLANNING PERMISSION

HADEN RITCHIE PARTNERSHIP  
MANOR HOUSE  
LICHFIELD STREET  
TAMWORTH  
STAFFS  
B79 7QF

LOCKETT & CO  
LOCKETT HOUSE  
30 NEW ROAD  
KIDDERMINSTER  
DY10 1AF

#### **PROPOSAL:**

NEW INDUSTRIAL UNIT AND ASSOCIATED CAR PARKING TO BE USED  
AS A TYRE SERVICE CENTRE

#### **LOCATION:**

CANNOCK ROAD FIVE WAYS HEATH HAYES

*Planning permission is granted for the above development as described on the accompanying plans (subject to the following conditions and reasons).*

- 1 The development to which this permission relates must be begun not later than the expiration of five years beginning with the date on which this permission is granted.

Reason

To comply with the requirements of section 91 of the Town and Country Planning Act 1990.

- 2 The use of the development hereby permitted shall not Commence until a vehicular access 7.3 metres wide with 10 metre radii has been constructed in accordance with the specification shown on the enclosed drawing number CSR 93/36

Reason

In the interests of highway safety.



APPLICATION NO:CH/99/0092

- 3 The use of the development hereby permitted shall not commence until those parts of the site shown on the approved drawing to be used by vehicles for access, parking, turning, loading and unloading have been constructed in concrete, bitumen or asphalt macadam, lined out, drained and lit.

Thereafter, those parts of the site shall be available for their designated use at all times when the development is occupied.

Reason

In the interests of highway safety.

- 4 No materials shall be used for the external surfaces of the development other than those specified on the application, except with the written approval of the Local Planning Authority.

Reason

In the interests of visual amenity.

- 5 The approved landscaping works, including all planting, seeding and turfing, shall be carried out on the first planting and seeding seasons following the occupation of any buildings or the completion of the development whichever is the sooner. Any trees or plants which within a period of five years from the date of planting die, are removed or become seriously damaged or diseased, shall be replaced in the next planting season with others of similar size and species unless the Local Planning Authority gives written consent to any variations.

Reason

In the interests of the visual amenity of the area.



*Development Landscape and Conservation Manager*  
*John Heminsley BA(Hons) MRTPI*

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PO Box 28  
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WS11 1BG  
Tel. (01543) 462621  
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DX 16095

APPLICATION NO: CH/99/0092

6 The development hereby permitted shall not be commenced until:-

- (a) a site investigation including recommendations for remedial treatment has been undertaken;
- (b) the Local Planning Authority has given approval in writing to the method of remedial treatment;
- (c) the approved remedial treatment has been carried out in full.

Reason

In order to enable the development to proceed in a safe environment and to protect the health and safety of its occupiers.

DATED *20/08/*~~30/07/~~1999

ON BEHALF OF THE SAID COUNCIL  
(SEE ACCOMPANYING NOTES)



# GEOTECHNICAL ENVIRONMENTAL AND MATERIALS SERVICES LTD

Our Ref: 98/066/1

James Pritchard Esq  
Concept Project Management  
Willow Court  
34 Thurmaston Lane  
Leicester  
LE5 0TE

3 Fellows Yard  
Plumtree  
Nottingham  
NG12 5NS

Tel and Fax 0115 937 7042  
Mobile Phone 0976 258723  
e mail; [pitts@gems-ltd.co.uk](mailto:pitts@gems-ltd.co.uk)

10 December 1998

CANNOCK CHASE DISTRICT  
COUNCIL  
PLANNING SERVICES  
- 9 SEP 1999

Dear Mr Pritchard

## FIVEWAYS, CANNOCK - GAS MONITORING

Further to our report of 2 December, we carried out the first gas monitoring visit on 8 December 1998 under the barometric pressure conditions which were required by Cannock Chase Council.

The gas monitoring was carried out using the instrument referred to in Section 3.5 of our report, namely a Geotechnical Instruments GA94A infra-red gas analyser (Serial No. G2751) with a flow pod attachment. Groundwater levels were also recorded in each borehole.

The results were as follows:

Borehole	Oxygen %	Methane v/v%	Methane LEL%	Carbon Dioxide %	Flow (l/h)	Ground- water (mbegl)
1	18.9	nd	nd	0.2	0	3.23
2	20.0	nd	nd	0.1	0	3.27

nd : not detected

Temperature: 11°C

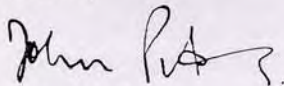
Barometric Pressure: 993mb and falling

Weather: Heavy and persistent rain; wind moderate SW with strong gusts

Ground conditions: very wet

Please do not hesitate to contact us if you have any queries about our results.

Sincerely



Dr John Pitts  
Director  
GEM Services Limited

0115 937 7042  
GEM LTD  
11  
Mr A

DIRECTORS: DR J PITTS L PITTS

REGISTERED OFFICE: 3 FELLOWS YARD PLUMTREE NOTTINGHAM NG12 5NS

REGISTERED NUMBER: 3217591



## 1.0 INTRODUCTION

1.1 We were instructed by Concept Project Management (Ref: JP10381/PC16/AP, 26 October 1998) on behalf of Key Retail Limited and ATS to carry out additional ground investigation works at Fiveways, Cannock. An earlier investigation has been carried out based on trial pits and this report should be read in conjunction with the report of that investigation (Report No. 98/066 of 25 November 1998).

1.2 The main aims of the additional ground investigation were:

- to determine the geotechnical properties of the soils in the southern part of the site in order to aid the design of foundations, that part of the site comprising a back filled cutting to a former mineral railway
- to identify whether special requirements would be required for concrete to be placed in direct contact with the ground or protection accorded to buried metals
- to determine whether contamination resulting from ground gases is present arising from the presence of landfills around the site, details of the contents of which are few or absent, or arising from the inclusion of putrescible materials in the back fill to the cutting itself.

1.3 This report was prepared for Concept Project Management and their Clients, Key Retail Limited and ATS. No responsibility will be accepted where this report, either in part or in its entirety is used by a third party.



## 2.0 THE SITE AND GEOLOGY

- 2.1 The site is located at National Grid Reference SK 016 099 on the southern side of a multiple road intersection known as Fiveways which is at Heath Hayes approximately 4km south-east of the town centre of Cannock (Appendix 1). The site forms the western margin of the road intersection with Cannock Road to the north and Hednesford Road to the east. To the west of the site is the car park of a café. The southern limit of the site is marked by mature bushes and semi-mature broadleaf trees.
- 2.2 The site itself is relatively flat lying covered with coarse grass and weeds around the periphery and tarmac in the central part. A raised concrete kerb topped with low bollards cuts the site diagonally from south-west to north-east and marks the northern limit of tarmac surfaced hard standing. The tarmac surface contains a marked depression in its south-eastern part. Standing water was present in the south-east corner of the site and the presence of typical wet ground grass species indicates that this is a common occurrence. At the north-eastern edge of the site is an inspection cover for Telecoms which revealed several lines, including fibre-optic cables at a depth of 1.6m. The lines were traced along the northern boundary of the site although extended up to 6m into the site from the Cannock Road boundary. The local telephone exchange is nearby to the west of the site. No other services were identified by the cable detector survey, although the main aim of the survey was to ensure that the trial pit positions were clear of services.
- 2.3 According to publications of the British Geological Survey, the site is underlain by strata of Middle Coal Measures (Upper Carboniferous) age overlain by boulder clay of Pleistocene age. The Middle Coal Measures are described as alternating mudstones, shales and siltstones with occasional sandstones, coal seams and seatearths. The boulder clay is described as a sandy gravelly clay.
- 2.4 According to the Environment Agency 'Policy and Practice for the Protection of Groundwater: Groundwater Vulnerability of Leicestershire', the site is underlain by a minor aquifer (Soar alluvium and gravels) with soils of high leaching potential. The soils are designated HU, the U referring to an urban setting in which a worst case vulnerability is assigned to the soils until proven otherwise. The Mercia Mudstones are classified as a 'Non-Aquifer' except for skerries.



### 3.0 SITE WORK

- 3.1 Site work was carried out on 13 November 1998 and consisted of two light cable percussion boreholes advanced to a depth (nominally) of 10m below existing ground level. During the boring, samples were taken for descriptive and testing purposes. Standard Penetration Tests (SPT) were also carried out in each boreholes, nominally at a rate of one per metre to 5m and at an interval of 1.5m thereafter.
- 3.2 In each borehole, 50mm internal diameter HDPE standpipe was installed, slotted section from the base of the borehole to within one metre of the surface and surrounded with 10mm pea gravel, with plain section standpipe to close to the surface surrounded by a bentonite seal. A bung-fitting gas tap was placed in each standpipe and a stop tap box secured in place with concrete.
- 3.3 The site work was carried out in accordance with the requirements of BS5930: Code of Practice for Site Investigations. The gas monitoring points were installed in accordance with the recommendations given in Waste Management Paper 27.
- 3.4 The locations of the boreholes are shown on the plan extract in Appendix 2. The logs of the boreholes which contain details of the samples taken and the results of the SPTs are given in Appendix 3.
- 3.5 Gas monitoring visits to the site will be carried out on two successive occasions during times of low (<1000mb) and falling barometric pressure. Concentrations of oxygen, methane, and carbon dioxide will be measured as well as gas flow in the boreholes. An infra-red gas analyser (GA94A Serial No. G2751) with a gas flow pod attachment is used for the monitoring. Barometric pressure, prevailing weather and ground conditions are noted and the depth of any groundwater within the standpipes is also monitored. The results of the gas monitoring will be reported separately.



KEY RETAIL LTD & ATS

Fiveways, Cannock  
Report of an Additional Ground Investigation

---

## 7.0 CONTAMINATION ASSESSMENT

7.1 A risk assessment will be included with the results of the gas monitoring.

#### 4.0 LABORATORY TESTING

- 4.1 Two samples of groundwater were scheduled for testing for total available sulfate content and pH.
- 4.2 The testing was carried out in accordance with the requirements of BS1377:1990 'Methods of test for soils for civil engineering purposes', Parts 1 and 3.



## 5.0 CURRENT LEGISLATION AND GUIDANCE ON CONTAMINATED LAND

### 5.1 Environmental Protection Act, 1990

5.1.1 The Environmental Protection Act, 1990 (EPA) received Royal Assent on 1 November 1990 and has been implemented in stages. Within the EPA, contaminated land is addressed in Sections 79-82 Statutory Nuisances. The EPA lists eight matters which constitute statutory nuisance as defined by the Act. Of particular relevance in this context are:

- any premises in such a state as to be prejudicial to health and nuisance;
- any accumulation or deposit which is prejudicial to health or nuisance

Local Authorities can serve notices on an owner of a contaminated site requiring that the nuisance is abated and the EPA empowers aggrieved individuals to make complaints about statutory nuisance directly to a magistrates court.

### 5.2 Environment Act, 1995

The Environment Act, 1995 received the Royal Assent on 19 July 1995. The Act sets out extensive provisions concerning contaminated land which are retrospectively inserted into the EPA, 1990 and took effect as a new Part IIA in April 1996. The provisions include a definition of contaminated land which is:

"Land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

- (a) significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) pollution of controlled water is being, or is likely to be caused."

Harm is defined as "harm to health of living organisms or interference with the ecological system of which they form part and, in the case of man, includes harm to his property".

The Act provides powers to the enforcing authority ( which may be the local authority or the Environment Agency) to serve a remediation notice on the owner or the occupier of the contaminated land, closed landfills or special sites. In the first case, responsibility for remediation lies with the person or persons who caused or knowingly permitted the land to be contaminated. However, if after reasonable enquiry, no appropriate person can be found, the owner or occupier bears the responsibility for undertaking the remediation.



### 5.3 The Building Regulations

5.3.1 Guidance on controlling the effects of methane on new developments on gassing ground is given in Approved Document C of the Building Regulations. For commercial buildings the guidance is qualitative and is given as follows:

“In other cases and for non-domestic buildings, expert advice should be sought. If the expert so advises, there should be a complete investigation into the nature of any hazardous gases and their source and the potential of the landfill site for future gas generation.”



## 6.0 GUIDANCE ON ASSESSMENT OF ANALYSES OF CONTAMINATION

### Soil Gases

- 6.1 Reference is made here to methane, carbon dioxide and oxygen. In combination with air, methane forms a mixture which can explode when given a source of ignition and suitable conditions, in the range of concentrations from about 5% to 15% methane by volume in air. These values are termed the lower and upper explosive limits respectively. At concentrations below the lower explosive limit (LEL) there is insufficient methane to support and explosion; at concentrations higher than the upper limit, insufficient oxygen. Corresponding explosive limits in air for a gas mixture of 60% methane and 40% carbon dioxide are between 8% and 20% landfill gas by volume. Gas mixtures in which oxygen is deficient, whilst not explosive at their cores, present a potential explosion risk at their periphery on dilution with air. Poor mixing may enable volumes of flammable gas to exist even where the overall composition may register outside the explosive limits. Any gas mixture containing more than the LEL of flammable gas therefore represents a fire hazard irrespective of whether an explosion can occur.
- 6.2 Low concentrations of potentially explosive gases are often expressed as a percentage of the LEL, 5% of methane in air by volume is equivalent to 100% LEL while 1% methane by volume in air corresponds to 20% LEL. Depleted oxygen concentrations will depress the potential for a methane-containing mixture to explode and therefore reduce the percentage LEL reading recorded by some gas detection instruments.
- 6.3 Landfill gas also represents a major hazard in any restricted space due to a risk of asphyxiation by exclusion of air or to effects from carbon dioxide. A reduction in the oxygen concentration to below 18% is unacceptable and carbon dioxide concentrations of 0.5% and 1.5% have been adopted by the Health and Safety Executive as the maximum acceptable long term (8 hour) and short term (10 minute) exposure limits respectively.
- 6.4 Soil gases may also cause distress to or even kill vegetation. The symptoms of stressed vegetation include yellowing or browning of foliage, premature leaf and needle drop from trees, and, if concentrations of gas are sufficiently high, plant death. Stress may be due to increased carbon dioxide concentrations, oxygen deficiency and/or the presence of other toxic gases. Carbon dioxide is directly toxic to plants, whilst methane, although not directly toxic, will tend to displace soil oxygen.
- 6.5 The principal guidance document on the control of landfill gases is Waste Management Paper No. 27. This provides technical advice on monitoring.



## 8.0 GEOTECHNICAL ASSESSMENT

- 8.1 The expected ground conditions in the section of the site were confirmed in that a thick layer of made ground was present marking the back filled mineral line cutting beneath which were found strata of the Mercia Mudstones Group. In summary, the succession was as follows:

FORMATION	DEPTH (m)	THICKNESS (m)
MADE GROUND comprising mixed fill of topsoil, clay, colliery shale, coal, cinders and coke, crushed brick, stone and concrete, tarmac, ash, crushed limestone and some wood, rags, plastic and metal	6.1-6.9m	
Firm sandy silty CLAY with some fine and medium gravel, with coarse gravel and cobbles in BH2	6.1-6.9	1.5-1.9
Stiff brownish grey silty CLAY becoming completely and highly weathered pale grey fissured and blocky MUDSTONE	8.3-8.8	0.7-1.3
Moderately weathered pale orangey brown thinly bedded fine SANDSTONE (BH1 only)	9.5	0.1 proven

- 8.2 The consistency of the made ground was predominantly very loose with the SPT rods falling under self weight in part of the sequence in BH1. The lower part of the made ground in BH1 appeared to become medium dense with higher blow counts over two tests. However, the individual increments for the two tests ranged for 5 to 11 for 75mm and 3 to 8 blows for 75mm. Therefore, although the fill may be slightly more dense, large fragments, probably wood were probably influencing the total value for the test.
- 8.3 The gravelly clay beneath the fill also showed a considerable range of undrained shear strength values. Using the relationship between SPT 'N' value and undrained shear strength developed by Stroud (1974) and assuming an  $f_1$  value of 5 based on the assessment of plasticity characteristics, an undrained shear strength of 165kPa is indicated at a depth of 8m in BH1, whereas in the higher part of the stratum in BH2 (6.5m), the equivalent value is 95kPa.
- 8.4 Once the boreholes penetrated the Mercia Mudstones Group and rock grade material, albeit weathered, was identified, 'N' values of >50 were achieved very quickly. An 'N' value of 50 corresponds to an undrained shear strength of at least 250kpa for these strata.



8.5 Concentrations of soluble sulfate in the groundwater samples tested ranged from <0.2g/l in BH1 to 2.4g/l from the strike at 3.0m in BH2. The pH values of the same samples were 7.9 and 7.8 respectively.

8.6 A single groundwater strike was identified in BH1 with three separate strikes in BH2 only one of which was within the made ground. In each case the groundwater level rose following the initial strike, 0.3m to 0.6m in BH1 and the upper strike in BH2. However, in BH2, the strike at 8.3m rose 1.0m in 20 minutes and the strike at 6.4m rose 1.5m in 20 minutes. It should be appreciated that groundwater levels may vary as a result of seasonal and other factors.

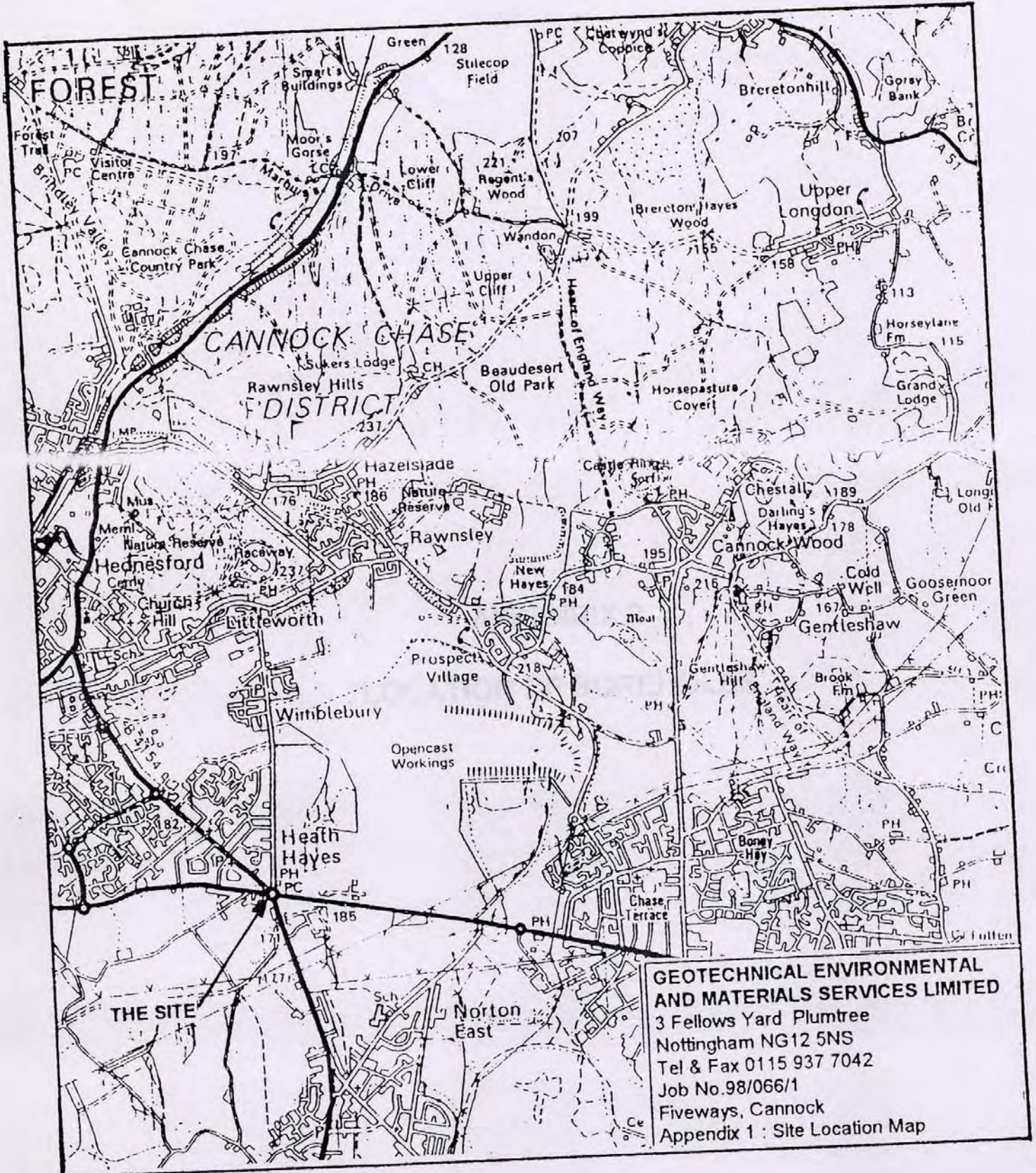


## 9.0 RECOMMENDATIONS AND CONCLUSIONS

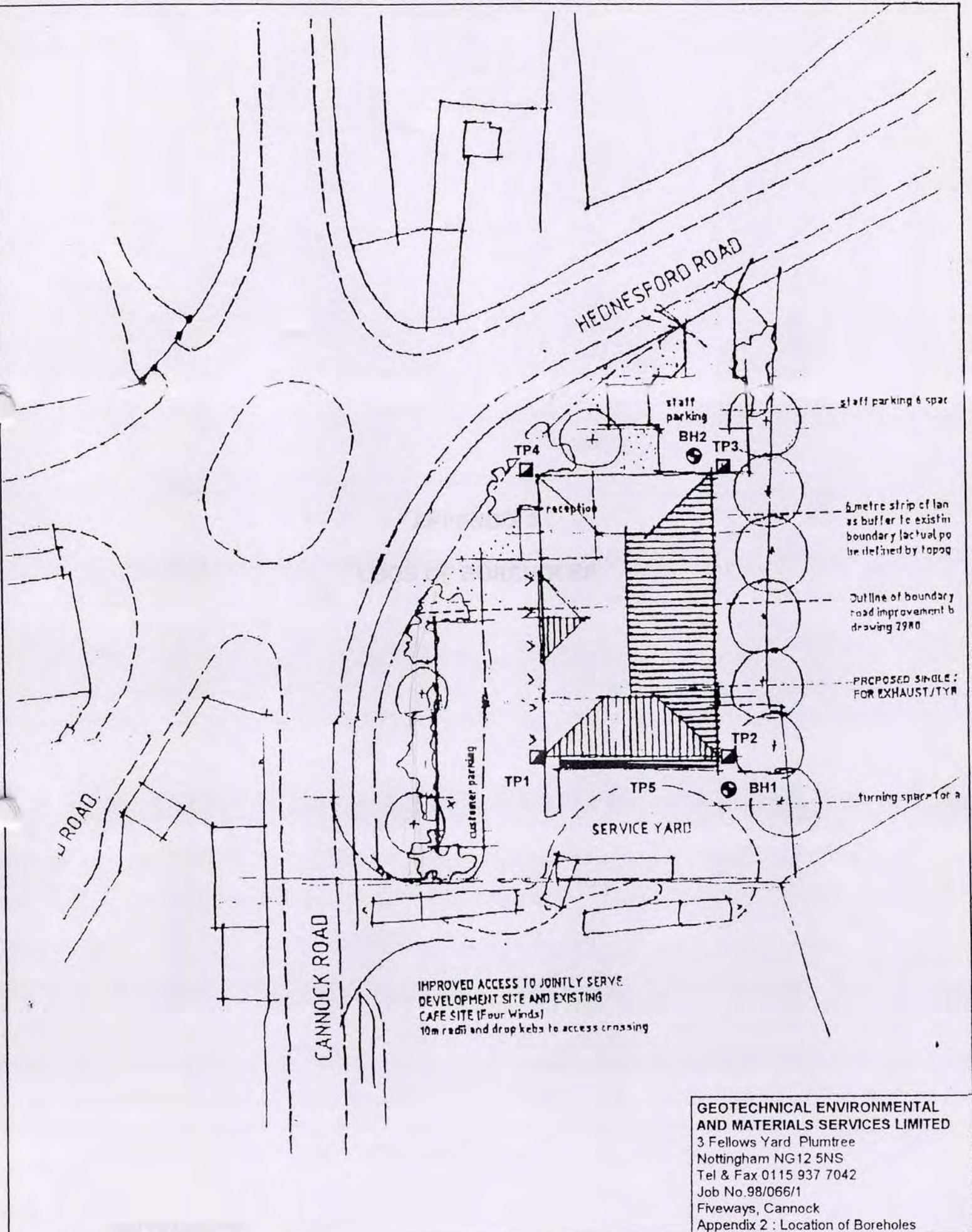
- 9.1 An additional phase of ground investigation was carried out at the site of a proposed new ATS depot at Fiveways, Heath Hays, Cannock.
- 9.2 It is recommended that the proposed building is supported on piled foundations. Pre-cast concrete driven piles are recommended in order to avoid arisings being brought to the surface which, in parts of the site may represent a risk to human targets and which may also prove expensive to dispose of. Although a very conservative design for the northern part of the site, it is recommended that the piles are driven to the weathered mudstones characterised by an SPT 'N' value of at least 50. In addition, in view of the very mixed and loose nature of the made ground, it is recommended that the piles are designed for end bearing only. This should allow some capacity for the piles in the back filled railway cutting to accommodate any negative skin friction generated by subsequent settlement of the fill under self weight or if loaded by an external source.
- 9.3 For a 250mm square section pile driven to 9m, a working load based on end bearing of 58kN may be assumed for a minimum 'N' value of 52. This is based on an  $N_c$  value of 9 and a Factor of Safety on end bearing of 2.5.
- 9.4 A suspended slab is recommended for the new building as ground conditions vary very greatly between the northern part of the site which is underlain by granular fill over natural, mainly granular soils, and the southern part of the site occupied by the back filled railway cutting.
- 9.5 Concentrations of soluble sulfate in the groundwater samples tested were variable. Concrete to be placed in direct contact with the made ground back filling the railway cutting should be designed in accordance with the recommendations in BRE Digest 363 (1991) for Class 3 sulfate conditions. The pH values of the groundwaters from the back filled cutting were on the alkaline side of neutral. Therefore, no additional protection needs to be provided to buried metals associated with the redevelopment in that part of the site.
- 9.6 The data in this report are from a limited investigation carried out by Geotechnical Environmental and Materials Services Limited. The methods of investigation applied can examine only a small part of the subsurface conditions which may be affected by the construction and life of the proposed works. Therefore, although the values and opinions are given in good faith, subsequent excavation at the time of construction may reveal conditions which were not exposed during the site investigation and which could not therefore be taken into account. Where this report is to be included in contract documents, it should be made clear to tenderers that they shall make their own interpretation and obtain confirmation of the data.



APPENDIX 1  
SITE LOCATION MAP



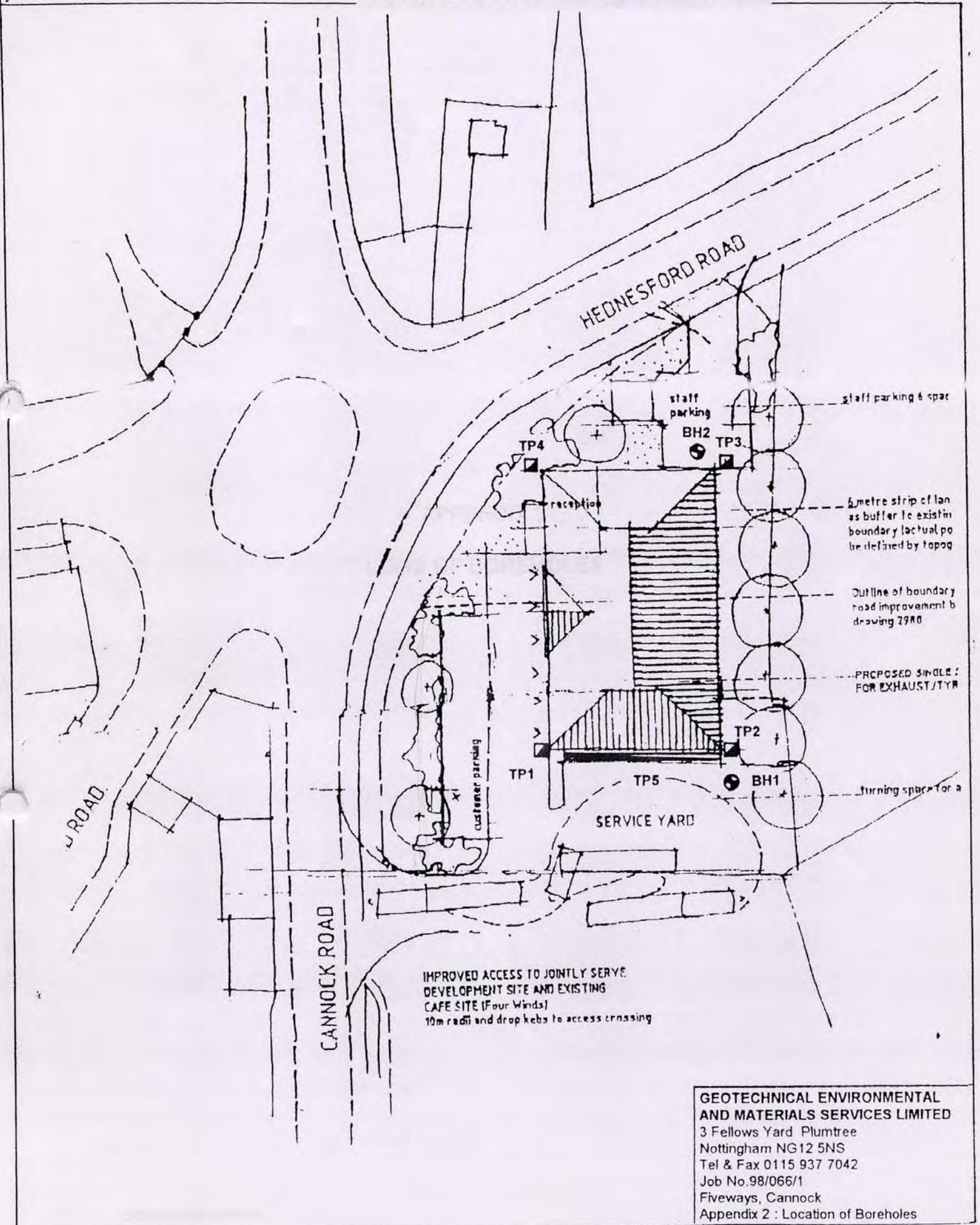




**GEOTECHNICAL ENVIRONMENTAL AND MATERIALS SERVICES LIMITED**  
 3 Fellows Yard Plumtree  
 Nottingham NG12 5NS  
 Tel & Fax 0115 937 7042  
 Job No.98/066/1  
 Fiveways, Cannock  
 Appendix 2 : Location of Boreholes



LOCATION OF BOREHOLES





Contract : FIVEWAYS, CANNOCK  
 Client : CONCEPT PROJECT MANAGEMENT

Borehole No : 2

Equipment and Methods :  
 Light cable percussion - 150mm dia.

Ground Level :

Job Number : 98/066/1  
 Dates : 13-11-98

Depth (m)	Thickness	Descriptions	Legend	Red. Level	In situ tests	Sample Taken	Sample Depth	Water Level
0.00		MADE GROUND comprising tarmac surfacing over pale grey ash fill with a little coal, some clay, and occasional rags				B	0-0.5	
		- becoming mixed fill of grey ash, gravel, brick fragments, concrete, ceramic, occasional wood and rags at 1.0m			(C) 15	B	1.0-1.5	
					(C) 6	B	2.0-2.5	
		- becoming wet dark grey mixed granular fill with some fine and medium gravel, brick fragments, crushed concrete, stone, with occasional plastic and metal at 2.8m			(C) 11	B W	3.0-6.0 3.0	▼ ▽
					(C) 8			
					(C) 7			▼
6.1	6.1	Firm orangey brown slightly sandy silty CLAY with a little rounded fine gravel			(C) 19	D	6.1	▽
		- becoming soft to firm with some fine and medium gravel at 6.5m				B	6.5-7.0	
7.6	1.5	- becoming pale grey and pale brown with occasional limestone gravel at 7.5m				D	7.5	
8.3	0.7	Firm brown sandy CLAY with coarse gravel and cobbles			(C) 30	B	8.0-8.5	▽
		Stiff brownish grey slightly sandy silty CLAY				D	9.0	
9.6	1.3	- becoming completely weathered pale grey fissured MUDSTONE at 9.3m			(C) 55/225	D	9.3	
		End of Borehole						

**Key**

Sample Types  
 U - Undisturbed  
 D - Disturbed  
 B - Bulk Disturbed  
 W - Water  
 \* - No Recovery

In Situ Tests  
 S - SPT(S) Value  
 C - SPT(C) Value

Water Levels  
 ▼ - Water Level  
 ▽ - Water Strike  
 ◇ - Standpipe Reading

**General Remarks**

- Borehole cased to 8.0m
- Standpipe installed to 9.6m; slotted section with pea gravel to 1.0m; Plain section with bentonite seal
- All water strikes with fast inflows

Sheet No. 1 of 1

Appendix : 4

Fig No 2



## LOGS OF BOREHOLES

Contract : FIVEWAYS, CANNOCK		Borehole No : 1							
Client : CONCEPT PROJECT MANAGEMENT									
Equipment and Methods : Light cable percussion - 150mm dia.		Ground Level :							
		Job Number : 98/066/1							
		Dates : 13-11-98							
Depth (m)	Thickness	Descriptions	Legend	Red. Level	In situ tests	Sample Taken	Sample Depth	Water Level	
0.00		MADE GROUND comprising dark greyish brown topsoil and clay fill with much burnt colliery shale and occasional brick fragments - becoming dark grey ash fill with occasional burnt colliery shale, brick, clay and sandstone cobbles at 0.6m				B	0-0.5		
					(C) 6	B	1.0-1.5		
		- becoming soft to firm dark grey sandy clay fill with occasional cinder and coke fragments at 2.0m			(C) 7	B	2.0-2.5		
		- becoming soft dark greyish brown sandy gravelly clay fill at 3.0m			(C) 0	B	3.0-3.5		
					(C) 4	B W	4.0-4.5 4.3	▼	
		- becoming dark grey very wet crushed brick, concrete and stone fill at 4.9m			(C) 27	B	5.0-5.5	▽	
		- becoming black ash and sand fill with much wood at 5.8m				D	6.0		
		- becoming gritty ash with limestone fragments at 6.5m			(C) 22	B	6.5-7.0		
6.9	6.9	Firm brown sandy CLAY with some fine and medium angular and sub-angular gravel  - becoming very stiff at 8.0m				D	7.5		
					(S) 33	B	8.0-8.5		
8.8	1.9	Highly weathered pale grey blocky MUDSTONE			(S) 52	D	9.0		
9.5	0.7	Moderately weathered, pale orangey brown thinly bedded fine grained SANDSTONE				B	9.5-9.6		
9.6	0.1	End of Borehole							
Key		In Situ Tests		General Remarks					
Sample Types		S - SPT(S) Value		1. Borehole cased to 7.5m					
U - Undisturbed		C - SPT(C) Value		2. Gas/groundwater monitoring standpipe installed to 9.6m; slotted to 1.0m with pea gravel surround; top metre in plain section with bentonite seal; stop tap box installed					
D - Disturbed		Water Levels		3. Chiselling from 6.6m to 6.9m. 0.5hours					
B - Bulk Disturbed		▼ - Water Level		Sheet No. 1 of 1		Appendix : 4		Fig No 1	
W - Water		▽ - Water Strike							
* - No Recovery		◊ - Standpipe Reading							





**Our ref:** UT\1999\000442\001  
**Your ref:** CH/99/0092

**Date:** 19th May 1999

Mr J W Heminsley  
Director of Planning & Architecture  
Cannock Chase Council  
Civic Centre,  
P O Box 28,  
Beecroft Road  
Cannock  
Staffordshire  
WS11 1BG



Dear Sir/Madam

**NEW INDUSTRIAL UNIT AND ASSOCIATED CAR PARKING AT CANNOCK ROAD,  
FIVE WATS, HEATH HAYES**

Thank you for referring the above application, which was received on 8 March 1999.

I apologise for the delay in replying, and trust that the Agency's comments, as set out below, will still be taken into consideration.

The Agency has no objections to the proposed development but wishes to make the following comments:

According to our records there are 5 landfill sites within 250 metres of the applicaton site.

Landfill site ref CC 35 known as Cannock Chase 35, lies 120 metres to the north east of the application site. According to our records it was filled with unknown wastes.

Landfill site ref CC 17 known as Cannock Chase 17, lies 140 metres to the south of the application site. According to our records it was filled with colliery spoil.

Landfill site ref CC 4 known as Cannock Chase 4, lies 230 metres to the south east of the application site. According to our records it was filled with colliery waste.

Site 1 (ref S-O-T 53) is approximately 90 metres to the east and accepted household waste. Site 2 (ref S-O-T 49) is approximately 130 metres to the north east and accepted general wastes.

In view of the above landfill sites and the unknown previous uses of this site, we would recommend the following conditions on any planning permission granted:



## CONDITION

No development approved by this permission shall be commenced until the application site has been subjected to a detailed scheme for the investigation and recording of contamination and a report has been submitted to and approved by the Local Planning Authority.

## REASON

To prevent pollution of the water environment.

## Information

Activities carried out at this site in the past may have caused contamination of soils, subsoils and groundwater. It is recommended that the site report includes the following:

(i) a desk study to identify historical land use with relation to potential ground contamination; and,

(ii) a limited soils investigation to identify the level of soil contamination on the site and the potential to cause pollution to the aquatic environment. The requirements of this investigation to be based upon previous land use information. In the event that contamination of this site is confirmed the developer should liaise with the Agency on measures required to protect surface water and groundwater interests.

The investigation shall include surveys to ascertain the presence of landfill gas, together with a report on the surveys to be submitted and approved by the Local Planning Authority. The report shall include the results of the survey and recommendations regarding any structural precautions to be incorporated into the development. The development shall be constructed in accordance with the approved details, unless otherwise agreed in writing by the Local Planning Authority.

The investigation shall also include leachability testing, as well as sampling of any groundwater encountered during the investigation.

## CONDITION:

No development approved by this permission shall be commenced until a scheme for the provision and implementation of the method of working of the site has been approved by the Local Planning Authority.

The scheme shall be implemented in accordance with the approved details.

## REASON:

To prevent pollution of the water environment.

In addition to the above, the Agency would also wish to see the following conditions:

## CONDITION:

Prior to being discharged into any watercourse, surface water sewer or soakaway system, all surface water drainage from parking areas and hardstandings shall be passed through trapped gullies with an overall capacity compatible with the site being drained.

---

## Environment Agency

Environment Agency Upper Trent Area, Sentinel House, Fradley Park., Lichfield, Staffordshire WS13 8RR  
Telephone : 01543 444141 Fax : 01543 444161



REASON:

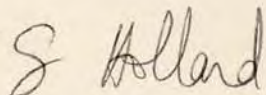
To prevent pollution of the water environment.

Site operators should ensure that there is no possibility of contaminated water entering and polluting surface or underground waters.

The information relating to landfill sites has been compiled from records and files from various sources and of varying degrees of reliability. The Agency is not able to offer any warranty as to the accuracy or completeness of the information provided, nor can it accept any liability in respect thereof.

The Agency has only very limited records of colliery and coal wastes. Therefore, we recommend that your enquiries are addressed to The Coal Authority, Mining Reports Office, Bretby Business Park, Ashby Road, Burton - on - Trent, Staffs. DE15 0QD.

Yours faithfully



PP **Mr Cliff Dobson**  
**Customer Services Manager**

Please ask for: Sharron Holland



# APPENDIX C

### Appendix C: Severity and Probability of Risk in Conceptual Site Models (after CIRIA552, Tables 6.3 to 6.5)

This report draws on guidance presented in CIRIA report 552, "Contaminated Land Risk Assessment, A Guide for Good Practice", wherein the "severity" term in the Conceptual Site Model is classified with reference to the sensitivity of the hazard and the receptor, as follows:

Situation	Severity Category	Description	Examples
ACUTE PROBLEM	Severe	Acute risk to human health likely to result in "significant harm" as defined in EPA90, catastrophic damage to buildings or property, acute risk of major pollution of controlled waters, acute risk of harm to ecosystems (as defined in Contaminated Land Regulations 2006)	High cyanide concentrations at the surface of a recreation area Major spillage into controlled waters Explosion, causing building collapse
SIGNIFICANT HARM TO SENSITIVE RECEPTOR	Medium	Chronic risk to human health likely to result in "significant harm" as defined in EPA90, chronic pollution of sensitive controlled waters, significant change at a sensitive ecosystems or species, significant damage to buildings or structures	Contaminant concentrations at a site in excess of SGVs, GAC or similar screening values Leaching of contaminants to sensitive aquifer Death of a species within a nature reserve
SIGNIFICANT HARM TO LESS SENSITIVE RECEPTOR	Mild	Pollution of non-sensitive waters, significant damage to buildings, structures, services or crops, damage to sensitive buildings, structures, services or the environment, which nonetheless result in "significant harm"	Pollution to (former) non-aquifer or to non-controlled surface watercourse. Damage to building rendering it unsafe to occupy (e.g. foundation or structural damage)
NON-SIGNIFICANT HARM	Minor	Harm, not necessarily resulting in "significant harm" but probably requiring expenditure to resolve or financial loss. Non-permanent risks to human health that are easily mitigated, e.g. by wearing PPE. Easily-repairable damage to structures or services	Contaminant concentrations requiring the wearing of PPE during site work, but no other long-term mitigation.  Discolouration of concrete

The likelihood of an event (probability) takes into account both the presence of hazard and receptor and the integrity of the pathway between hazard and receptor, and is assessed as follows:

Category	There is a pollution linkage and:
High	Event is likely in the short term and almost inevitable over the long term. Or there is evidence of actual harm at/to the receptor
Likely	Event is possible in the short term and likely over the long term
Low	Event is unlikely in the short term and possible over the long term
Unlikely	Event is unlikely, even in the long term

Potential severity and probability have been assessed in the following matrix, to give an overall risk rating:

	<b>Severity</b>			
<b>Probability</b>	Severe	Medium	Mild	Minor
High	Very high	High	Moderate	Low/moderate
Likely	High	Moderate	Low/moderate	Low
Low	Moderate	Low/moderate	Low	Very low
Unlikely	Low/moderate	Low	Very low	Very low

The above risk categories are likely to result in the following actions:

- Very high: urgent intervention / investigation needed, remediation likely to be required
- High: urgent intervention / investigation needed, remediation possibly required in short term and probably required in long term
- Moderate: investigation needed to clarify and refine risk; remediation may be required over the long term
- Low: it is possible that harm could arise to a receptor, but if realised, such harm is likely to be, at worst, mild
- Very low: it is possible that harm could arise to a receptor, but if realised, such harm is unlikely to be severe.

## APPENDIX B

## **Appendix B: Limitations Statement**

1. This report has been prepared for the exclusive use of Cannock Chase District Council and copyright subsists with Grontmij Limited. Prior written permission must be obtained to reproduce all or part of the report.
2. This report and/or opinions have been prepared for the specific purpose stated in the document. The recommendations should not be used for other purposes or adjacent sites without further reference to Grontmij Limited.
3. Observations were made of the site and soil arisings as indicated within the report. Where access to portions of the site was unavailable or limited, Grontmij Limited renders no opinion as to the environmental status of such parts of the site.
4. Grontmij has relied upon the existing desktop study data provided by Cannock Chase District Council to be accurate, and has not taken steps to independently check the accuracy of the data provided.
5. Our interpretation of any regulatory database information (including the MAGIC and British Geological Survey websites) within an earlier report, and relied upon in this report, assumes that the data provided is accurate. A disclaimer provided by database search companies is as follows: ' the data is derived from historical sources or information available in public records or from third parties and is supplied to us without warranty by data suppliers and we cannot warrant the accuracy or completeness of the data or the reports.' We cannot therefore accept any responsibility for the accuracy of the data used in this study, only that its interpretation has been carried out with due skill, care and diligence.
6. The conclusions and recommendations submitted in this report are based in part upon the data obtained from soil samples from exploratory holes. The nature and extent of variations between the exploratory holes is inferred in the report and could only be confirmed by further investigation. If variations or other latent conditions become evident, it will be necessary to re-evaluate the recommendations of this report.
7. The generalised soil profile described in the text is intended to convey trends in sub-surface conditions. The boundaries between strata are approximate and idealised and have been developed in interpretations of widely spaced explorations and samples; actual soil transitions may be more gradual. For specific information, refer to the exploration logs.
8. Water levels and/or gas readings have been taken in the borings and/or observation wells at times and under conditions stated on the exploration logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater or gas may occur due to variations in rainfall, atmospheric pressure and other factors different from those prevailing at the time the measurements were made.
9. The conclusions and recommendations of this report are based in part upon various types of chemical analysis of soil, water or gases, and are contingent upon their validity. These data have been reviewed and interpretations made in the report. Variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time and other factors. Should additional analytical or monitoring data

become available in the future, these data should be reviewed and conclusions and recommendations presented herein modified accordingly.

10. Chemical analyses have been performed for specific parameters during the course of this study, as detailed in the text. It must be noted that additional constituents not searched for during the current study may be present in soil, groundwater and soil voids at the site.

# APPENDIX C



# WINDOW SAMPLE LOG

WINDOW SAMPLE No  
**WS01**

Project <b>West of Fiveways</b>		Client <b>Cannock Chase District Council</b>		Logged By <b>BJD</b>
Job No <b>106270</b>	Date <b>08-12-10</b> <b>08-12-10</b>	Ground Level (m)	Co-ordinates	Checked By

SAMPLES & TESTS			Water	STRATA				Instrument Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES				0.15	MADE GROUND: (Turf over) Brown slightly sandy CLAY. (Topsoil).		
0.30-0.30	ES				0.50	MADE GROUND: Brown very gravelly clayey SAND. Gravel is fine to coarse subangular to subrounded brick, quartz and concrete. Fragments of reinforcing steel, pottery, glass and plastic noted.		
					0.55			
0.70-0.70	ES				0.70	MADE GROUND: CONCRETE		
					(0.45)	MADE GROUND: Brown very gravelly clayey SAND. Gravel is fine to coarse subangular to subrounded brick, quartz and concrete. Fragments of pottery, glass and plastic noted.		
					1.15			
					1.30			
1.50-1.50	ES				(0.60)	MADE GROUND: Dark grey sandy CLAY with ash. Fibrous material noted at 0.8m		
					1.90	MADE GROUND: Orange brown SAND		
						MADE GROUND: Dark brown clayey slightly gravelly SAND. Gravel is rare to medium angular to subrounded sandstone and quartz.		
						End of Hole at 1.9m bgl.		

Groundwater		General Remarks		Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks		<b>1.9m bgl</b>
None Encountered		1.90m: Refusal - Concrete Location: Back garden in lawn. No groundwater strike		

Contractor <b>Sherwood Drilling</b>	Method/ Plant Used <b>Hand held window sampling</b>	All dimensions in metres Scale 1:50 Sheet 1 of 1
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GRONTMIJ WINDOW SAMPLE LOG 2006 WEST OF FIVEWAYS WS GINT INPUT SHEET GP1 AGS3 ALL GDT 4/5/11





# WINDOW SAMPLE LOG

WINDOW SAMPLE No  
**WS02**

Project <b>West of Fiveways</b>		Client <b>Cannock Chase District Council</b>		Logged By <b>BJD</b>
Job No <b>106270</b>	Date <b>08-12-10</b> <b>08-12-10</b>	Ground Level (m)	Co-ordinates	Checked By

SAMPLES & TESTS			Water	STRATA			Instrument	Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)		
0.10-0.10	ES				0.10	MADE GROUND: Brown sandy CLAY (topsoil)		
0.30-0.30	ES				(0.40) 0.50	MADE GROUND: Brown clayey gravelly SAND with concrete cobbles. Gravel is fine to very coarse angular to subrounded quartz, brick and concrete.		
0.70-0.70	ES				0.55 0.90	MADE GROUND: CONCRETE. Required breaking out with a drill. MADE GROUND: Dark brown clayey very gravelly SAND. Gravel is angular fine to very coarse brick.		
					(1.30)	MADE GROUND: BRICK fragments with fine to very coarse angular gravel of brick		
2.20-2.50	ES				2.20 2.50	MADE GROUND: Dark brown grey gravelly SAND with ASH. Gravel is fine to medium angular sandstone and shale. Possible hydrocarbon staining at 2.4m End of Hole at 2.5m bgl.		

GRONTMIJ WINDOW SAMPLE LOG 2006 WEST OF FIVEWAYS WS GINT INPUT SHEET.GPJ AGS3 ALL.GDT 4/5/11

Groundwater Strike Depth: (m) Rising to: (m) Groundwater Remarks		General Remarks 2.50m: Refusal - Brick Location: Back garden in lawn. No groundwater strike	Final Depth <b>2.5m bgl</b>
None Encountered		Method/ Plant Used <b>Hand held window sampling</b>	All dimensions in metres Scale 1:50 Sheet 1 of 1



# WINDOW SAMPLE LOG

WINDOW SAMPLE No  
**WS03**

Project West of Fiveways		Client Cannock Chase District Council		Logged By BJD
Job No 106270	Date 08-12-10 08-12-10	Ground Level (m)	Co-ordinates	Checked By

SAMPLES & TESTS			Water	STRATA			Instrument Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	
0.10-0.10	ES				0.25	MADE GROUND: Brown clayey SAND (Topsoil).	
0.30-0.30	ES				(1.30)	MADE GROUND: Dark brown gravelly SAND with ASH. Gravel is fine to very coarse subangular to subrounded quartz and brick. Whole bricks recovered.	
0.70-0.70	ES						
1.30-1.50	ES				1.55	MADE GROUND: Brown clayey slightly gravelly SAND. Gravel is fine to very coarse subrounded to rounded quartz	
					(0.45) 2.00		End of Hole at 2m bgl.

<b>Groundwater</b> Strike Depth: (m)   Rising to: (m)   Groundwater Remarks None Encountered		<b>General Remarks</b> 2.0m: Refusal - Chip board Location: Back garden in lawn. No groundwater strike	<b>Final Depth</b> <b>2m bgl</b>
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Contractor Sherwood Drilling	Method/ Plant Used    Hand held window sampling	All dimensions in metres Scale 1:50 Sheet 1 of 1
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GRONTMIJ WINDOW SAMPLE LOG 2006 WEST OF FIVEWAYS WS GINT INPUT SHEET GPJ AGS3 ALL GDT 4/5/11



# WINDOW SAMPLE LOG

WINDOW SAMPLE No  
**WS04**

Project <b>West of Fiveways</b>		Client <b>Cannock Chase District Council</b>		Logged By <b>BJD</b>
Job No <b>106270</b>	Date <b>08-12-10</b> <b>08-12-10</b>	Ground Level (m)	Co-ordinates	Checked By

SAMPLES & TESTS			Water	STRATA				Instrument Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES				0.10	MADE GROUND: (Turf over) Brown sandy CLAY (Topsoil)		
0.30-0.30	ES				(0.80)	MADE GROUND: Red GRAVEL of fine to very coarse angular shale.		
0.70-0.70	ES				0.90			
1.20-1.50	ES				(0.60)	MADE GROUND: Red clayey sandy GRAVEL of fine to medium angular shale.		
					1.50	MADE GROUND: Black fine ASH with rare fine to medium subangular gravel of quartz.		
					(0.50)			
					2.00	MADE GROUND: Black fine ASH with rare fine to medium subangular gravel of quartz.		
						End of Hole at 2m bgl.		

<b>Groundwater</b> Strike Depth: (m)   Rising to: (m)   Groundwater Remarks <p style="text-align: center;">None Encountered</p>		<b>General Remarks</b> 2.0m: Refusal - Dense gravel Location: Back garden in lawn. No groundwater strike	<b>Final Depth</b>  <p style="text-align: center;"><b>2m bgl</b></p>
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Contractor <b>Sherwood Drilling</b>	Method/ Plant Used <b>Hand held window sampling</b>	<small>All dimensions in metres Scale 1:50</small> <small>Sheet 1 of 1</small>
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GRONTMIJ WINDOW SAMPLE LOG 2006 WEST OF FIVEWAYS WS GINT INPUT SHEET GPJ AGS3 ALL GDT 4/5/11

**Notes:**

Logged by BJD

1. No groundwater was encountered within any of the below trial pits
2. Sample frequency: 0.1m, 0.3m & 0.7m
3. All pits undertaken on 13/12/2010

<b>HP No: 1</b>	<b>House Address: 2 Newlands Court</b>	<b>Location of HP: Gravel area at front</b>
<b>Depth (M BGL):</b>	<b>Strata Description:</b>	<b>Additional notes:</b>
0.00 - 0.70	MADE GROUND: Brown silty gravelly SAND with fragments of brick and concrete. Gravel is fine to very coarse angular to sub rounded quartz, brick and concrete.	No evidence of contamination
<b>HP No: 2</b>	<b>House Address: 4 Newlands Court</b>	<b>Location of HP: Flower Bed in Rear Garden</b>
<b>Depth (M BGL):</b>	<b>Strata Description:</b>	<b>Additional notes:</b>
0.00 - 0.50	MADE GROUND: Brown gravelly SAND. Gravel is fine to coarse sub angular to sub rounded quartz (Topsoil).	No evidence of contamination
0.50 - 0.70	MADE GROUND: Brown silty gravelly SAND. Gravel is fine to coarse sub angular to sub rounded quartz.	Fragments of black stained timber, broken glass and concrete.
<b>HP No: 3</b>	<b>House Address: 6 Newlands Court</b>	<b>Location of HP: Flower Bed in Rear Garden</b>
<b>Depth (M BGL):</b>	<b>Strata Description:</b>	<b>Additional notes:</b>
0.00 - 0.25	MADE GROUND: Brown silty SAND (Topsoil)	No evidence of contamination
0.25 - 0.70	MADE GROUND: Brown gravelly SAND. Gravel is fine angular brick, concrete and glass.	Plastic fragments at 0.30m bgl
<b>HP No: 4</b>	<b>House Address: 5 Newlands Lane</b>	<b>Location of HP: Turfed area in Front Garden</b>
<b>Depth (M BGL):</b>	<b>Strata Description:</b>	<b>Additional notes:</b>
0.00 - 0.70	MADE GROUND: Turf over dark brown silty gravelly SAND with concrete cobbles. Gravel is fine to coarse angular to subrounded quartz, sandstone and brick.	Fragments of metal pipe, cable and fabric.
<b>HP No: 5</b>	<b>House Address: 10 Newlands Court</b>	<b>Location of HP: Flower Bed in Rear Garden</b>
<b>Depth (M BGL):</b>	<b>Strata Description:</b>	<b>Additional notes:</b>
0.00 - 0.30	MADE GROUND: Brown gravelly SAND. Gravel is fine to coarse sub angular to sub rounded quartz (Topsoil).	No evidence of contamination
0.30 - 0.70	MADE GROUND: Brown gravelly SAND. Gravel is fine angular brick and concrete.	

# APPENDIX D



Grontmij  
Radcliffe House  
3rd Floor  
Blenheim Court, Lode lane  
Solihull  
West Midlands  
B912AA

**Attention:** Gareth Taylor

## CERTIFICATE OF ANALYSIS

**Date:** 14 January 2011  
**Customer:** H\_GRONTMIJ\_SOL  
**Sample Delivery Group (SDG):** 101210-8  
**Your Reference:**  
**Location:** Fiveways  
**Report No:** 111099

We received 16 samples on Friday December 10, 2010 and 7 of these samples were scheduled for analysis which was completed on Friday January 14, 2011. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

**Sonia McWhan**

Laboratory Manager



1291  
GROUP



**SDG:** 101210-8  
**Job:** H\_GRONTMIJ\_SOL-42  
**Client Reference:**

**Location:** Fiveways  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 111099  
**Superseded Report:**

## Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2558268	WS01		0.10	08/12/2010
2558301	WS01		0.30	08/12/2010
2558326	WS01		0.70	08/12/2010
2558356	WS01		1.50	08/12/2010
2558384	WS02		0.10	08/12/2010
2558417	WS02		0.30	08/12/2010
2558459	WS02		0.70	08/12/2010
2558492	WS02		2.20 - 2.50	08/12/2010
2558525	WS03		0.10	08/12/2010
2558755	WS03		0.30	08/12/2010
2558791	WS03		0.70	08/12/2010
2558861	WS03		1.30 - 1.50	08/12/2010
2558887	WS04		0.10	08/12/2010
2558912	WS04		0.30	08/12/2010
2558948	WS04		0.70	08/12/2010
2558985	WS04		1.20 - 1.50	08/12/2010

Only received samples which have had analysis scheduled will be shown on the following pages.



SDG: 101210-8  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

## Test Schedule

SOLID	Lab Sample No(s)		Customer Sample Reference		AGS Reference		Depth (m)		Container	
	2558301	2558326	2558384	2558326	2558384	2558326	2558384	2558326	2558384	2558326
<b>Results Legend</b>										
<b>X</b> Test										
<b>N</b> No Determination Possible										
Asbestos Containing Material Screen	All	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
Boron Water Soluble	All	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 4		X		X		X		X
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 4		X		X		X		X
GRO by GC-FID (S)	All	NDPs: 0 Tests: 4			X		X	X		X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Barium	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Beryllium	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Cadmium	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Chromium	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Copper	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Lead	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Mercury	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Nickel	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Selenium	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Vanadium	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
	Zinc	NDPs: 0 Tests: 7	X	X	X	X	X	X	X	X
PAH by GCMS	All	NDPs: 0 Tests: 3			X		X		X	





SDG: 101210-8  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

SOLID Results Legend	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container									
						2558301	2558326	2558384	2558492	2558755	2558948	2558985		
<b>X</b> Test <b>N</b> No Determination Possible		WS01		0.30	250g Amber Jar									
		WS01		0.70	250g Amber Jar 60g VOC 400g Tub									
		WS02		0.10	250g Amber Jar 400g Tub									
		WS02		2.20 - 2.50	250g Amber Jar 60g VOC 400g Tub									
		WS03		0.30	250g Amber Jar 400g Tub									
		WS04		0.70	250g Amber Jar 400g Tub									
		WS04		1.20 - 1.50	60g VOC 400g Tub									
pH	All	NDPs: 0 Tests: 7				X	X	X	X	X	X	X		
Sample description	All	NDPs: 0 Tests: 7				X	X	X	X	X	X			
Semi Volatile Organic Compounds	All	NDPs: 0 Tests: 2					X							
Total Organic Carbon	All	NDPs: 0 Tests: 7				X	X	X	X	X	X			
Total Sulphate	All	NDPs: 0 Tests: 3					X			X				
TPH CWG GC (S)	All	NDPs: 0 Tests: 4					X		X			X		
VOC MS (S)	All	NDPs: 0 Tests: 2					X		X					



SDG: 101210-8  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

## Sample Descriptions

### Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2558301	WS01	0.30	Dark Brown	Sand	0.1 - 2 mm	Stones	Brick
2558326	WS01	0.70	Dark Brown	Silty Clay	0.063 - 0.1 mm	Stones	N/A
2558384	WS02	0.10	Dark Brown	Loamy Sand	0.1 - 2 mm	Stones	None
2558492	WS02	2.20 - 2.50	Dark Brown	Silty Sand	0.063 - 0.1 mm	Stones	Crushed Brick
2558755	WS03	0.30	Dark Brown	Sandy Loam	0.1 - 2 mm	Stones	None
2558948	WS04	0.70	Light Brown	Sandy Loam	0.1 - 2 mm	Stones	None
2558985	WS04	1.20 - 1.50	Light Brown	Sandy Silt Loam	0.063 - 0.1 mm	Stones	Crushed Brick

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



## CERTIFICATE OF ANALYSIS

SDG: 101210-8  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

Results Legend		Customer Sample R	WS01	WS01	WS02	WS02	WS03	WS04
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.30	0.70	0.10	2.20 - 2.50	0.30	0.70
M	mCERTS accredited.		Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
S	Non-conforming work.		08/12/2010	08/12/2010	08/12/2010	08/12/2010	08/12/2010	08/12/2010
aq	Aqueous / settled sample.		10/12/2010	10/12/2010	10/12/2010	10/12/2010	10/12/2010	10/12/2010
diss.filt	Dissolved / filtered sample.		101210-8	101210-8	101210-8	101210-8	101210-8	101210-8
tot.unfilt	Total / unfiltered sample.		2558301	2558326	2558384	2558492	2558755	2558948
*	subcontracted test.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.							
Component	LOD/Units	Method						
Asbestos Containing Material Screen	-	TM001	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected
Soil Organic Matter (SOM)	<0.35 %	TM132	3.65 #	4.5 #	2.86 #	4.07 #	3.74 #	<0.35 #
pH	1 pH Units	TM133	8.08 M	8.29 M	6.18 M	8.46 M	8.07 M	8.41 M
Chromium, Hexavalent	<0.6 mg/kg	TM151	<3 #	6.49 #	<1.2 #	<0.6 #	<1.2 #	<0.6 #
Arsenic	<0.6 mg/kg	TM181	10.6 M	14.7 M	5.63 M	9.71 M	7.4 M	7.53 M
Barium	<0.6 mg/kg	TM181	246 #	454 #	68.4 #	191 #	148 #	157 #
Beryllium	<0.01 mg/kg	TM181	1.16 M	0.961 M	0.252 M	0.558 M	0.728 M	1.16 M
Cadmium	<0.02 mg/kg	TM181	1.8 M	3.49 M	0.5 M	1.26 M	0.8 M	0.636 M
Chromium	<0.9 mg/kg	TM181	31.9 M	39.1 M	9.41 M	20.1 M	12.4 M	28.1 M
Copper	<1.4 mg/kg	TM181	78.9 M	172 M	14.5 M	37.4 M	27.7 M	19.1 M
Lead	<0.7 mg/kg	TM181	189 M	403 M	40.9 M	160 M	84.7 M	23.8 M
Mercury	<0.14 mg/kg	TM181	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M	<0.14 M
Nickel	<0.2 mg/kg	TM181	34.5 M	40.3 M	6.15 M	27.6 M	14.2 M	32.6 M
Selenium	<1 mg/kg	TM181	<1 #	<1 #	<1 #	<1 #	<1 #	<1 #
Vanadium	<0.2 mg/kg	TM181	37.9 #	27.3 #	13.4 #	26.4 #	17.8 #	31.7 #
Zinc	<1.9 mg/kg	TM181	498 M	1060 M	77.5 M	144 M	178 M	75.9 M
Sulphate, Total	<48 mg/kg	TM221		2220 M			755 M	123 M
Boron, water soluble	<1 mg/kg	TM222	<1 M	<1 M	<1 M	<1 M	<1 M	<1 M



### CERTIFICATE OF ANALYSIS

**SDG:** 101210-8  
**Job:** H\_GRONTMIJ\_SOL-42  
**Client Reference:**

**Location:** Fiveways  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 111099  
**Superseded Report:**

Results Legend		Customer Sample R							
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference		WS04 1.20 - 1.50 Soil/Solid 08/12/2010 10/12/2010 101210-8 2558985					
M	mCERTS accredited.								
S	Non-conforming work.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	subcontracted test.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.								
Component	LOD/Units	Method							
Asbestos Containing Material Screen	-	TM001	No ACM Detected						
Soil Organic Matter (SOM)	<0.35 %	TM132	2.93	#					
pH	1 pH Units	TM133	8.43	M					
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6	#					
Arsenic	<0.6 mg/kg	TM181	13.5	M					
Barium	<0.6 mg/kg	TM181	364	#					
Beryllium	<0.01 mg/kg	TM181	1.44	M					
Cadmium	<0.02 mg/kg	TM181	1.74	M					
Chromium	<0.9 mg/kg	TM181	25.8	M					
Copper	<1.4 mg/kg	TM181	39.3	M					
Lead	<0.7 mg/kg	TM181	107	M					
Mercury	<0.14 mg/kg	TM181	<0.14	M					
Nickel	<0.2 mg/kg	TM181	35.6	M					
Selenium	<1 mg/kg	TM181	<1	#					
Vanadium	<0.2 mg/kg	TM181	39.7	#					
Zinc	<1.9 mg/kg	TM181	788	M					
Boron, water soluble	<1 mg/kg	TM222	<1	M					



## CERTIFICATE OF ANALYSIS

SDG: 101210-8  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

## PAH by GCMS

Results Legend		Customer Sample R	WS02	WS03	WS04				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference							
M	mCERTS accredited.		0.10	0.30	1.20 - 1.50				
S	Non-conforming work.		Soil/Solid	Soil/Solid	Soil/Solid				
aq	Aqueous / settled sample.		08/12/2010	08/12/2010	08/12/2010				
diss.filt	Dissolved / filtered sample.		10/12/2010	10/12/2010	10/12/2010				
tot.unfilt	Total / unfiltered sample.		101210-8	101210-8	101210-8				
*	subcontracted test.		2558384	2558755	2558985				
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.								
Component	LOD/Units		Method						
Naphthalene-d8 % recovery**	%		TM218	106	95.4	104			
Acenaphthene-d10 % recovery**	%	TM218	105	93.8	102				
Phenanthrene-d10 % recovery**	%	TM218	100	95.6	107				
Chrysene-d12 % recovery**	%	TM218	94.9	93.8	110				
Perylene-d12 % recovery**	%	TM218	94.6	97.9	107				
Naphthalene	<9 µg/kg	TM218	<9 M	67.1 M	383 M				
Acenaphthylene	<12 µg/kg	TM218	<12 M	71.7 M	6190 M				
Acenaphthene	<8 µg/kg	TM218	<8 M	32.6 M	322 M				
Fluorene	<10 µg/kg	TM218	<10 M	31.7 M	1900 M				
Phenanthrene	<15 µg/kg	TM218	52.3 M	453 M	23400 M				
Anthracene	<16 µg/kg	TM218	<16 M	138 M	12100 M				
Fluoranthene	<17 µg/kg	TM218	101 M	1530 M	49900 M				
Pyrene	<15 µg/kg	TM218	82.7 M	1400 M	36300 M				
Benzo(a)anthracene	<14 µg/kg	TM218	63.8 M	757 M	26100 M				
Chrysene	<10 µg/kg	TM218	66.3 M	700 M	19900 M				
Benzo(b)fluoranthene	<15 µg/kg	TM218	125 M	919 M	16200 M				
Benzo(k)fluoranthene	<14 µg/kg	TM218	41.9 M	451 M	8810 M				
Benzo(a)pyrene	<15 µg/kg	TM218	76.9 M	899 M	18100 M				
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	63.5 M	587 M	7870 M				
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	<23 M	168 M	2720 M				
Benzo(g,h,i)perylene	<24 µg/kg	TM218	88.9 M	759 M	8010 M				
Polyaromatic hydrocarbons, Total	<118 µg/kg	TM218	762 M	8970 M	238000 M				





SDG: 101210-8  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

## Semi Volatile Organic Compounds

Results Legend		Customer Sample R	WS01	WS02				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference						
M	mCERTS accredited.		0.70	2.20 - 2.50				
S	Non-conforming work.		Soil/Solid	Soil/Solid				
aq	Aqueous / settled sample.		08/12/2010	08/12/2010				
diss.filt	Dissolved / filtered sample.		10/12/2010	10/12/2010				
tot.unfilt	Total / unfiltered sample.		101210-8	101210-8				
*	subcontracted test.		2558326	2558492				
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.							
Component	LOD/Units		Method					
Phenol	<100 µg/kg		TM157	<100	<100			
Pentachlorophenol	<100 µg/kg	TM157	<100	<100				
n-Nitroso-n-dipropylamine	<100 µg/kg	TM157	<100	<100				
Nitrobenzene	<100 µg/kg	TM157	<100	<100				
Isophorone	<100 µg/kg	TM157	<100	<100				
Hexachloroethane	<100 µg/kg	TM157	<100	<100				
Hexachlorocyclopentadiene	<100 µg/kg	TM157	<100	<100				
Hexachlorobutadiene	<100 µg/kg	TM157	<100	<100				
Hexachlorobenzene	<100 µg/kg	TM157	<100	<100				
n-Dioctyl phthalate	<100 µg/kg	TM157	<100	<100				
Dimethyl phthalate	<100 µg/kg	TM157	<100	<100				
Diethyl phthalate	<100 µg/kg	TM157	<100	<100				
n-Dibutyl phthalate	<100 µg/kg	TM157	177	<100				
Dibenzofuran	<100 µg/kg	TM157	<100	<100				
Carbazole	<100 µg/kg	TM157	<100	<100				
Butylbenzyl phthalate	<100 µg/kg	TM157	<100	<100				
bis(2-Ethylhexyl) phthalate	<100 µg/kg	TM157	515	<100				
bis(2-Chloroethoxy)methane	<100 µg/kg	TM157	<100	<100				
bis(2-Chloroethyl)ether	<100 µg/kg	TM157	<100	<100				
Azobenzene	<100 µg/kg	TM157	<100	<100				
4-Nitrophenol	<100 µg/kg	TM157	<100	<100				
4-Nitroaniline	<100 µg/kg	TM157	<100	<100				
4-Methylphenol	<100 µg/kg	TM157	<100	<100				
4-Chlorophenylphenylether	<100 µg/kg	TM157	<100	<100				
4-Chloroaniline	<100 µg/kg	TM157	<100	<100				
4-Chloro-3-methylphenol	<100 µg/kg	TM157	<100	<100				
4-Bromophenylphenylether	<100 µg/kg	TM157	<100	<100				
3-Nitroaniline	<100 µg/kg	TM157	<100	<100				
2-Nitrophenol	<100 µg/kg	TM157	<100	<100				
2-Nitroaniline	<100 µg/kg	TM157	<100	<100				
2-Methylphenol	<100 µg/kg	TM157	<100	<100				
1,2,4-Trichlorobenzene	<100 µg/kg	TM157	<100	<100				
2-Chlorophenol	<100 µg/kg	TM157	<100	<100				
2,6-Dinitrotoluene	<100 µg/kg	TM157	<100	<100				
2,4-Dinitrotoluene	<100 µg/kg	TM157	<100	<100				

SDG: 101210-8  
 Job: H\_Grontmij\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

**Semi Volatile Organic Compounds**

Results Legend		Customer Sample R	WS01	WS02			
#	ISO17025 accredited.						
M	mCERTS accredited.						
§	Non-conforming work.						
aq	Aqueous / settled sample.						
diss.filt	Dissolved / filtered sample.						
tot.unfilt	Total / unfiltered sample.						
*	subcontracted test.						
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.						
		Depth (m)	0.70	2.20 - 2.50			
		Sample Type	Soil/Solid	Soil/Solid			
		Date Sampled	08/12/2010	08/12/2010			
		Date Received	10/12/2010	10/12/2010			
		SDG Ref	101210-8	101210-8			
		Lab Sample No.(s)	2558326	2558492			
		AGS Reference					
Component	LOD/Units	Method					
2,4-Dimethylphenol	<100 µg/kg	TM157	<100	<100			
2,4-Dichlorophenol	<100 µg/kg	TM157	<100	<100			
2,4,6-Trichlorophenol	<100 µg/kg	TM157	<100	<100			
2,4,5-Trichlorophenol	<100 µg/kg	TM157	<100	<100			
1,4-Dichlorobenzene	<100 µg/kg	TM157	<100	<100			
1,3-Dichlorobenzene	<100 µg/kg	TM157	<100	<100			
1,2-Dichlorobenzene	<100 µg/kg	TM157	<100	<100			
2-Chloronaphthalene	<100 µg/kg	TM157	<100	<100			
2-Methylnaphthalene	<100 µg/kg	TM157	<100	<100			
Acenaphthylene	<100 µg/kg	TM157	<100	<100			
Acenaphthene	<100 µg/kg	TM157	<100	<100			
Anthracene	<100 µg/kg	TM157	<100	621			
Benzo(a)anthracene	<100 µg/kg	TM157	508	1890			
Benzo(b)fluoranthene	<100 µg/kg	TM157	852	1240			
Benzo(k)fluoranthene	<100 µg/kg	TM157	573	1220			
Benzo(a)pyrene	<100 µg/kg	TM157	717	1700			
Benzo(g,h,i)perylene	<100 µg/kg	TM157	643	847			
Chrysene	<100 µg/kg	TM157	723	1710			
Fluoranthene	<100 µg/kg	TM157	832	4240			
Fluorene	<100 µg/kg	TM157	<100	<100			
Indeno(1,2,3-cd)pyrene	<100 µg/kg	TM157	569	839			
Phenanthrene	<100 µg/kg	TM157	371	1850			
Pyrene	<100 µg/kg	TM157	773	3840			
Naphthalene	<100 µg/kg	TM157	<100	<100			
Dibenzo(a,h)anthracene	<100 µg/kg	TM157	177	176			



SDG: 101210-8  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

## TPH CWG (S)

Results Legend		Customer Sample R	WS01	WS02	WS03	WS04			
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference							
M	mCERTS accredited.		0.70	2.20 - 2.50	0.30	1.20 - 1.50			
S	Non-conforming work.		Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid			
aq	Aqueous / settled sample.		08/12/2010	08/12/2010	08/12/2010	08/12/2010			
diss.filt	Dissolved / filtered sample.		10/12/2010	10/12/2010	10/12/2010	10/12/2010			
tot.unfilt	Total / unfiltered sample.		101210-8	101210-8	101210-8	101210-8			
*	subcontracted test.		2558326	2558492	2558755	2558985			
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.								
Component	LOD/Units		Method						
GRO Surrogate % recovery**	%		TM089	59	73	68	49		
GRO >C5-C12	<44 µg/kg	TM089	464	24100	<44	393			
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5 #	<5 #	<5 #	<5 #			
Benzene	<10 µg/kg	TM089	<10 M	<10 M	<10 M	<10 M			
Toluene	<2 µg/kg	TM089	<2 M	2.38 M	<2 M	<2 M			
Ethylbenzene	<3 µg/kg	TM089	<3 M	<3 M	5.7 M	4.6 M			
m,p-Xylene	<6 µg/kg	TM089	<6 M	<6 M	<6 M	<6 M			
o-Xylene	<3 µg/kg	TM089	<3 M	<3 M	3.42 M	<3 M			
m,p,o-Xylene	<10 µg/kg	TM089	<10	<10	<10	<10			
BTEX, Total	<10 µg/kg	TM089	<10	<10	<10	<10			
Aliphatics >C5-C6	<10 µg/kg	TM089	45.3	<10	<10	<10			
Aliphatics >C6-C8	<10 µg/kg	TM089	146	30.9	<10	<10			
Aliphatics >C8-C10	<10 µg/kg	TM089	101	9160	<10	113			
Aliphatics >C10-C12	<10 µg/kg	TM089	62.2	5250	<10	113			
Aliphatics >C12-C16	<100 µg/kg	TM173	2150	3100	3720	8330			
Aliphatics >C16-C21	<100 µg/kg	TM173	4360	4780	6990	19700			
Aliphatics >C21-C35	<100 µg/kg	TM173	49300	29000	41500	109000			
Aliphatics >C35-C44	<100 µg/kg	TM173	27000	6490	16800	51700			
Total Aliphatics >C12-C44	<100 µg/kg	TM173	82800	43300	69000	189000			
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10	<10	<10	<10			
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10	<10	<10	<10			
Aromatics >EC8-EC10	<10 µg/kg	TM089	67.3	6110	13.7	80.5			
Aromatics >EC10-EC12	<10 µg/kg	TM089	41.4	3500	<10	74.8			
Aromatics >EC12-EC16	<100 µg/kg	TM173	2990	3700	1410	21900			
Aromatics >EC16-EC21	<100 µg/kg	TM173	14000	37300	14700	185000			
Aromatics >EC21-EC35	<100 µg/kg	TM173	105000	90900	84400	584000			
Aromatics >EC35-EC44	<100 µg/kg	TM173	99400	37600	55000	246000			
Aromatics >EC40-EC44	<100 µg/kg	TM173	46900	14900	22600	92900			
Total Aromatics >EC12-EC44	<100 µg/kg	TM173	221000	169000	156000	1040000			
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173	304000	237000	225000	1230000			
Total Aliphatics >C5-35	<100 µg/kg	TM173	56100	51300	52200	137000			
Total Aromatics >C5-35	<100 µg/kg	TM173	122000	141000	101000	790000			
Total Aliphatics & Aromatics >C5-35	<100 µg/kg	TM173	178000	193000	153000	928000			



SDG: 101210-8  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

## VOC MS (S)

Results Legend		Customer Sample R	WS01	WS02				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference						
M	mCERTS accredited.		0.70	2.20 - 2.50				
S	Non-conforming work.		Soil/Solid	Soil/Solid				
aq	Aqueous / settled sample.		08/12/2010	08/12/2010				
diss.filt	Dissolved / filtered sample.		10/12/2010	10/12/2010				
tot.unfilt	Total / unfiltered sample.		10/12/2010	10/12/2010				
*	subcontracted test.		101210-8	101210-8				
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.		2558326	2558492				
Component	LOD/Units		Method					
Dibromofluoromethane**	%		TM116	162	141			
Toluene-d8**	%	TM116	96.7	99				
4-Bromofluorobenzene**	%	TM116	132	121				
Dichlorodifluoromethane	<4 µg/kg	TM116	<4	<4				
Chloromethane	<7 µg/kg	TM116	<7	<7				
Vinyl Chloride	<10 µg/kg	TM116	<10	<10				
Bromomethane	<13 µg/kg	TM116	<13	<13				
Chloroethane	<14 µg/kg	TM116	<14	<14				
Trichlorofluoromethane	<6 µg/kg	TM116	<6	<6				
1.1-Dichloroethene	<10 µg/kg	TM116	<10	<10				
Carbon Disulphide	<7 µg/kg	TM116	<7	<7				
Dichloromethane	<10 µg/kg	TM116	28.5	<10				
Methyl Tertiary Butyl Ether	<11 µg/kg	TM116	<11	<11				
trans-1-2-Dichloroethene	<11 µg/kg	TM116	<11	<11				
1.1-Dichloroethane	<8 µg/kg	TM116	<8	<8				
cis-1-2-Dichloroethene	<5 µg/kg	TM116	<5	<5				
2.2-Dichloropropane	<12 µg/kg	TM116	<12	<12				
Bromochloromethane	<14 µg/kg	TM116	<14	<14				
Chloroform	<8 µg/kg	TM116	<8	<8				
1.1.1-Trichloroethane	<7 µg/kg	TM116	<7	<7				
1.1-Dichloropropene	<11 µg/kg	TM116	<11	<11				
Carbontetrachloride	<14 µg/kg	TM116	<14	<14				
1.2-Dichloroethane	<5 µg/kg	TM116	<5	<5				
Benzene	<9 µg/kg	TM116	18.5	<9				
Trichloroethene	<9 µg/kg	TM116	<9	<9				
1.2-Dichloropropane	<12 µg/kg	TM116	<12	<12				
Dibromomethane	<9 µg/kg	TM116	<9	<9				
Bromodichloromethane	<7 µg/kg	TM116	<7	<7				
cis-1-3-Dichloropropene	<14 µg/kg	TM116	<14	<14				
Toluene	<5 µg/kg	TM116	24.4	9.67				
trans-1-3-Dichloropropene	<14 µg/kg	TM116	<14	<14				
1.1.2-Trichloroethane	<10 µg/kg	TM116	<10	<10				
1.3-Dichloropropane	<7 µg/kg	TM116	<7	<7				
Tetrachloroethene	<5 µg/kg	TM116	9.67	15.1				
Dibromochloromethane	<13 µg/kg	TM116	<13	<13				



## CERTIFICATE OF ANALYSIS

SDG: 101210-8  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

## VOC MS (S)

Results Legend		Customer Sample R	WS01	WS02				
#	ISO17025 accredited.							
M	mCERTS accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.70	2.20 - 2.50				
S	Non-conforming work.		Soil/Solid	Soil/Solid				
aq	Aqueous / settled sample.		08/12/2010	08/12/2010				
diss.filt	Dissolved / filtered sample.		10/12/2010	10/12/2010				
tot.unfilt	Total / unfiltered sample.		101210-8	101210-8				
*	subcontracted test.		2558326	2558492				
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.							
Component	LOD/Units		Method					
1,2-Dibromoethane	<12 µg/kg		TM116	<12 M	<12 M			
Chlorobenzene	<5 µg/kg		TM116	<5 M	<5 M			
1,1,1,2-Tetrachloroethane	<10 µg/kg	TM116	<10 M	<10 M				
Ethylbenzene	<4 µg/kg	TM116	14.8 M	11.1 M				
p/m-Xylene	<14 µg/kg	TM116	<14 #	<14 #				
o-Xylene	<10 µg/kg	TM116	<10 M	<10 M				
Styrene	<10 µg/kg	TM116	20.8 M	<10 M				
Bromoform	<10 µg/kg	TM116	<10 M	<10 M				
Isopropylbenzene	<5 µg/kg	TM116	<5 M	<5 M				
1,1,2,2-Tetrachloroethane	<10 µg/kg	TM116	<10 #	<10 #				
1,2,3-Trichloropropane	<17 µg/kg	TM116	<17 M	<17 M				
Bromobenzene	<10 µg/kg	TM116	<10 M	<10 M				
Propylbenzene	<11 µg/kg	TM116	<11 M	<11 M				
2-Chlorotoluene	<9 µg/kg	TM116	<9 M	<9 M				
1,3,5-Trimethylbenzene	<8 µg/kg	TM116	<8 #	<8 #				
4-Chlorotoluene	<12 µg/kg	TM116	<12 M	<12 M				
tert-Butylbenzene	<12 µg/kg	TM116	<12 #	<12 #				
1,2,4-Trimethylbenzene	<9 µg/kg	TM116	<9 #	<9 #				
sec-Butylbenzene	<10 µg/kg	TM116	<10 M	<10 M				
4-Isopropyltoluene	<11 µg/kg	TM116	<11 M	<11 M				
1,3-Dichlorobenzene	<6 µg/kg	TM116	<6 M	<6 M				
1,4-Dichlorobenzene	<5 µg/kg	TM116	<5 M	<5 M				
n-Butylbenzene	<10 µg/kg	TM116	<10 M	<10 M				
1,2-Dichlorobenzene	<12 µg/kg	TM116	<12 M	<12 M				
1,2-Dibromo-3-chloropropane	<14 µg/kg	TM116	<14 M	<14 M				
Tert-amyl methyl ether	<15 µg/kg	TM116	<15	<15				
1,2,4-Trichlorobenzene	<6 µg/kg	TM116	<6 #	<6 #				
Hexachlorobutadiene	<12 µg/kg	TM116	<12	<12				
Naphthalene	<13 µg/kg	TM116	<13 M	<13 M				
1,2,3-Trichlorobenzene	<6 µg/kg	TM116	<6 M	<6 M				





**SDG:** 101210-8  
**Job:** H\_GRONTMIJ\_SOL-42  
**Client Reference:**

**Location:** Fiveways  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 111099  
**Superseded Report:**

## Table of Results - Appendix

### REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	<b>#</b>	ISO 17025 Accredited	*	Subcontracted Test	<b>M</b>	MCERTS Accredited
<b>NFD</b>	No Fibres Detected	<b>PFD</b>	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	<b>EC</b>	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample <sup>1</sup>	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM001	In - house Method	Determination of asbestos containing material by screening on solids		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
TM157	HP 6890 Gas Chromatograph (GC) system and HP 5973 Mass Selective Detector (MSD).	Determination of SVOC in Soils by GC-MS extracted by sonication in DCM/Acetone		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer		
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer		

<sup>1</sup> Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.



SDG: 101210-8  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 111099  
 Superseded Report:

### Test Completion Dates

Lab Sample No(s)	2558301	2558326	2558384	2558492	2558755	2558948	2558985
Customer Sample Ref.	WS01	WS01	WS02	WS02	WS03	WS04	WS04
AGS Ref.							
Depth	0.30	0.70	0.10	2.20 - 2.50	0.30	0.70	1.20 - 1.50
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Asbestos Containing Material Screen	06-Jan-2011	06-Jan-2011	06-Jan-2011	06-Jan-2011	06-Jan-2011	06-Jan-2011	06-Jan-2011
Boron Water Soluble	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011
EPH CWG (Aliphatic) GC (S)		11-Jan-2011		10-Jan-2011	10-Jan-2011		10-Jan-2011
EPH CWG (Aromatic) GC (S)		11-Jan-2011		10-Jan-2011	10-Jan-2011		10-Jan-2011
GRO by GC-FID (S)		13-Jan-2011		09-Jan-2011	09-Jan-2011		09-Jan-2011
Hexavalent Chromium (s)	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011
Metals by iCap-OES (Soil)	07-Jan-2011	07-Jan-2011	10-Jan-2011	10-Jan-2011	10-Jan-2011	07-Jan-2011	10-Jan-2011
PAH by GCMS			09-Jan-2011		10-Jan-2011		10-Jan-2011
pH	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011
Sample description	05-Jan-2011	06-Jan-2011	06-Jan-2011	05-Jan-2011	06-Jan-2011	06-Jan-2011	05-Jan-2011
Semi Volatile Organic Compounds		10-Jan-2011		10-Jan-2011			
Total Organic Carbon	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011	07-Jan-2011
Total Sulphate		11-Jan-2011			11-Jan-2011	11-Jan-2011	
TPH CWG GC (S)		13-Jan-2011		10-Jan-2011	10-Jan-2011		10-Jan-2011
VOC MS (S)		11-Jan-2011		11-Jan-2011			

SDG: 101210-8  
 Job: H\_Grontmij\_SOL-42  
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## Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

12. Results relate only to the items tested

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.

19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

24. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 -C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY				
ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOX THERM	GRAMMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOX THERM	GRAMMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOX THERM	IATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOX THERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOX THERM	GCMS
HERBICIDES	D&C	HEXANE ACETONE	SOX THERM	GCMS
PESTICIDES	D&C	HEXANE ACETONE	SOX THERM	GCMS
EPH (DRO)	D&C	HEXANE ACETONE	END OVER END	GC/FID
EPH (MIN OIL)	D&C	HEXANE ACETONE	END OVER END	GC/FID
EPH (CLEANED UP)	D&C	HEXANE ACETONE	END OVER END	GC/FID
EPH CWG BY GC	D&C	HEXANE ACETONE	END OVER END	GC/FID
PCB TOT / PCB CON	D&C	HEXANE ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE ACETONE	MICROWAVE TM28.	GCMS
C8-C10 (C8-C10) EZ FLASH	WET	HEXANE ACETONE	SHAKER	GC/EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE ACETONE	SHAKER	GC/EZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM ACETONE	SONICATE	GCMS

LIQUID MATRICES EXTRACTION SUMMARY			
ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREESULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST COP/OPP	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL BY R	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

### Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.



Grontmij  
Radcliffe House  
3rd Floor  
Blenheim Court, Lode lane  
Solihull  
West Midlands  
B912AA

**Attention:** Gareth Taylor

## CERTIFICATE OF ANALYSIS

**Date:** 13 January 2011  
**Customer:** H\_GRONTMIJ\_SOL  
**Sample Delivery Group (SDG):** 101214-5  
**Your Reference:**  
**Location:** Fiveways  
**Report No:** 110765

We received 15 samples on Tuesday December 14, 2010 and 5 of these samples were scheduled for analysis which was completed on Thursday January 13, 2011. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

**Sonia McWhan**

Laboratory Manager



1291  
GROUP



**SDG:** 101214-5  
**Job:** H\_GRONTMIJ\_SOL-42  
**Client Reference:**

**Location:** Fiveways  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 110765  
**Superseded Report:**

## Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2649431	HP01		0.10	13/12/2010
2649432	HP01		0.30	13/12/2010
2649433	HP01		0.70	13/12/2010
2649435	HP02		0.10	13/12/2010
2649437	HP02		0.30	13/12/2010
2649438	HP02		0.70	13/12/2010
2649440	HP03		0.10	13/12/2010
2649441	HP03		0.30	13/12/2010
2649442	HP03		0.70	13/12/2010
2649444	HP04		0.10	13/12/2010
2649445	HP04		0.30	13/12/2010
2649446	HP04		0.70	13/12/2010
2649447	HP05		0.10	13/12/2010
2649448	HP05		0.30	13/12/2010
2649450	HP05		0.70	13/12/2010

Only received samples which have had analysis scheduled will be shown on the following pages.





SDG: 101214-5  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 110765  
 Superseded Report:

## Test Schedule



SOLID	Results Legend		Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
	Test	No Determination Possible	2649431	2649438	2649441	2649444	2649446
Asbestos Containing Material Screen	All	NDPs: 0 Tests: 3					400g Tub 250g Amber Jar
Boron Water Soluble	All	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 60g VOC
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 3		X	X	X	400g Tub 60g VOC
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 3		X	X	X	400g Tub 60g VOC
GRO by GC-FID (S)	All	NDPs: 0 Tests: 3		X	X	X	400g Tub 60g VOC
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
Metals by iCap-OES (Soil)	Arsenic	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Barium	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Beryllium	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Cadmium	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Chromium	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Copper	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Lead	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Mercury	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Nickel	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Selenium	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Vanadium	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
	Zinc	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
PAH by GCMS	All	NDPs: 0 Tests: 3		X	X	X	400g Tub 250g Amber Jar
pH	All	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
Sample description	All	NDPs: 0 Tests: 5	X	X	X	X	400g Tub 250g Amber Jar
Semi Volatile Organic Compounds	All	NDPs: 0 Tests: 1	X				400g Tub 250g Amber Jar



SDG: 101214-5  
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 Client Reference:

Location: Fiveways  
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 Superseded Report:

SOLID Results Legend   Test   No Determination Possible	Lab Sample No(s)	2649431	2649438	2649441	2649444	2649446	
	Customer Sample Reference	HP01	HP02	HP03	HP04	HP04	
	AGS Reference						
	Depth (m)	0.10	0.70	0.30	0.10	0.70	
	Container	250g Amber Jar 400g Tub	250g Amber Jar 400g Tub	250g Amber Jar 400g Tub	250g Amber Jar 60g VOC	250g Amber Jar 400g Tub	400g Tub 250g Amber Jar 60g VOC
Total Organic Carbon	All	NDPs: 0 Tests: 5					
Total Sulphate	All	NDPs: 0 Tests: 3					
TPH CWG GC (S)	All	NDPs: 0 Tests: 3					
VOC MS (S)	All	NDPs: 0 Tests: 1					



SDG: 101214-5  
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Order Number:  
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 Superseded Report:

## Sample Descriptions

### Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2649431	HP01	0.10	Dark Brown	Sand	0.1 - 2 mm	Stones	N/A
2649438	HP02	0.70	Dark Brown	Sand	0.1 - 2 mm	Stones	N/A
2649441	HP03	0.30	Dark Brown	Sandy Loam	0.1 - 2 mm	Stones	Crushed Brick
2649444	HP04	0.10	Dark Brown	Sandy Loam	0.1 - 2 mm	Stones	Crushed Brick
2649446	HP04	0.70	Dark Brown	Sandy Loam	0.1 - 2 mm	Stones	Crushed Brick

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



CERTIFICATE OF ANALYSIS

**SDG:** 101214-5  
**Job:** H\_GRONTMIJ\_SOL-42  
**Client Reference:**

**Location:** Fiveways  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 110765  
**Superseded Report:**

Results Legend		Customer Sample R	HP01	HP02	HP03	HP04	HP04		
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.10	0.70	0.30	0.10	0.70		
M	mCERTS accredited.		Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	
S	Non-conforming work.		13/12/2010	13/12/2010	13/12/2010	13/12/2010	13/12/2010	13/12/2010	
aq	Aqueous / settled sample.		14/12/2010	14/12/2010	14/12/2010	14/12/2010	14/12/2010	14/12/2010	
diss.filt	Dissolved / filtered sample.		101214-5	101214-5	101214-5	101214-5	101214-5	101214-5	
tot.unfilt	Total / unfiltered sample.		2649431	2649438	2649441	2649444	2649444	2649446	
*	subcontracted test.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.								
<b>Component</b>	<b>LOD/Units</b>		<b>Method</b>						
Asbestos Containing Material Screen	-	TM001			No ACM Detected	No ACM Detected	No ACM Detected		
Soil Organic Matter (SOM)	<0.35 %	TM132	4.24	6.14	4.59	4.97	5.38		
			#	#	#	#	#		
pH	1 pH Units	TM133	8.44	7.71	7.72	7.69	8.17		
			M	M	M	M	M		
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6	<0.6	2.09	<0.6	<0.6		
			#	#	#	#	#		
Arsenic	<0.6 mg/kg	TM181	6.64	10.3	7.06	9.82	11		
			M	M	M	M	M		
Barium	<0.6 mg/kg	TM181	134	218	236	143	162		
			#	#	#	#	#		
Beryllium	<0.01 mg/kg	TM181	1.06	1.85	0.579	0.978	1.26		
			M	M	M	M	M		
Cadmium	<0.02 mg/kg	TM181	0.694	1.23	0.243	<0.02	0.28		
			M	M	M	M	M		
Chromium	<0.9 mg/kg	TM181	27.2	24.5	17.6	30.1	21.5		
			M	M	M	M	M		
Copper	<1.4 mg/kg	TM181	55.5	205	37.3	32.3	38.9		
			M	M	M	M	M		
Lead	<0.7 mg/kg	TM181	81.7	132	206	58.7	62.5		
			M	M	M	M	M		
Mercury	<0.14 mg/kg	TM181	<0.14	0.591	<0.14	<0.14	<0.14		
			M	M	M	M	M		
Nickel	<0.2 mg/kg	TM181	15	23.7	12.1	30.3	30.1		
			M	M	M	M	M		
Selenium	<1 mg/kg	TM181	<1	<1	<1	<1	<1		
			#	#	#	#	#		
Vanadium	<0.2 mg/kg	TM181	27.8	33.2	23.6	32.8	32.7		
			#	#	#	#	#		
Zinc	<1.9 mg/kg	TM181	212	381	232	118	162		
			M	M	M	M	M		
Sulphate, Total	<48 mg/kg	TM221	1190		4820	542			
			M		M	M			
Boron, water soluble	<1 mg/kg	TM222	1.05	1	<1	<1	<1		
			M	M	M	M	M		



SDG: 101214-5  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 110765  
 Superseded Report:

## PAH by GCMS

Results Legend		Customer Sample R	HP03	HP04	HP04				
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference							
M	mCERTS accredited.		0.30	0.10	0.70				
S	Non-conforming work.		Soil/Solid	Soil/Solid	Soil/Solid				
aq	Aqueous / settled sample.		13/12/2010	13/12/2010	13/12/2010				
diss.filt	Dissolved / filtered sample.		14/12/2010	14/12/2010	14/12/2010				
tot.unfilt	Total / unfiltered sample.		101214-5	101214-5	101214-5				
*	subcontracted test.		2649441	2649444	2649446				
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.								
Component	LOD/Units		Method						
Naphthalene-d8 % recovery**	%		TM218	109	97.6	98.6			
Acenaphthene-d10 % recovery**	%	TM218	109	97.7	98.5				
Phenanthrene-d10 % recovery**	%	TM218	110	99.1	99.8				
Chrysene-d12 % recovery**	%	TM218	106	98.1	98.2				
Perylene-d12 % recovery**	%	TM218	110	100	99.6				
Naphthalene	<9 µg/kg	TM218	26	39	34.5	M	M	M	
Acenaphthylene	<12 µg/kg	TM218	46.4	49	55.4	M	M	M	
Acenaphthene	<8 µg/kg	TM218	<16	11.3	11.9	M	M	M	
Fluorene	<10 µg/kg	TM218	<20	12.6	17.8	M	M	M	
Phenanthrene	<15 µg/kg	TM218	205	275	389	M	M	M	
Anthracene	<16 µg/kg	TM218	96.1	80.5	85.9	M	M	M	
Fluoranthene	<17 µg/kg	TM218	627	816	1030	M	M	M	
Pyrene	<15 µg/kg	TM218	591	744	938	M	M	M	
Benz(a)anthracene	<14 µg/kg	TM218	330	483	485	M	M	M	
Chrysene	<10 µg/kg	TM218	306	504	499	M	M	M	
Benzo(b)fluoranthene	<15 µg/kg	TM218	670	754	767	M	M	M	
Benzo(k)fluoranthene	<14 µg/kg	TM218	243	354	381	M	M	M	
Benzo(a)pyrene	<15 µg/kg	TM218	532	671	663	M	M	M	
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	373	450	443	M	M	M	
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	103	121	116	M	M	M	
Benzo(g,h,i)perylene	<24 µg/kg	TM218	480	602	570	M	M	M	
Polyaromatic hydrocarbons, Total	<118 µg/kg	TM218	4630	5970	6480	M	M	M	





SDG: 101214-5  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 110765  
 Superseded Report:

## Semi Volatile Organic Compounds

Results Legend		Customer Sample R	HP02					
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.70 Soil/Solid 13/12/2010 14/12/2010 101214-5 2649438					
M	mCERTS accredited.							
S	Non-conforming work.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	subcontracted test.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.							
Component	LOD/Units			Method				
Phenol	<100 µg/kg			TM157	<100			
Pentachlorophenol	<100 µg/kg	TM157	<100					
n-Nitroso-n-dipropylamine	<100 µg/kg	TM157	<100					
Nitrobenzene	<100 µg/kg	TM157	<100					
Isophorone	<100 µg/kg	TM157	<100					
Hexachloroethane	<100 µg/kg	TM157	<100					
Hexachlorocyclopentadiene	<100 µg/kg	TM157	<100					
Hexachlorobutadiene	<100 µg/kg	TM157	<100					
Hexachlorobenzene	<100 µg/kg	TM157	<100					
n-Dioctyl phthalate	<100 µg/kg	TM157	<100					
Dimethyl phthalate	<100 µg/kg	TM157	<100					
Diethyl phthalate	<100 µg/kg	TM157	<100					
n-Dibutyl phthalate	<100 µg/kg	TM157	<100					
Dibenzofuran	<100 µg/kg	TM157	<100					
Carbazole	<100 µg/kg	TM157	<100					
Butylbenzyl phthalate	<100 µg/kg	TM157	<100					
bis(2-Ethylhexyl) phthalate	<100 µg/kg	TM157	229					
bis(2-Chloroethoxy)methane	<100 µg/kg	TM157	<100					
bis(2-Chloroethyl)ether	<100 µg/kg	TM157	<100					
Azobenzene	<100 µg/kg	TM157	<100					
4-Nitrophenol	<100 µg/kg	TM157	<100					
4-Nitroaniline	<100 µg/kg	TM157	<100					
4-Methylphenol	<100 µg/kg	TM157	<100					
4-Chlorophenylphenylether	<100 µg/kg	TM157	<100					
4-Chloroaniline	<100 µg/kg	TM157	<100					
4-Chloro-3-methylphenol	<100 µg/kg	TM157	<100					
4-Bromophenylphenylether	<100 µg/kg	TM157	<100					
3-Nitroaniline	<100 µg/kg	TM157	<100					
2-Nitrophenol	<100 µg/kg	TM157	<100					
2-Nitroaniline	<100 µg/kg	TM157	<100					
2-Methylphenol	<100 µg/kg	TM157	<100					
1,2,4-Trichlorobenzene	<100 µg/kg	TM157	<100					
2-Chlorophenol	<100 µg/kg	TM157	<100					
2,6-Dinitrotoluene	<100 µg/kg	TM157	<100					
2,4-Dinitrotoluene	<100 µg/kg	TM157	<100					

**CERTIFICATE OF ANALYSIS**

**SDG:** 101214-5  
**Job:** H\_GRONTMIJ\_SOL-42  
**Client Reference:**

**Location:** Fiveways  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 110765  
**Superseded Report:**

**Semi Volatile Organic Compounds**

Results Legend		Customer Sample R	HP02					
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.70 Soil/Solid 13/12/2010 14/12/2010 101214-5 2649438					
M	mCERTS accredited.							
§	Non-conforming work.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	subcontracted test.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.							
Component	LOD/Units	Method						
2,4-Dimethylphenol	<100 µg/kg	TM157	<100					
2,4-Dichlorophenol	<100 µg/kg	TM157	<100					
2,4,6-Trichlorophenol	<100 µg/kg	TM157	<100					
2,4,5-Trichlorophenol	<100 µg/kg	TM157	<100					
1,4-Dichlorobenzene	<100 µg/kg	TM157	<100					
1,3-Dichlorobenzene	<100 µg/kg	TM157	<100					
1,2-Dichlorobenzene	<100 µg/kg	TM157	<100					
2-Chloronaphthalene	<100 µg/kg	TM157	<100					
2-Methylnaphthalene	<100 µg/kg	TM157	<100					
Acenaphthylene	<100 µg/kg	TM157	<100					
Acenaphthene	<100 µg/kg	TM157	<100					
Anthracene	<100 µg/kg	TM157	214					
Benzo(a)anthracene	<100 µg/kg	TM157	1100					
Benzo(b)fluoranthene	<100 µg/kg	TM157	1390					
Benzo(k)fluoranthene	<100 µg/kg	TM157	1140					
Benzo(a)pyrene	<100 µg/kg	TM157	1630					
Benzo(g,h,i)perylene	<100 µg/kg	TM157	1320					
Chrysene	<100 µg/kg	TM157	1110					
Fluoranthene	<100 µg/kg	TM157	2050					
Fluorene	<100 µg/kg	TM157	<100					
Indeno(1,2,3-cd)pyrene	<100 µg/kg	TM157	1140					
Phenanthrene	<100 µg/kg	TM157	720					
Pyrene	<100 µg/kg	TM157	2120					
Naphthalene	<100 µg/kg	TM157	<100					
Dibenzo(a,h)anthracene	<100 µg/kg	TM157	238					



## CERTIFICATE OF ANALYSIS

SDG: 101214-5  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 110765  
 Superseded Report:

## TPH CWG (S)

Results Legend		Customer Sample R	HP02	HP03	HP04			
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference						
M	mCERTS accredited.		0.70	0.30	0.10			
S	Non-conforming work.		Soil/Solid	Soil/Solid	Soil/Solid			
aq	Aqueous / settled sample.		13/12/2010	13/12/2010	13/12/2010			
diss.filt	Dissolved / filtered sample.		14/12/2010	14/12/2010	14/12/2010			
tot.unfilt	Total / unfiltered sample.		101214-5	101214-5	101214-5			
*	subcontracted test.		2649438	2649441	2649444			
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.							
Component	LOD/Units	Method						
GRO Surrogate % recovery**	%	TM089	35	109	47			
GRO >C5-C12	<44 µg/kg	TM089	<44	<44	<44			
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5	<5	<5			
Benzene	<10 µg/kg	TM089	<10	<10	<10			
Toluene	<2 µg/kg	TM089	<2	<2	<2			
Ethylbenzene	<3 µg/kg	TM089	<3	<3	<3			
m,p-Xylene	<6 µg/kg	TM089	<6	<6	<6			
o-Xylene	<3 µg/kg	TM089	<3	<3	<3			
m,p,o-Xylene	<10 µg/kg	TM089	<10	<10	<10			
BTEX, Total	<10 µg/kg	TM089	<10	<10	<10			
Aliphatics >C5-C6	<10 µg/kg	TM089	<10	<10	<10			
Aliphatics >C6-C8	<10 µg/kg	TM089	<10	<10	<10			
Aliphatics >C8-C10	<10 µg/kg	TM089	<10	<10	<10			
Aliphatics >C10-C12	<10 µg/kg	TM089	<10	<10	<10			
Aliphatics >C12-C16	<100 µg/kg	TM173	8630	4800	10300			
Aliphatics >C16-C21	<100 µg/kg	TM173	27400	7860	4960			
Aliphatics >C21-C35	<100 µg/kg	TM173	166000	52100	37600			
Aliphatics >C35-C44	<100 µg/kg	TM173	109000	17900	16000			
Total Aliphatics >C12-C44	<100 µg/kg	TM173	311000	82600	68900			
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10	<10	<10			
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10	<10	<10			
Aromatics >EC8-EC10	<10 µg/kg	TM089	<10	<10	<10			
Aromatics >EC10-EC12	<10 µg/kg	TM089	<10	<10	<10			
Aromatics >EC12-EC16	<100 µg/kg	TM173	4980	5270	8560			
Aromatics >EC16-EC21	<100 µg/kg	TM173	51000	27700	14100			
Aromatics >EC21-EC35	<100 µg/kg	TM173	307000	130000	102000			
Aromatics >EC35-EC44	<100 µg/kg	TM173	263000	61100	49800			
Aromatics >EC40-EC44	<100 µg/kg	TM173	121000	24200	20600			
Total Aromatics >EC12-EC44	<100 µg/kg	TM173	626000	224000	174000			
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173	937000	306000	243000			
Total Aliphatics >C5-35	<100 µg/kg	TM173	202000	64800	52900			
Total Aromatics >C5-35	<100 µg/kg	TM173	363000	163000	125000			
Total Aliphatics & Aromatics >C5-35	<100 µg/kg	TM173	565000	227000	178000			



SDG: 101214-5  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 110765  
 Superseded Report:

## VOC MS (S)

Results Legend		Customer Sample R						
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	HP02					
M	mCERTS accredited.			0.70				
S	Non-conforming work.			Soil/Solid				
aq	Aqueous / settled sample.			13/12/2010				
diss.filt	Dissolved / filtered sample.			14/12/2010				
tot.unfilt	Total / unfiltered sample.							
*	subcontracted test.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.							
Component	LOD/Units			Method				
Dibromofluoromethane**	%			TM116	110			
Toluene-d8**	%	TM116	94.3					
4-Bromofluorobenzene**	%	TM116	141					
Dichlorodifluoromethane	<4 µg/kg	TM116	<4	M				
Chloromethane	<7 µg/kg	TM116	<7	#				
Vinyl Chloride	<10 µg/kg	TM116	<10	#				
Bromomethane	<13 µg/kg	TM116	<13	M				
Chloroethane	<14 µg/kg	TM116	<14	M				
Trichlorofluoromethane	<6 µg/kg	TM116	<6	M				
1.1-Dichloroethene	<10 µg/kg	TM116	<10	#				
Carbon Disulphide	<7 µg/kg	TM116	<7	M				
Dichloromethane	<10 µg/kg	TM116	30.6	#				
Methyl Tertiary Butyl Ether	<11 µg/kg	TM116	<11	M				
trans-1-2-Dichloroethene	<11 µg/kg	TM116	<11	M				
1.1-Dichloroethane	<8 µg/kg	TM116	<8	M				
cis-1-2-Dichloroethene	<5 µg/kg	TM116	<5	M				
2.2-Dichloropropane	<12 µg/kg	TM116	<12	M				
Bromochloromethane	<14 µg/kg	TM116	<14	M				
Chloroform	<8 µg/kg	TM116	<8	M				
1.1.1-Trichloroethane	<7 µg/kg	TM116	<7	M				
1.1-Dichloropropene	<11 µg/kg	TM116	<11	M				
Carbontetrachloride	<14 µg/kg	TM116	<14	M				
1.2-Dichloroethane	<5 µg/kg	TM116	<5	M				
Benzene	<9 µg/kg	TM116	16	M				
Trichloroethene	<9 µg/kg	TM116	<9	M				
1.2-Dichloropropane	<12 µg/kg	TM116	<12	M				
Dibromomethane	<9 µg/kg	TM116	<9	M				
Bromodichloromethane	<7 µg/kg	TM116	<7	M				
cis-1-3-Dichloropropene	<14 µg/kg	TM116	<14	M				
Toluene	<5 µg/kg	TM116	16.3	M				
trans-1-3-Dichloropropene	<14 µg/kg	TM116	<14	M				
1.1.2-Trichloroethane	<10 µg/kg	TM116	<10	M				
1.3-Dichloropropane	<7 µg/kg	TM116	<7	#				
Tetrachloroethene	<5 µg/kg	TM116	18.4	M				
Dibromochloromethane	<13 µg/kg	TM116	<13	M				



SDG: 101214-5  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 110765  
 Superseded Report:

## VOC MS (S)

Results Legend		Customer Sample R						
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	HP02					
M	mCERTS accredited.			0.70				
S	Non-conforming work.			Soil/Solid				
aq	Aqueous / settled sample.			13/12/2010				
diss.filt	Dissolved / filtered sample.			14/12/2010				
tot.unfilt	Total / unfiltered sample.			101214-5				
*	subcontracted test.			2649438				
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.							
Component	LOD/Units			Method				
1,2-Dibromoethane	<12 µg/kg			TM116	<12	M		
Chlorobenzene	<5 µg/kg	TM116	<5	M				
1,1,1,2-Tetrachloroethane	<10 µg/kg	TM116	<10	M				
Ethylbenzene	<4 µg/kg	TM116	15.2	M				
p/m-Xylene	<14 µg/kg	TM116	<14	#				
o-Xylene	<10 µg/kg	TM116	<10	M				
Styrene	<10 µg/kg	TM116	<10	M				
Bromoform	<10 µg/kg	TM116	<10	M				
Isopropylbenzene	<5 µg/kg	TM116	<5	M				
1,1,2,2-Tetrachloroethane	<10 µg/kg	TM116	<10	#				
1,2,3-Trichloropropane	<17 µg/kg	TM116	<17	M				
Bromobenzene	<10 µg/kg	TM116	<10	M				
Propylbenzene	<11 µg/kg	TM116	<11	M				
2-Chlorotoluene	<9 µg/kg	TM116	<9	M				
1,3,5-Trimethylbenzene	<8 µg/kg	TM116	<8	#				
4-Chlorotoluene	<12 µg/kg	TM116	<12	M				
tert-Butylbenzene	<12 µg/kg	TM116	<12	#				
1,2,4-Trimethylbenzene	<9 µg/kg	TM116	<9	#				
sec-Butylbenzene	<10 µg/kg	TM116	<10	M				
4-Isopropyltoluene	<11 µg/kg	TM116	<11	M				
1,3-Dichlorobenzene	<6 µg/kg	TM116	<6	M				
1,4-Dichlorobenzene	<5 µg/kg	TM116	<5	M				
n-Butylbenzene	<10 µg/kg	TM116	<10	M				
1,2-Dichlorobenzene	<12 µg/kg	TM116	<12	M				
1,2-Dibromo-3-chloropropane	<14 µg/kg	TM116	<14	M				
Tert-amyl methyl ether	<15 µg/kg	TM116	<15					
1,2,4-Trichlorobenzene	<6 µg/kg	TM116	<6	#				
Hexachlorobutadiene	<12 µg/kg	TM116	<12					
Naphthalene	<13 µg/kg	TM116	<13	M				
1,2,3-Trichlorobenzene	<6 µg/kg	TM116	<6	M				



**SDG:** 101214-5  
**Job:** H\_GRONTMIJ\_SOL-42  
**Client Reference:**

**Location:** Fiveways  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 110765  
**Superseded Report:**

### Table of Results - Appendix

**REPORT KEY**

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	<b>#</b>	ISO 17025 Accredited	*	Subcontracted Test	<b>M</b>	MCERTS Accredited
<b>NFD</b>	No Fibres Detected	<b>PFD</b>	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	<b>EC</b>	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample <sup>1</sup>	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM001	In - house Method	Determination of asbestos containing material by screening on solids		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
TM157	HP 6890 Gas Chromatograph (GC) system and HP 5973 Mass Selective Detector (MSD).	Determination of SVOC in Soils by GC-MS extracted by sonication in DCM/Acetone		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer		
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer		

<sup>1</sup> Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.



SDG: 101214-5  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
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 Attention: Gareth Taylor

Order Number:  
 Report Number: 110765  
 Superseded Report:

### Test Completion Dates

Lab Sample No(s)	2649431	2649438	2649441	2649444	2649446
Customer Sample Ref.	HP01	HP02	HP03	HP04	HP04
AGS Ref.					
Depth	0.10	0.70	0.30	0.10	0.70
Type	SOLID	SOLID	SOLID	SOLID	SOLID
Asbestos Containing Material Screen			06-Jan-2011	06-Jan-2011	06-Jan-2011
Boron Water Soluble	06-Jan-2011	06-Jan-2011	11-Jan-2011	11-Jan-2011	11-Jan-2011
EPH CWG (Aliphatic) GC (S)		10-Jan-2011	12-Jan-2011	12-Jan-2011	
EPH CWG (Aromatic) GC (S)		10-Jan-2011	12-Jan-2011	12-Jan-2011	
GRO by GC-FID (S)		13-Jan-2011	12-Jan-2011	13-Jan-2011	
Hexavalent Chromium (s)	07-Jan-2011	07-Jan-2011	11-Jan-2011	11-Jan-2011	11-Jan-2011
Metals by iCap-OES (Soil)	06-Jan-2011	06-Jan-2011	11-Jan-2011	11-Jan-2011	11-Jan-2011
PAH by GCMS			11-Jan-2011	11-Jan-2011	11-Jan-2011
pH	06-Jan-2011	06-Jan-2011	10-Jan-2011	10-Jan-2011	10-Jan-2011
Sample description	05-Jan-2011	05-Jan-2011	10-Jan-2011	10-Jan-2011	10-Jan-2011
Semi Volatile Organic Compounds		10-Jan-2011			
Total Organic Carbon	06-Jan-2011	06-Jan-2011	11-Jan-2011	11-Jan-2011	11-Jan-2011
Total Sulphate	06-Jan-2011		11-Jan-2011	11-Jan-2011	
TPH CWG GC (S)		13-Jan-2011	12-Jan-2011	13-Jan-2011	
VOC MS (S)		11-Jan-2011			

SDG: 101214-5  
 Job: H\_GRONTMIJ\_SOL-42  
 Client Reference:

Location: Fiveways  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 110765  
 Superseded Report:

## Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

12. Results relate only to the items tested

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.

19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

24. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 -C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY				
ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOX THERM	GRAMMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOX THERM	GRAMMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOX THERM	IATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOX THERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOX THERM	GCMS
HERBICIDES	D&C	HEXANE ACETONE	SOX THERM	GCMS
PESTICIDES	D&C	HEXANE ACETONE	SOX THERM	GCMS
EPH (DRO)	D&C	HEXANE ACETONE	END OVER END	GC/FID
EPH (MIN OIL)	D&C	HEXANE ACETONE	END OVER END	GC/FID
EPH (CLEANED UP)	D&C	HEXANE ACETONE	END OVER END	GC/FID
EPH CWG BY GC	D&C	HEXANE ACETONE	END OVER END	GC/FID
PCB TOT / PCB CON	D&C	HEXANE ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE ACETONE	MICROWAVE TM28.	GCMS
C8-C10 (C8-C10) EZ FLASH	WET	HEXANE ACETONE	SHAKER	GC/EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE ACETONE	SHAKER	GC/EZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM ACETONE	SONICATE	GCMS

LIQUID MATRICES EXTRACTION SUMMARY			
ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREESULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST COP/OPP	DOM	LIQUID/LIQUID SHAKE	GCMS
TRAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL BY R	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

### Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

### Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anorthophyllite	-
Fibrous Tremolite	-



Grontmij  
Radcliffe House  
3rd Floor  
Blenheim Court, Lode lane  
Solihull  
West Midlands  
B912AA

**Attention:** Gareth Taylor

Please note: this test certificate contains results from multiple sites. The relevant results to the study site are those at Newlands Court or Newlands Lane only (some preceded by the reference "Fiveways").

## CERTIFICATE OF ANALYSIS

**Date:** 22 June 2011  
**Customer:** H\_GRONTMIJ\_SOL  
**Sample Delivery Group (SDG):** 110602-58  
**Your Reference:**  
**Location:** Part 2a Assistance  
**Report No:** 135175

**This report has been revised and directly supersedes 133432 in its entirety.**

We received 29 samples on Thursday June 02, 2011 and 29 of these samples were scheduled for analysis which was completed on Wednesday June 22, 2011. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Approved By:

**Sonia McWhan**

Operations Manager





**SDG:** 110602-58  
**Job:** H\_GRONTMIJ\_SOL-54  
**Client Reference:**

**Location:** Part 2a Assistance  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 135175  
**Superseded Report:** 133432

## Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
3588809	10 WESTGATE			31/05/2011
3588808	11 GOODWOOD			31/05/2011
3588826	11 NEWLANDS COURT FIVEWAYS		0.30	31/05/2011
3588818	110 STAFFORD LANE			31/05/2011
3588805	121 ARMITAGE ROAD			31/05/2011
3588806	125 ARMITAGE ROAD			31/05/2011
3588811	2 SANDOWN			31/05/2011
3588819	21 HERONDALE			31/05/2011
3588807	3 SLADE VIEW RISE			31/05/2011
3588787	3A BLAKE CLOSE			31/05/2011
3588810	4 KEMPTON			31/05/2011
3588813	41 SWALLOWFIELDS			31/05/2011
3588814	73 STAGBOROUGH			31/05/2011
3588815	8 STAGBOROUGH WAY			31/05/2011
3588788	83 BLAKE CLOSE			31/05/2011
3588803	99 ARMITAGE ROAD			31/05/2011
3588802	FIVEWAYS 1 NEWLANDS LANE			31/05/2011
3588798	FIVEWAYS 11 NEWLANDS COURT			31/05/2011
3588799	FIVEWAYS 5 NEWLANDS COURT			31/05/2011
3588800	FIVEWAYS 9 NEWLANDS COURT			31/05/2011
3588795	VIEW ST. 32 FOSTERS AVE.			31/05/2011
3588793	VIEW ST. 53 VIEW ST.			31/05/2011
3588797	VIEW ST. 9 WARD ST.			31/05/2011
3588790	VIEW ST. WS2		1.20	31/05/2011
3588791	VIEW ST. WS3		1.10	31/05/2011
3588789	VIEW ST. WS4		1.60	31/05/2011

Only received samples which have had analysis scheduled will be shown on the following pages.







SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

SOLID Results Legend  <input checked="" type="checkbox"/> Test  <input checked="" type="checkbox"/> No Determination Possible	Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	
		3588826 3588823 3588822 3588820	11 NEWLANDS 9 NEWLANDS 5 NEWLANDS 1 NEWLANDS LANE		0.30 0.30 0.30 0.30	1kg TUB 1kg TUB 1kg TUB 1kg TUB
	Asbestos Containing Material Screen	All	NDPs: 0 Tests: 1			<input checked="" type="checkbox"/>
	Asbestos Identification	All	NDPs: 0 Tests: 1			<input checked="" type="checkbox"/>
	CEN Readings	All	NDPs: 0 Tests: 3			<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 3			<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	
Mercury Dissolved	All	NDPs: 0 Tests: 3			<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 3			<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	
Sample description	All	NDPs: 0 Tests: 4			<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	
VOC MS (W)	All	NDPs: 0 Tests: 3			<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	

**SDG:** 110602-58  
**Job:** H\_GRONTMIJ\_SOL-54  
**Client Reference:**
**Location:** Part 2a Assistance  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 135175  
**Superseded Report:** 133432

## Sample Descriptions

**Grain Sizes**

very fine	<input type="checkbox"/> <0.063mm	fine	<input type="checkbox"/> 0.063mm - 0.1mm	medium	<input type="checkbox"/> 0.1mm - 2mm	coarse	<input type="checkbox"/> 2mm - 10mm	very coarse	<input type="checkbox"/> >10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
3588822	5 NEWLANDS COURT FIVEWAYS	0.30	Dark Brown	Top Soil	0.1 - 2 mm	Stones	Crushed Brick
3588823	9 NEWLANDS COURT FIVEWAYS	0.30	Dark Brown	Top Soil	0.1 - 2 mm	Stones	Crushed Brick
3588826	11 NEWLANDS COURT FIVEWAYS	0.30	Dark Brown	Top Soil	0.1 - 2 mm	Stones	Crushed Brick
3588820	1 NEWLANDS LANE FIVEWAYS	0.30	Dark Brown	Top Soil	0.1 - 2 mm	Crushed Brick	Glass & Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.









CERTIFICATE OF ANALYSIS

<b>SDG:</b> 110602-58	<b>Location:</b> Part 2a Assistance	<b>Order Number:</b>
<b>Job:</b> H_GRONTMIJ_SOL-54	<b>Customer:</b> Grontmij	<b>Report Number:</b> 135175
<b>Client Reference:</b>	<b>Attention:</b> Gareth Taylor	<b>Superseded Report:</b> 133432

Results Legend		Customer Sample R	5 NEWLANDS COUR T FIVEWAYS	9 NEWLANDS COUR T FIVEWAYS	11 NEWLANDS COUR RT FIVEWAYS	1 NEWLANDS LANE FIVEWAYS	2 SANDOWN	3 SLADE VIEW RI SE
#	ISO17025 accredited.	<b>Depth (m)</b> <b>Sample Type</b> <b>Date Sampled</b> <b>Date Received</b> <b>SDG Ref</b> <b>Lab Sample No.(s)</b> <b>AGS Reference</b>						
M	mCERTS accredited.		0.30	0.30	0.30	0.30		
S	Non-conforming work.		Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Water(GW/SW)	Water(GW/SW)
aq	Aqueous / settled sample.		31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011
diss.filt	Dissolved / filtered sample.		02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011
tot.unfilt	Total / unfiltered sample.		110602-58	110602-58	110602-58	110602-58	110602-58	110602-58
*	Subcontracted test.		3588822	3588823	3588826	3588820	3588811	3588807
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
Component	LOD/Units		Method					
Antimony (diss.filt)	<0.16 µg/l	TM152					0.202 #	0.426 #
Arsenic (diss.filt)	<0.12 µg/l	TM152					1.92 #	1.85 #
Boron (diss.filt)	<9.4 µg/l	TM152					107 #	128 #
Cadmium (diss.filt)	<0.1 µg/l	TM152					0.201 #	<0.1 #
Chromium (diss.filt)	<0.22 µg/l	TM152					12.5 #	13.3 #
Copper (diss.filt)	<0.85 µg/l	TM152					118 #	175 #
Lead (diss.filt)	<0.02 µg/l	TM152					0.862 #	0.042 #
Nickel (diss.filt)	<0.15 µg/l	TM152					4.46 #	1.69 #
Zinc (diss.filt)	<0.41 µg/l	TM152					295 #	26 #
Mercury (diss.filt)	<0.01 µg/l	TM183					<0.01 #	<0.01 #
Moisture	%	PM114	28.8	7.81		24.7		
Moisture content ratio	%	PM114	40.4	8.47		32.9		
Dry matter content ratio	%	PM114	71.2	92.2		75.3		
Asbestos Containing Material Screen	-	TM001			Possible ACM Det			



CERTIFICATE OF ANALYSIS

SDG: 110602-58
Job: H\_GRONTMIJ\_SOL-54
Client Reference:

Location: Part 2a Assistance
Customer: Grontmij
Attention: Gareth Taylor

Order Number:
Report Number: 135175
Superseded Report: 133432

Table with columns for Results Legend, Customer Sample R, and various chemical components (Antimony, Arsenic, Boron, Cadmium, Chromium, Copper, Lead, Nickel, Zinc, Mercury) across different locations (110 STAFFORD LA NE, 73 STAGBOROUGH, 8 STAGBOROUGH W AY, 41 SWALLOWFIELD S, VIEW ST. 32 FOS TERS AVE., VIEW ST. 53 VIE W ST.).



CERTIFICATE OF ANALYSIS

**SDG:** 110602-58  
**Job:** H\_GRONTMIJ\_SOL-54  
**Client Reference:**

**Location:** Part 2a Assistance  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 135175  
**Superseded Report:** 133432

Results Legend		Customer Sample R		10 WESTGATE	VIEW ST. 9 WARD ST.	VIEW ST. WS2	VIEW ST. WS3	VIEW ST. WS4		
#	ISO17025 accredited.	<b>Depth (m)</b> <b>Sample Type</b> <b>Date Sampled</b> <b>Date Received</b> <b>SDG Ref</b> <b>Lab Sample No.(s)</b> <b>AGS Reference</b>				1.20	1.10	1.60		
M	mCERTS accredited.		Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	
S	Non-conforming work.		31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011	
aq	Aqueous / settled sample.		02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011	
diss.filt	Dissolved / filtered sample.		110602-58	110602-58	110602-58	110602-58	110602-58	110602-58	110602-58	
tot.unfilt	Total / unfiltered sample.		3588809	3588797	3588790	3588790	3588791	3588791	3588789	
*	Subcontracted test.									
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F)	Trigger breach confirmed									
Component	LOD/Units		Method							
Antimony (diss.filt)	<0.16 µg/l	TM152	0.203 #	0.236 #						
Arsenic (diss.filt)	<0.12 µg/l	TM152	2.18 #	3.17 #	0.535 #	1.1 #	0.912 #			
Boron (diss.filt)	<9.4 µg/l	TM152	106 #	106 #	171 #	226 #	59.5 #			
Cadmium (diss.filt)	<0.1 µg/l	TM152	<0.1 #	0.149 #	0.605 #	<0.1 #	0.167 #			
Chromium (diss.filt)	<0.22 µg/l	TM152	13.9 #	10 #	11.5 #	20.9 #	28.6 #			
Copper (diss.filt)	<0.85 µg/l	TM152	27.6 #	361 #	2.24 #	3.42 #	<0.85 #			
Lead (diss.filt)	<0.02 µg/l	TM152	0.066 #	0.23 #	0.072 #	0.16 #	0.05 #			
Nickel (diss.filt)	<0.15 µg/l	TM152	1.47 #	3.73 #	3.9 #	3.3 #	3.91 #			
Vanadium (diss.filt)	<0.24 µg/l	TM152			2.88 #	4.02 #	8.48 #			
Zinc (diss.filt)	<0.41 µg/l	TM152	9.15 #	293 #	15.9 #	4.05 #	<0.41 #			
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01 #	<0.01 #	<0.01 #	<0.01 #	<0.01 #	<0.01 #		



SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## PAH Spec MS - Aqueous (W)

Results Legend			Customer Sample R	99 ARMITAGE ROA D	121 ARMITAGE RO AD	125 ARMITAGE RO AD	83 BLAKE CLOSE	3A BLAKE CLOSE	FIVEWAYS 5 NEWLANDS COURT
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
M	mCERTS accredited.			31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011
S	Non-conforming work.			02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011
aq	Aqueous / settled sample.			110602-58	110602-58	110602-58	110602-58	110602-58	110602-58
diss.filt	Dissolved / filtered sample.			3588803	3588805	3588806	3588788	3588787	3588799
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted test.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
Component	LOD/Units	Method							
Naphthalene (aq)	<0.1 µg/l	TM178	<0.1 #	<0.1 #	<0.1 #	0.11 #	<0.1 #	<0.1 #	
Acenaphthene (aq)	<0.015 µg/l	TM178	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	
Acenaphthylene (aq)	<0.011 µg/l	TM178	<0.011 #	<0.011 #	<0.011 #	<0.011 #	<0.011 #	<0.011 #	
Fluoranthene (aq)	<0.017 µg/l	TM178	<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #	
Anthracene (aq)	<0.015 µg/l	TM178	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	
Phenanthrene (aq)	<0.022 µg/l	TM178	<0.022 #	<0.022 #	<0.022 #	<0.022 #	<0.022 #	<0.022 #	
Fluorene (aq)	<0.014 µg/l	TM178	<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #	
Chrysene (aq)	<0.013 µg/l	TM178	<0.013 #	<0.013 #	<0.013 #	<0.013 #	<0.013 #	<0.013 #	
Pyrene (aq)	<0.015 µg/l	TM178	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178	<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #	
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178	<0.023 #	<0.023 #	<0.023 #	<0.023 #	<0.023 #	<0.023 #	
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178	<0.027 #	<0.027 #	<0.027 #	<0.027 #	<0.027 #	<0.027 #	
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178	<0.009 #	<0.009 #	<0.009 #	<0.009 #	<0.009 #	<0.009 #	
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178	<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #	
PAH, Total Detected USEPA 16 (aq)	µg/l	TM178	none detected	none detected	none detected	0.11	none detected	none detected	



SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## PAH Spec MS - Aqueous (W)

Results Legend			Customer Sample R	11 GOODWOOD	21 HERONDALE	4 KEMPTON	FIVEWAYS 9 NEWL ANDS COURT	FIVEWAYS 11 NEW LANDS COURT	FIVEWAYS 1 NEWL ANDS LANE
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
M	mCERTS accredited.			31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011
S	Non-conforming work.			02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011
aq	Aqueous / settled sample.			110602-58	110602-58	110602-58	110602-58	110602-58	110602-58
diss.filt	Dissolved / filtered sample.			3588808	3588819	3588810	3588800	3588798	3588802
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted test.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
Component	LOD/Units	Method							
Naphthalene (aq)	<0.1 µg/l	TM178		<0.1 #	<0.1 #	<0.1 #	<0.1 #	0.121 #	<0.1 #
Acenaphthene (aq)	<0.015 µg/l	TM178		<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #
Acenaphthylene (aq)	<0.011 µg/l	TM178		<0.011 #	<0.011 #	<0.011 #	<0.011 #	<0.011 #	<0.011 #
Fluoranthene (aq)	<0.017 µg/l	TM178		<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #
Anthracene (aq)	<0.015 µg/l	TM178		<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #
Phenanthrene (aq)	<0.022 µg/l	TM178		<0.022 #	<0.022 #	<0.022 #	<0.022 #	<0.022 #	<0.022 #
Fluorene (aq)	<0.014 µg/l	TM178		<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #
Chrysene (aq)	<0.013 µg/l	TM178		<0.013 #	<0.013 #	<0.013 #	<0.013 #	<0.013 #	<0.013 #
Pyrene (aq)	<0.015 µg/l	TM178		<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178		<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178		<0.023 #	<0.023 #	<0.023 #	<0.023 #	<0.023 #	<0.023 #
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178		<0.027 #	<0.027 #	<0.027 #	<0.027 #	<0.027 #	<0.027 #
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178		<0.009 #	<0.009 #	<0.009 #	<0.009 #	<0.009 #	<0.009 #
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178		<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178		<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178		<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #
PAH, Total Detected USEPA 16 (aq)	µg/l	TM178		none detected	none detected	none detected	none detected	0.121	none detected





SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## PAH Spec MS - Aqueous (W)

Results Legend			Customer Sample R	2 SANDOWN	3 SLADE VIEW RI SE	110 STAFFORD LA NE	73 STAGBOROUGH	8 STAGBOROUGH W AY	41 SWALLOWFIELD S
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	Water(GW/SW) 31/05/2011 02/06/2011 110602-58 3588811	Water(GW/SW) 31/05/2011 02/06/2011 110602-58 3588807	Water(GW/SW) 31/05/2011 02/06/2011 110602-58 3588818	Water(GW/SW) 31/05/2011 02/06/2011 110602-58 3588814	Water(GW/SW) 31/05/2011 02/06/2011 110602-58 3588815	Water(GW/SW) 31/05/2011 02/06/2011 110602-58 3588813
M	mCERTS accredited.								
S	Non-conforming work.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted test.								
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery								
(F)	Trigger breach confirmed								
Component	LOD/Units	Method							
Naphthalene (aq)	<0.1 µg/l	TM178	<0.1 #	0.103 #	0.131 #	<0.1 #	<0.1 #	<0.1 #	
Acenaphthene (aq)	<0.015 µg/l	TM178	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	
Acenaphthylene (aq)	<0.011 µg/l	TM178	<0.011 #	<0.011 #	<0.011 #	<0.011 #	<0.011 #	<0.011 #	
Fluoranthene (aq)	<0.017 µg/l	TM178	<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #	
Anthracene (aq)	<0.015 µg/l	TM178	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	
Phenanthrene (aq)	<0.022 µg/l	TM178	<0.022 #	<0.022 #	<0.022 #	<0.022 #	<0.022 #	<0.022 #	
Fluorene (aq)	<0.014 µg/l	TM178	<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #	
Chrysene (aq)	<0.013 µg/l	TM178	<0.013 #	<0.013 #	<0.013 #	<0.013 #	<0.013 #	<0.013 #	
Pyrene (aq)	<0.015 µg/l	TM178	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	<0.015 #	
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178	<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #	<0.017 #	
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178	<0.023 #	<0.023 #	<0.023 #	<0.023 #	<0.023 #	<0.023 #	
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178	<0.027 #	<0.027 #	<0.027 #	<0.027 #	<0.027 #	<0.027 #	
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178	<0.009 #	<0.009 #	<0.009 #	<0.009 #	<0.009 #	<0.009 #	
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178	<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #	<0.014 #	
PAH, Total Detected USEPA 16 (aq)	µg/l	TM178	none detected	0.103	0.131	none detected	none detected	none detected	



## CERTIFICATE OF ANALYSIS

SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## PAH Spec MS - Aqueous (W)

Results Legend			Customer Sample R	VIEW ST. 32 FOS TERS AVE.	VIEW ST. 53 VIE W ST.	VIEW ST. 9 WARD ST.	VIEW ST. WS2	VIEW ST. WS3	VIEW ST. WS4	
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference				1.20	1.10	1.60	
M	mCERTS accredited.			Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
S	Non-conforming work.			31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011	31/05/2011
aq	Aqueous / settled sample.			02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011	02/06/2011
diss.filt	Dissolved / filtered sample.			110602-58	110602-58	110602-58	110602-58	110602-58	110602-58	110602-58
tot.unfilt	Total / unfiltered sample.			3588795	3588793	3588797	3588790	3588791	3588789	3588789
*	Subcontracted test.									
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery									
(F)	Trigger breach confirmed									
Component	LOD/Units	Method								
Naphthalene (aq)	<0.1 µg/l	TM178	0.104	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Acenaphthene (aq)	<0.015 µg/l	TM178	<0.015	<0.015	<0.015	<0.015	<0.015	0.0225	0.0156	
Acenaphthylene (aq)	<0.011 µg/l	TM178	<0.011	<0.011	<0.011	<0.011	<0.011	0.0181	<0.011	
Fluoranthene (aq)	<0.017 µg/l	TM178	<0.017	<0.017	<0.017	<0.017	<0.017	0.981	0.465	
Anthracene (aq)	<0.015 µg/l	TM178	<0.015	<0.015	<0.015	<0.015	<0.015	0.0538	0.0302	
Phenanthrene (aq)	<0.022 µg/l	TM178	<0.022	<0.022	<0.022	<0.022	<0.022	0.217	0.13	
Fluorene (aq)	<0.014 µg/l	TM178	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	
Chrysene (aq)	<0.013 µg/l	TM178	<0.013	<0.013	<0.013	<0.013	<0.013	0.935	0.434	
Pyrene (aq)	<0.015 µg/l	TM178	<0.015	<0.015	<0.015	<0.015	<0.015	1.11	0.559	
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178	<0.017	<0.017	<0.017	<0.017	<0.017	0.565	0.283	
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178	<0.023	<0.023	<0.023	<0.023	<0.023	0.625	0.279	
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178	<0.027	<0.027	<0.027	<0.027	<0.027	0.815	0.33	
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178	<0.009	<0.009	<0.009	<0.009	<0.009	0.916	0.352	
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178	<0.016	<0.016	<0.016	<0.016	<0.016	0.112	0.0359	
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178	<0.016	<0.016	<0.016	<0.016	<0.016	0.689	0.198	
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178	<0.014	<0.014	<0.014	<0.014	<0.014	0.54	0.164	
PAH, Total Detected USEPA 16 (aq)	µg/l	TM178	0.104	none detected	none detected	none detected	7.6	3.28		



SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## PAH Spec MS - Aqueous (W)

Results Legend		Customer Sample R	10 WESTGATE					
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Date Received SDG Ref Lab Sample No.(s) AGS Reference	Water(GW/SW) 31/05/2011 02/06/2011 110602-58 3588809					
M	mCERTS accredited.							
S	Non-conforming work.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted test.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
Component	LOD/Units			Method				
Naphthalene (aq)	<0.1 µg/l	TM178	<0.1	#				
Acenaphthene (aq)	<0.015 µg/l	TM178	<0.015	#				
Acenaphthylene (aq)	<0.011 µg/l	TM178	<0.011	#				
Fluoranthene (aq)	<0.017 µg/l	TM178	<0.017	#				
Anthracene (aq)	<0.015 µg/l	TM178	<0.015	#				
Phenanthrene (aq)	<0.022 µg/l	TM178	<0.022	#				
Fluorene (aq)	<0.014 µg/l	TM178	<0.014	#				
Chrysene (aq)	<0.013 µg/l	TM178	<0.013	#				
Pyrene (aq)	<0.015 µg/l	TM178	<0.015	#				
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178	<0.017	#				
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178	<0.023	#				
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178	<0.027	#				
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178	<0.009	#				
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178	<0.016	#				
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178	<0.016	#				
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178	<0.014	#				
PAH, Total Detected USEPA 16 (aq)	µg/l	TM178	none detected					



CERTIFICATE OF ANALYSIS

SDG: 110602-58
Job: H\_GRONTMIJ\_SOL-54
Client Reference:

Location: Part 2a Assistance
Customer: Grontmij
Attention: Gareth Taylor

Order Number:
Report Number: 135175
Superseded Report: 133432

VOC MS (W)

Table with columns: Results Legend, Customer Sample R, VIEW ST. WS2, VIEW ST. WS3, VIEW ST. WS4, Component, LOD/Units, Method. Rows include Toluene-d8\*\*, Methyl tertiary butyl ether (MTBE), Benzene, Toluene, Ethylbenzene, m,p-Xylene, o-Xylene.



### CERTIFICATE OF ANALYSIS

**SDG:** 110602-58  
**Job:** H\_GRONTMIJ\_SOL-54  
**Client Reference:**

**Location:** Part 2a Assistance  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 135175  
**Superseded Report:** 133432

## Asbestos Identification

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Customer Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	11 NEWLANDS COURT FIVEWAYS NS Z 0.30 SOLID 31/05/2011 00:00:00 02/06/2011 14:02:44 110602-58 3,588,826 TM048	16/6/11	Paul Poynton	Typical of asbestos cement	Not Detected (#)	Detected (#)	Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected





## CERTIFICATE OF ANALYSIS

SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## CEN 2:1 STAGE BATCH TEST

## WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

## Client Reference

Mass Sample taken (kg) 0.232  
 Mass of dry sample (kg) 0.175  
 Particle Size <4mm >95%

## Site Location

Part 2a Assistance  
 Moisture Content Ratio (%) 32.9  
 Dry Matter Content Ratio (%) 75.3

## Case

SDG 110602-58  
 Lab Sample Number(s) 3588820  
 Sampled Date 31-May-2011  
 Customer Sample Ref. 1 NEWLANDS LANE FIVEWAYS  
 Depth (m) 0.30

## Solid Waste Analysis

Total Organic Carbon (%) -  
 Loss on Ignition (%) -  
 Sum of BTEX (mg/kg) -  
 Sum of 7 PCBs (mg/kg) -  
 Mineral Oil (mg/kg) -  
 PAH Sum of 17 (mg/kg) -  
 pH (pH Units) -  
 ANC to pH 6 (mol/kg) -  
 ANC to pH 4 (mol/kg) -

## Eluate Analysis

	Conc <sup>n</sup> in 2:1 eluate (mg/l)		2:1 conc <sup>n</sup> leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0218	<0.00012	0.0436	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	0.000384	<0.0001	0.000768	<0.001	0.04	1	5
Chromium	0.0121	<0.00022	0.0242	<0.0022	0.5	10	70
Copper	0.0395	<0.00085	0.079	<0.0085	2	50	100
Mercury Dissolved (CVAf)	0.000037	<0.00001	0.000074	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.00575	<0.00015	0.0115	<0.0015	0.4	10	40
Lead	0.0313	<0.00002	0.0626	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	-	-	-	-	0.1	0.5	7
Zinc	0.029	<0.00041	0.058	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	-	-	-	-	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

## Leach Test Information

Date Prepared 15-Jun-2011  
 pH (pH Units) 8.24  
 Conductivity (µS/cm) 490.00  
 Temperature (°C) 20.00  
 Volume Leachant (Litres) 0.292  
 Volume of Eluate VE1 (Litres)

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable  
 Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation  
 Mcerts Certification does not apply to leachates

22/06/2011 08:52:27

08:52:12 22/06/2011

<b>SDG:</b> 110602-58	<b>Location:</b> Part 2a Assistance	<b>Order Number:</b>
<b>Job:</b> H_GRONTMIJ_SOL-54	<b>Customer:</b> Grontmij	<b>Report Number:</b> 135175
<b>Client Reference:</b>	<b>Attention:</b> Gareth Taylor	<b>Superseded Report:</b> 133432

**CEN 2:1 STAGE BATCH TEST**

**WAC ANALYTICAL RESULTS**

REF : BS EN 12457/1

<b>Client Reference</b>		<b>Site Location</b>	Part 2a Assistance
<b>Mass Sample taken (kg)</b>	0.232	<b>Moisture Content Ratio (%)</b>	32.9
<b>Mass of dry sample (kg)</b>	0.175	<b>Dry Matter Content Ratio (%)</b>	75.3
<b>Particle Size &lt;4mm</b>	>95%		

<b>Case</b>	
<b>SDG</b>	110602-58
<b>Lab Sample Number(s)</b>	3588820
<b>Sampled Date</b>	31-May-2011
<b>Customer Sample Ref.</b>	1 NEWLANDS LANE FIVEWAYS
<b>Depth (m)</b>	0.30

**Solid Waste Analysis**

Total Organic Carbon (%)	-	-	-
Loss on Ignition (%)	-	-	-
Sum of BTEX (mg/kg)	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-
Mineral Oil (mg/kg)	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-
pH (pH Units)	-	-	-
ANC to pH 6 (mol/kg)	-	-	-
ANC to pH 4 (mol/kg)	-	-	-

Eluate Analysis	Conc <sup>n</sup> in 2:1 eluate (mg/l)		2:1 conc <sup>n</sup> leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg
	Result	Limit of Detection	Result	Limit of Detection	
Boron	0.0612	<0.0094	0.122	<0.094	-
Vanadium	0.0191	<0.00024	0.0382	<0.0024	-
<b>PAH Spec MS - Aqueous (W)</b>					
Naphthalene by GCMS	<0.0001	<0.0001	<0.0002	<0.001	-
Acenaphthene by GCMS	<0.000015	<0.000015	<0.00003	<0.00015	-
Acenaphthylene by GCMS	<0.000011	<0.000011	<0.000022	<0.00011	-
Fluoranthene by GCMS	0.0000595	<0.000017	0.000119	<0.00017	-
Anthracene by GCMS	<0.000015	<0.000015	<0.00003	<0.00015	-
Phenanthrene by GCMS	<0.000022	<0.000022	<0.000044	<0.00022	-
Fluorene by GCMS	<0.000014	<0.000014	<0.000028	<0.00014	-
Chrysene by GCMS	0.0000189	<0.000013	0.0000378	<0.00013	-
Pyrene by GCMS	0.0000479	<0.000015	0.0000958	<0.00015	-
Benz(a)anthracene by GCMS	0.0000184	<0.000017	0.0000368	<0.00017	-
Benzo(b)fluoranthene by GCMS	<0.000023	<0.000023	<0.000046	<0.00023	-
Benzo(k)fluoranthene by GCMS	<0.000027	<0.000027	<0.000054	<0.00027	-
Benzo(a)pyrene by GCMS	<0.000009	<0.000009	<0.000018	<0.00009	-
Dibenzo(ah)anthracene by GCMS	<0.000016	<0.000016	<0.000032	<0.00016	-
Benzo(ghi)perylene by GCMS	<0.000016	<0.000016	<0.000032	<0.00016	-
Indeno(123cd)pyrene by GCMS	<0.000014	<0.000014	<0.000028	<0.00014	-
PAH 16 EPA Total by GCMS	0.000145	<0	0.00029	<0	-
<b>VOC MS (W)</b>					
Toluene-d8	-	-	-	-	-
Tert-butyl methyl ether	<0.0016	<0.0016	<0.0032	<0.016	-
Benzene	<0.0013	<0.0013	<0.0026	<0.013	-

**Leach Test Information**

Date Prepared	15-Jun-2011
pH (pH Units)	8.24
Conductivity (µS/cm)	490.00
Temperature (°C)	20.00
Volume Leachant (Litres)	0.292
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable  
 Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation  
 Mcerts Certification does not apply to leachates

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## CERTIFICATE OF ANALYSIS

SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## CEN 2:1 STAGE BATCH TEST

## WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		Site Location	
Mass Sample taken (kg)	0.232	Moisture Content Ratio (%)	32.9
Mass of dry sample (kg)	0.175	Dry Matter Content Ratio (%)	75.3
Particle Size <4mm	>95%		

Case  
 SDG 110602-58  
 Lab Sample Number(s) 3588820  
 Sampled Date 31-May-2011  
 Customer Sample Ref. 1 NEWLANDS LANE FIVEWAYS  
 Depth (m) 0.30

## Solid Waste Analysis

Total Organic Carbon (%)	-	-	-
Loss on Ignition (%)	-	-	-
Sum of BTEX (mg/kg)	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-
Mineral Oil (mg/kg)	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-
pH (pH Units)	-	-	-
ANC to pH 6 (mol/kg)	-	-	-
ANC to pH 4 (mol/kg)	-	-	-

Eluate Analysis	Conc <sup>n</sup> in 2:1 eluate (mg/l)		2:1 conc <sup>n</sup> leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg
	Result	Limit of Detection	Result	Limit of Detection	
<b>VOC MS (W)</b>					
Toluene	<0.0014	<0.0014	<0.0028	<0.014	-
Ethylbenzene	<0.0025	<0.0025	<0.005	<0.025	-
p/m-Xylene	<0.0025	<0.0025	<0.005	<0.025	-
o-Xylene	<0.0017	<0.0017	<0.0034	<0.017	-

## Leach Test Information

Date Prepared 15-Jun-2011  
 pH (pH Units) 8.24  
 Conductivity (µS/cm) 490.00  
 Temperature (°C) 20.00  
 Volume Leachant (Litres) 0.292  
 Volume of Eluate VE1 (Litres)

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable  
 Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation  
 Mcerts Certification does not apply to leachates

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## CERTIFICATE OF ANALYSIS

SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## CEN 2:1 STAGE BATCH TEST

## WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

## Client Reference

Mass Sample taken (kg) 0.246  
 Mass of dry sample (kg) 0.175  
 Particle Size <4mm >95%

## Site Location

Part 2a Assistance  
 Moisture Content Ratio (%) 40.4  
 Dry Matter Content Ratio (%) 71.2

## Case

SDG 110602-58  
 Lab Sample Number(s) 3588822  
 Sampled Date 31-May-2011  
 Customer Sample Ref. 5 NEWLANDS COURT FIVEWAYS  
 Depth (m) 0.30

## Solid Waste Analysis

Total Organic Carbon (%) -  
 Loss on Ignition (%) -  
 Sum of BTEX (mg/kg) -  
 Sum of 7 PCBs (mg/kg) -  
 Mineral Oil (mg/kg) -  
 PAH Sum of 17 (mg/kg) -  
 pH (pH Units) -  
 ANC to pH 6 (mol/kg) -  
 ANC to pH 4 (mol/kg) -

## Eluate Analysis

	Conc <sup>n</sup> in 2:1 eluate (mg/l)		2:1 conc <sup>n</sup> leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.00366	<0.00012	0.00732	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	0.000112	<0.0001	0.000224	<0.001	0.04	1	5
Chromium	0.00331	<0.00022	0.00662	<0.0022	0.5	10	70
Copper	0.0144	<0.00085	0.0288	<0.0085	2	50	100
Mercury Dissolved (CVAf)	0.0000214	<0.00001	0.0000428	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.00357	<0.00015	0.00714	<0.0015	0.4	10	40
Lead	0.00334	<0.00002	0.00668	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	-	-	-	-	0.1	0.5	7
Zinc	0.0212	<0.00041	0.0424	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	-	-	-	-	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

## Leach Test Information

Date Prepared 16-Jun-2011  
 pH (pH Units) 7.83  
 Conductivity (µS/cm) 285.00  
 Temperature (°C) 20.00  
 Volume Leachant (Litres) 0.279  
 Volume of Eluate VE1 (Litres)

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable  
 Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation  
 Mcerts Certification does not apply to leachates

22/06/2011 08:52:27

08:52:12 22/06/2011

<b>SDG:</b> 110602-58	<b>Location:</b> Part 2a Assistance	<b>Order Number:</b>
<b>Job:</b> H_GRONTMIJ_SOL-54	<b>Customer:</b> Grontmij	<b>Report Number:</b> 135175
<b>Client Reference:</b>	<b>Attention:</b> Gareth Taylor	<b>Superseded Report:</b> 133432

**CEN 2:1 STAGE BATCH TEST**

**WAC ANALYTICAL RESULTS**

REF : BS EN 12457/1

<b>Client Reference</b>		<b>Site Location</b>	Part 2a Assistance
<b>Mass Sample taken (kg)</b>	0.246	<b>Moisture Content Ratio (%)</b>	40.4
<b>Mass of dry sample (kg)</b>	0.175	<b>Dry Matter Content Ratio (%)</b>	71.2
<b>Particle Size &lt;4mm</b>	>95%		

<b>Case</b>	
<b>SDG</b>	110602-58
<b>Lab Sample Number(s)</b>	3588822
<b>Sampled Date</b>	31-May-2011
<b>Customer Sample Ref.</b>	5 NEWLANDS COURT FIVEWAYS
<b>Depth (m)</b>	0.30

**Solid Waste Analysis**

Total Organic Carbon (%)	-	-	-
Loss on Ignition (%)	-	-	-
Sum of BTEX (mg/kg)	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-
Mineral Oil (mg/kg)	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-
pH (pH Units)	-	-	-
ANC to pH 6 (mol/kg)	-	-	-
ANC to pH 4 (mol/kg)	-	-	-

Eluate Analysis	Conc <sup>n</sup> in 2:1 eluate (mg/l)		2:1 conc <sup>n</sup> leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg
	Result	Limit of Detection	Result	Limit of Detection	
Boron	0.0819	<0.0094	0.164	<0.094	-
Vanadium	0.00428	<0.00024	0.00856	<0.0024	-
<b>PAH Spec MS - Aqueous (W)</b>					
Naphthalene by GCMS	0.000113	<0.0001	0.000226	<0.001	-
Acenaphthene by GCMS	<0.000015	<0.000015	<0.00003	<0.00015	-
Acenaphthylene by GCMS	<0.000011	<0.000011	<0.000022	<0.00011	-
Fluoranthene by GCMS	0.0000253	<0.000017	0.0000506	<0.00017	-
Anthracene by GCMS	<0.000015	<0.000015	<0.00003	<0.00015	-
Phenanthrene by GCMS	<0.000022	<0.000022	<0.000044	<0.00022	-
Fluorene by GCMS	<0.000014	<0.000014	<0.000028	<0.00014	-
Chrysene by GCMS	0.0000193	<0.000013	0.0000386	<0.00013	-
Pyrene by GCMS	0.0000297	<0.000015	0.0000594	<0.00015	-
Benz(a)anthracene by GCMS	0.0000206	<0.000017	0.0000412	<0.00017	-
Benzo(b)fluoranthene by GCMS	<0.000023	<0.000023	<0.000046	<0.00023	-
Benzo(k)fluoranthene by GCMS	<0.000027	<0.000027	<0.000054	<0.00027	-
Benzo(a)pyrene by GCMS	0.00000978	<0.000009	0.0000196	<0.00009	-
Dibenzo(ah)anthracene by GCMS	<0.000016	<0.000016	<0.000032	<0.00016	-
Benzo(ghi)perylene by GCMS	<0.000016	<0.000016	<0.000032	<0.00016	-
Indeno(123cd)pyrene by GCMS	<0.000014	<0.000014	<0.000028	<0.00014	-
PAH 16 EPA Total by GCMS	0.000218	<0	0.000436	<0	-
<b>VOC MS (W)</b>					
Toluene-d8	-	-	-	-	-
Tert-butyl methyl ether	<0.0016	<0.0016	<0.0032	<0.016	-
Benzene	<0.0013	<0.0013	<0.0026	<0.013	-

**Leach Test Information**

Date Prepared	16-Jun-2011
pH (pH Units)	7.83
Conductivity (µS/cm)	285.00
Temperature (°C)	20.00
Volume Leachant (Litres)	0.279
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable  
 Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation  
 Mcerts Certification does not apply to leachates

22/06/2011 08:52:27

08:52:12 22/06/2011





SDG: 110602-58  
 Job: H\_Grontmij\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## CEN 2:1 STAGE BATCH TEST

## WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

<b>Client Reference</b>		<b>Site Location</b>	Part 2a Assistance
<b>Mass Sample taken (kg)</b>	0.246	<b>Moisture Content Ratio (%)</b>	40.4
<b>Mass of dry sample (kg)</b>	0.175	<b>Dry Matter Content Ratio (%)</b>	71.2
<b>Particle Size &lt;4mm</b>	>95%		

## Case

SDG 110602-58  
 Lab Sample Number(s) 3588822  
 Sampled Date 31-May-2011  
 Customer Sample Ref. 5 NEWLANDS COURT FIVEWAYS  
 Depth (m) 0.30

## Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

## Eluate Analysis

	Conc <sup>n</sup> in 2:1 eluate (mg/l)		2:1 conc <sup>n</sup> leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg
	Result	Limit of Detection	Result	Limit of Detection	
<b>VOC MS (W)</b>					
Toluene	<0.0014	<0.0014	<0.0028	<0.014	-
Ethylbenzene	<0.0025	<0.0025	<0.005	<0.025	-
p/m-Xylene	<0.0025	<0.0025	<0.005	<0.025	-
o-Xylene	<0.0017	<0.0017	<0.0034	<0.017	-

## Leach Test Information

Date Prepared 16-Jun-2011  
 pH (pH Units) 7.83  
 Conductivity (µS/cm) 285.00  
 Temperature (°C) 20.00  
 Volume Leachant (Litres) 0.279  
 Volume of Eluate VE1 (Litres)

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable  
 Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation  
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## CERTIFICATE OF ANALYSIS

SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## CEN 2:1 STAGE BATCH TEST

## WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

## Client Reference

Mass Sample taken (kg) 0.190  
 Mass of dry sample (kg) 0.175  
 Particle Size <4mm >95%

## Site Location

Part 2a Assistance  
 Moisture Content Ratio (%) 8.47  
 Dry Matter Content Ratio (%) 92.2

## Case

SDG 110602-58  
 Lab Sample Number(s) 3588823  
 Sampled Date 31-May-2011  
 Customer Sample Ref. 9 NEWLANDS COURT FIVEWAYS  
 Depth (m) 0.30

## Solid Waste Analysis

Total Organic Carbon (%) -  
 Loss on Ignition (%) -  
 Sum of BTEX (mg/kg) -  
 Sum of 7 PCBs (mg/kg) -  
 Mineral Oil (mg/kg) -  
 PAH Sum of 17 (mg/kg) -  
 pH (pH Units) -  
 ANC to pH 6 (mol/kg) -  
 ANC to pH 4 (mol/kg) -

## Eluate Analysis

	Conc <sup>n</sup> in 2:1 eluate (mg/l)		2:1 conc <sup>n</sup> leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.00223	<0.00012	0.00446	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	<0.0001	<0.0001	<0.0002	<0.001	0.04	1	5
Chromium	0.00348	<0.00022	0.00696	<0.0022	0.5	10	70
Copper	0.0124	<0.00085	0.0248	<0.0085	2	50	100
Mercury Dissolved (CVAf)	0.0000253	<0.00001	0.0000506	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.00327	<0.00015	0.00654	<0.0015	0.4	10	40
Lead	0.00369	<0.00002	0.00738	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	-	-	-	-	0.1	0.5	7
Zinc	0.00585	<0.00041	0.0117	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	-	-	-	-	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

## Leach Test Information

Date Prepared 15-Jun-2011  
 pH (pH Units) 8.14  
 Conductivity (µS/cm) 488.00  
 Temperature (°C) 20.00  
 Volume Leachant (Litres) 0.335  
 Volume of Eluate VE1 (Litres)

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable  
 Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation  
 Mcerts Certification does not apply to leachates

22/06/2011 08:52:27

08:52:12 22/06/2011

<b>SDG:</b> 110602-58	<b>Location:</b> Part 2a Assistance	<b>Order Number:</b>
<b>Job:</b> H_GRONTMIJ_SOL-54	<b>Customer:</b> Grontmij	<b>Report Number:</b> 135175
<b>Client Reference:</b>	<b>Attention:</b> Gareth Taylor	<b>Superseded Report:</b> 133432

**CEN 2:1 STAGE BATCH TEST**

**WAC ANALYTICAL RESULTS**

REF : BS EN 12457/1

<b>Client Reference</b>		<b>Site Location</b>	Part 2a Assistance
<b>Mass Sample taken (kg)</b>	0.190	<b>Moisture Content Ratio (%)</b>	8.47
<b>Mass of dry sample (kg)</b>	0.175	<b>Dry Matter Content Ratio (%)</b>	92.2
<b>Particle Size &lt;4mm</b>	>95%		

<b>Case</b>	
<b>SDG</b>	110602-58
<b>Lab Sample Number(s)</b>	3588823
<b>Sampled Date</b>	31-May-2011
<b>Customer Sample Ref.</b>	9 NEWLANDS COURT FIVEWAYS
<b>Depth (m)</b>	0.30

**Solid Waste Analysis**

Total Organic Carbon (%)	-	-	-
Loss on Ignition (%)	-	-	-
Sum of BTEX (mg/kg)	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-
Mineral Oil (mg/kg)	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-
pH (pH Units)	-	-	-
ANC to pH 6 (mol/kg)	-	-	-
ANC to pH 4 (mol/kg)	-	-	-

Eluate Analysis	Conc <sup>n</sup> in 2:1 eluate (mg/l)		2:1 conc <sup>n</sup> leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg
	Result	Limit of Detection	Result	Limit of Detection	
Boron	0.0254	<0.0094	0.0508	<0.094	-
Vanadium	0.00347	<0.00024	0.00694	<0.0024	-
<b>PAH Spec MS - Aqueous (W)</b>					
Naphthalene by GCMS	<0.0001	<0.0001	<0.0002	<0.001	-
Acenaphthene by GCMS	0.0000174	<0.000015	0.0000348	<0.00015	-
Acenaphthylene by GCMS	<0.000011	<0.000011	<0.000022	<0.00011	-
Fluoranthene by GCMS	<0.000017	<0.000017	<0.000034	<0.00017	-
Anthracene by GCMS	<0.000015	<0.000015	<0.00003	<0.00015	-
Phenanthrene by GCMS	<0.000022	<0.000022	<0.000044	<0.00022	-
Fluorene by GCMS	<0.000014	<0.000014	<0.000028	<0.00014	-
Chrysene by GCMS	<0.000013	<0.000013	<0.000026	<0.00013	-
Pyrene by GCMS	<0.000015	<0.000015	<0.00003	<0.00015	-
Benz(a)anthracene by GCMS	<0.000017	<0.000017	<0.000034	<0.00017	-
Benzo(b)fluoranthene by GCMS	<0.000023	<0.000023	<0.000046	<0.00023	-
Benzo(k)fluoranthene by GCMS	<0.000027	<0.000027	<0.000054	<0.00027	-
Benzo(a)pyrene by GCMS	<0.000009	<0.000009	<0.000018	<0.00009	-
Dibenzo(ah)anthracene by GCMS	<0.000016	<0.000016	<0.000032	<0.00016	-
Benzo(ghi)perylene by GCMS	<0.000016	<0.000016	<0.000032	<0.00016	-
Indeno(123cd)pyrene by GCMS	<0.000014	<0.000014	<0.000028	<0.00014	-
PAH 16 EPA Total by GCMS	0.0000174	<0	0.0000348	<0	-
<b>VOC MS (W)</b>					
Toluene-d8	-	-	-	-	-
Tert-butyl methyl ether	<0.0016	<0.0016	<0.0032	<0.016	-
Benzene	<0.0013	<0.0013	<0.0026	<0.013	-

**Leach Test Information**

Date Prepared	15-Jun-2011
pH (pH Units)	8.14
Conductivity (µS/cm)	488.00
Temperature (°C)	20.00
Volume Leachant (Litres)	0.335
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable  
 Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation  
 Mcerts Certification does not apply to leachates  
 22/06/2011 08:52:27



## CERTIFICATE OF ANALYSIS

SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

## CEN 2:1 STAGE BATCH TEST

## WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		Site Location	
Part 2a Assistance		Part 2a Assistance	
Mass Sample taken (kg)	0.190	Moisture Content Ratio (%)	8.47
Mass of dry sample (kg)	0.175	Dry Matter Content Ratio (%)	92.2
Particle Size <4mm	>95%		

## Case

SDG 110602-58  
 Lab Sample Number(s) 3588823  
 Sampled Date 31-May-2011  
 Customer Sample Ref. 9 NEWLANDS COURT FIVEWAYS  
 Depth (m) 0.30

## Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

## Eluate Analysis

	Conc <sup>n</sup> in 2:1 eluate (mg/l)		2:1 conc <sup>n</sup> leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg
	Result	Limit of Detection	Result	Limit of Detection	
<b>VOC MS (W)</b>					
Toluene	<0.0014	<0.0014	<0.0028	<0.014	-
Ethylbenzene	<0.0025	<0.0025	<0.005	<0.025	-
p/m-Xylene	<0.0025	<0.0025	<0.005	<0.025	-
o-Xylene	<0.0017	<0.0017	<0.0034	<0.017	-

## Leach Test Information

Date Prepared 15-Jun-2011  
 pH (pH Units) 8.14  
 Conductivity (µS/cm) 488.00  
 Temperature (°C) 20.00  
 Volume Leachant (Litres) 0.335  
 Volume of Eluate VE1 (Litres)

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable  
 Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation  
 Mcerts Certification does not apply to leachates

22/06/2011 08:52:27

08:52:12 22/06/2011



**SDG:** 110602-58  
**Job:** H\_GRONTMIJ\_SOL-54  
**Client Reference:**

**Location:** Part 2a Assistance  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 135175  
**Superseded Report:** 133432

## Table of Results - Appendix

### REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10<sup>-7</sup>

<b>NDP</b>	No Determination Possible	<b>#</b>	ISO 17025 Accredited	*	Subcontracted Test	<b>M</b>	MCERTS Accredited
<b>NFD</b>	No Fibres Detected	<b>PFD</b>	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	<b>EC</b>	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample <sup>1</sup>	Surrogate Corrected
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
PM114		Leaching Procedure for CEN Two Stage Batch Test 2:1/8:1 Cumulative		
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step		
TM001	In - house Method	Determination of asbestos containing material by screening on solids		
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM208	Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace / GC-MS in Waters		

<sup>1</sup> Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.





SDG: 110602-58  
 Job: H\_GRONTMIJ\_SOL-54  
 Client Reference:

Location: Part 2a Assistance  
 Customer: Grontmij  
 Attention: Gareth Taylor

Order Number:  
 Report Number: 135175  
 Superseded Report: 133432

### Test Completion Dates

Lab Sample No(s)	3588803	3588805	3588806	3588788	3588808	3588787	3588799	3588800	3588798	3588802
Customer Sample Ref.	99 ARMITAGE ROAD	121 ARMITAGE ROAD	125 ARMITAGE ROAD	83 BLAKE CLOSE	11 GOODWOOD	3A BLAKE CLOSE	FIVEWAYS 5 NEWLANDS COURT	FIVEWAYS 9 NEWLANDS COURT	FIVEWAYS 11 NEWLANDS COURT	FIVEWAYS 1 NEWLANDS LANE
AGS Ref.										
Depth										
Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Dissolved Metals by ICP-MS	08-Jun-2011	08-Jun-2011	08-Jun-2011	08-Jun-2011	07-Jun-2011	08-Jun-2011	09-Jun-2011	09-Jun-2011	08-Jun-2011	08-Jun-2011
Mercury Dissolved	07-Jun-2011	07-Jun-2011	08-Jun-2011	07-Jun-2011	07-Jun-2011	08-Jun-2011	08-Jun-2011	08-Jun-2011	07-Jun-2011	08-Jun-2011
PAH Spec MS - Aqueous (W)	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011

Lab Sample No(s)	3588819	3588810	3588822	3588823	3588826	3588820	3588811	3588807	3588818	3588814
Customer Sample Ref.	21 HERONDALE	4 KEMPTON	5 NEWLANDS COURT FIVEWAYS	NEWLANDS COURT FIVEWAYS	11 NEWLANDS COURT FIVEWAYS	NEWLANDS LANE FIVEWAYS	2 SANDOWN	3 SLADE VIEW RISE	110 STAFFORD LANE	73 STAGBOROUGH
AGS Ref.										
Depth			0.30	0.30	0.30	0.30				
Type	LIQUID	LIQUID	SOLID	SOLID	SOLID	SOLID	LIQUID	LIQUID	LIQUID	LIQUID
Asbestos Containing Material Screen			16-Jun-2011	16-Jun-2011	16-Jun-2011	16-Jun-2011				
Asbestos Identification					16-Jun-2011					
CEN 2:1 Leachate (1 Stage)			16-Jun-2011	16-Jun-2011		16-Jun-2011				
CEN Readings			20-Jun-2011	20-Jun-2011		20-Jun-2011				
Dissolved Metals by ICP-MS	08-Jun-2011	08-Jun-2011	21-Jun-2011	21-Jun-2011		21-Jun-2011	08-Jun-2011	08-Jun-2011	08-Jun-2011	08-Jun-2011
Mercury Dissolved	07-Jun-2011	08-Jun-2011	21-Jun-2011	21-Jun-2011		21-Jun-2011	08-Jun-2011	07-Jun-2011	07-Jun-2011	08-Jun-2011
PAH Spec MS - Aqueous (W)	09-Jun-2011	09-Jun-2011	20-Jun-2011	21-Jun-2011		20-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011
Sample description			14-Jun-2011	14-Jun-2011	16-Jun-2011	14-Jun-2011				
VOC MS (W)			22-Jun-2011	22-Jun-2011		22-Jun-2011				

Lab Sample No(s)	3588815	3588813	3588809	3588795	3588793	3588797	3588790	3588791	3588789
Customer Sample Ref.	3 STAGBOROUGH WAY	41 SWALLOWFIELD S	10 WESTGATE	VIEW ST. 32 FOSTERS AVE.	VIEW ST. 53 VIEW ST.	VIEW ST. 9 WARD ST.	VIEW ST. WS2	VIEW ST. WS3	VIEW ST. WS4
AGS Ref.									
Depth							1.20	1.10	1.60
Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Dissolved Metals by ICP-MS	08-Jun-2011	08-Jun-2011	07-Jun-2011	08-Jun-2011	09-Jun-2011	10-Jun-2011	08-Jun-2011	08-Jun-2011	09-Jun-2011
Mercury Dissolved	07-Jun-2011	07-Jun-2011	07-Jun-2011	07-Jun-2011	08-Jun-2011	07-Jun-2011	07-Jun-2011	07-Jun-2011	08-Jun-2011
PAH Spec MS - Aqueous (W)	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011	09-Jun-2011
VOC MS (W)							09-Jun-2011	09-Jun-2011	09-Jun-2011

**SDG:** 110602-58  
**Job:** H\_GRONTMIJ\_SOL-54  
**Client Reference:**

**Location:** Part 2a Assistance  
**Customer:** Grontmij  
**Attention:** Gareth Taylor

**Order Number:**  
**Report Number:** 135175  
**Superseded Report:** 133432

## Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 -C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY				
ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DOM	SOX THERM	GRAMMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOX THERM	GRAMMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DOM	SOX THERM	ATROSCAN
ELEMENTAL SULPHUR	D&C	DOM	SOX THERM	HPLC
PHENOLS BY GCMS	WET	DOM	SOX THERM	GCMS
HERBICIDES	D&C	HEXANE ACETONE	SOX THERM	GCMS
PESTICIDES	D&C	HEXANE ACETONE	SOX THERM	GCMS
EPH (GRO)	D&C	HEXANE ACETONE	END OVER END	GC/FID
EPH (MINOL)	D&C	HEXANE ACETONE	END OVER END	GC/FID
EPH (CLEANED UP)	D&C	HEXANE ACETONE	END OVER END	GC/FID
EPH CAG BY GC	D&C	HEXANE ACETONE	END OVER END	GC/FID
PCB TOT / PCB CON	D&C	HEXANE ACETONE	END OVER END	GCMS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE ACETONE	MICROWAVE TM218	GCMS
C8-C10 (C8-C10) EZ FLASH	WET	HEXANE ACETONE	SHAKER	GCEZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE ACETONE	SHAKER	GCEZ
SEM VOLATILE ORGANIC COMPOUNDS	WET	DOM ACETONE	SONICATE	GCMS

LIQUID MATRICES EXTRACTION SUMMARY			
ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAHMS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
EPH CAG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC/FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GCMS
SVOC	DOM	LIQUID/LIQUID SHAKE	GCMS
FREE SULPHUR	DOM	SOLID PHASE EXTRACTION	HPLC
PEST COP/OPP	DOM	LIQUID/LIQUID SHAKE	GCMS
TRIAZINE HERBS	DOM	LIQUID/LIQUID SHAKE	GCMS
PHENOLS MS	DOM	SOLID PHASE EXTRACTION	GCMS
TPH by INFRARED (R)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by R	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GCMS

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials or those identified as potentially asbestos containing during sample description which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anorthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

**SDG:** 110602-58  
**Job:** H\_GRONTMIJ\_SOL-54  
**Client Reference:**  
**Location:** Part 2a Assistance

**Customer:** Grontmij  
**Attention:** Gareth Taylor  
**Order No.:**  
**Report No.:** 133432

## Asbestos Identification

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Customer Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	11 NEWLANDS COURT FIVEWAYS NS Z 0.30 SOLID 31/05/2011 00:00:00 02/06/2011 14:02:44 110602-58 3588826 TM048	16/6/11	Paul Poynton	Typical of asbestos cement	Not Detected	Detected	Detected	Not Detected	Not Detected	Not Detected	Not Detected



# Jones Environmental Laboratory

Unit 3 Deeside Point  
Zone 3  
Deeside Industrial Park  
Deeside  
CH5 2UA

Grontmij  
Radcliffe House  
Blenheim Court  
Lode Lane  
Solihull  
B91 2AA

Tel: +44 (0) 1244 833780  
Fax: +44 (0) 1244 833781

No.4225

**Attention :** Gareth Taylor  
**Date :** 27th May, 2011  
**Your reference :** 106270  
**Our reference :** Test Report 11/4106 Batch 1  
**Location :** WEST OF FIVEWAYS  
**Date samples received :** 18th May, 2011  
**Status :** Final report  
**Issue :** 1

Six samples were received for analysis on 18th May, 2011, which was completed on 27th May 2011. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

A handwritten signature in blue ink, appearing to read 'J Farrell'.

**J W Farrell- Jones CChem FRSC**  
**Chartered Chemist**





# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

## SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C

Asbestos screens where requested will be undertaken by a UKAS accredited laboratory.

## WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory. It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples. All samples are treated as groundwaters and analysis performed on settled samples unless we are instructed otherwise.

## DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

*The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:*

\$	Sample temperature on receipt considered inappropriate for analysis requested.
^	Samples exceeding recommended holding times.
&	Samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials).
~	No sampling date given, unable to confirm if samples are with acceptable holding times.

## SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130%. Results are not surrogate corrected.

## AQCs

Where AQC's fall outside UKAS/MCERTS criteria analysis is repeated if possible.

## NOTE

The laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

**ABBREVIATIONS and ACRONYMS USED**

#	UKAS accredited.
M	MCERTS accredited.
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
SS	Calibrated against a single substance.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
W	Results expressed on as received basis.
+	AQC is outside our current performance criteria. Results should be considered as indicative only and are not accredited. However the AQC is within UKAS/MCERTS acceptance criteria.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
SE	Surrogate recovery outside performance criteria. Results not accredited.
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
DR	Dilution required.





# Scientific Analysis Laboratories Ltd

## Certificate of Analysis

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

Scientific Analysis Laboratories is a  
limited company registered in England and  
Wales (No 2514788) whose address is at  
Hadfield House, Hadfield Street, Manchester M16 9FE

**Report Number:** 259092-1

**Date of Report:** 05-Dec-2011

**Customer:** Grontmij  
3rd Floor  
Radcliffe House  
Blenheim Court  
Lode Lane  
Solihull  
B91 2AA

**Customer Contact:** Mr Gareth Taylor

**Customer Job Reference:**

**Customer Site Reference:** Fiveways, number 11

**Date Job Received at SAL:** 24-Nov-2011

**Date Analysis Started:** 28-Nov-2011

**Date Analysis Completed:** 05-Dec-2011

The results reported relate to samples received in the laboratory  
This report should not be reproduced except in full without the written approval of the laboratory  
Tests covered by this certificate were conducted in accordance with SAL SOPs

Report checked  
and authorised by :  
Mr Ross Walker  
Customer Services Manager  
(Land)

Issued by :  
Mr Ross Walker  
Customer Services Manager  
(Land)

<b>SAL Reference:</b> 259092 <b>Project Site:</b> Fiveways, number 11 <b>Customer Reference:</b>									
<b>Soil</b> <b>Miscellaneous</b>		Analysed as Soil							
<b>SAL Reference</b>		<b>259092 001</b>	<b>259092 002</b>	<b>259092 003</b>	<b>259092 004</b>	<b>259092 005</b>			
<b>Customer Sample Reference</b>		<b>G1</b>	<b>G2</b>	<b>G3</b>	<b>G4</b>	<b>G5</b>			
<b>Date Sampled</b>		<b>22-NOV-2011</b>	<b>22-NOV-2011</b>	<b>22-NOV-2011</b>	<b>22-NOV-2011</b>	<b>22-NOV-2011</b>			
<b>Determinand</b>	<b>Method</b>	<b>Test Sample</b>	<b>LOD</b>	<b>Units</b>					
Asbestos ID	T27	AR			Crocidolite Detected	N.D.	N.D.	N.D.	N.D.
					-				
					Chrysotile Detected				
					-				

### Index to symbols used in 259092-1

Value	Description
AR	As Received
N.D.	Not Detected
S	Analysis was subcontracted
U	Analysis is UKAS accredited

### Method Index

Value	Description
T27	PLM

### Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Asbestos ID	T27	AR			SU	001-005



# Scientific Analysis Laboratories Ltd

## Certificate of Analysis

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

Scientific Analysis Laboratories is a  
limited company registered in England and  
Wales (No 2514788) whose address is at  
Hadfield House, Hadfield Street, Manchester M16 9FE

**Report Number:** 260285-1

**Date of Report:** 15-Dec-2011

**Customer:** Grontmij  
3rd Floor  
Radcliffe House  
Blenheim Court  
Lode Lane  
Solihull  
B91 2AA

**Customer Contact:** Mr Gareth Taylor

**Customer Job Reference:**

**Customer Site Reference:** Fiveways, number 11

**Date Job Received at SAL:** 06-Dec-2011

**Date Analysis Started:** 07-Dec-2011

**Date Analysis Completed:** 15-Dec-2011

The results reported relate to samples received in the laboratory  
This report should not be reproduced except in full without the written approval of the laboratory  
Tests covered by this certificate were conducted in accordance with SAL SOPs

Report checked  
and authorised by :  
Mr Ross Walker  
Customer Services Manager  
(Land)

Issued by :  
Mr Ross Walker  
Customer Services Manager  
(Land)



<b>SAL Reference:</b> 260285 <b>Project Site:</b> Fiveways, number 11 <b>Customer Reference:</b>					
<b>Soil</b> <b>Miscellaneous</b>		Analysed as Soil			
<b>SAL Reference</b>					<b>260285 001</b>
<b>Customer Sample Reference</b>					<b>G1 259092-1</b>
Determinand	Method	Test Sample	LOD	Units	
Asbestos Quantification	T27	AR	0.001	%	<b>0.51</b>

### Index to symbols used in 260285-1

Value	Description
AR	As Received
S	Analysis was subcontracted
U	Analysis is UKAS accredited

### Notes

Sample 001 - Chrysotile asbestos present contained within cement and within bitumen based roof felt but there were no free fibres detected in the soil

### Method Index

Value	Description
T27	PLM

### Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Asbestos Quantification	T27	AR	0.001	%	SU	001

# APPENDIX E

TABLE 1 - GAS MONITORING DATA																			
Site: West of Fiveways																	Job No. 106270		
Monitoring Well Sampling & Testing Record																			
BH	Date	Pipe Internal Diameter mm	Monitored By	Gas												Weather			
				Borehole Pressure pa	Flow l/h	CH <sub>4</sub> % v/v	CH <sub>4</sub> GSV	CO <sub>2</sub> % v/v	CO <sub>2</sub> GSV	O <sub>2</sub> % v/v	CO ppm	H <sub>2</sub> S ppm	PID CF ppm	HEX %	LEL %	Gas Analyser	Atmospheric Pressure mbar	Conditions @ Monitoring	Ambient Temp °C
WS01	28/01/2011		RJH	-3.00	-0.8	0.1	-0.0008	0.5	-0.004	19.3	0	-10	1	0	0	GFM	1010	Clear	-5
WS01	11/02/2011		KS	NM	0	0.1	0	0.7	0	18.5	-3	-10	Nm	NM	NM	GFM	994		10.0
WS01	25/02/2011		KAS	1.00	-0.3	0.1	-0.0003	0.6	-0.0018	19.1	-3	-10	1	0	0	GFM	1006	Overcast	11
WS01	11/03/2011		KAS	1.00	-0.3	0.1	-0.0003	0.7	-0.0021	19.3	-3	-10	1	0	0	GFM	998	Overcast	
WS02	28/01/2011		RJH	-3.00	-1	0.1	-0.001	0.1	-0.001	19.8	0	-10	1	0	0	GFM	1009	Clear	-5.0
WS02	11/02/2011		KS	NM	-3	0.1	-0.003	0.1	-0.003	19.9	-1	-10	NM	NM	NM	GFM	994		10
WS02	25/02/2011		KAS	2.00	0.6	0.1	0.0003	0.1	0.0003	19.7	-1	-10	1	0.001	0	GFM	1006	Overcast	11.0
WS02	11/03/2011		KAS	0.00	0.4	0.1	0.0001	1.6	0.0016	18.1	-1	-10	1	0	0	GFM	997	Overcast	
WS03	28/01/2011		RJH	-3.00	-0.90	0.1	-0.0009	0.80	-0.0072	19.00	-1.00	-10.00	1.00	0.00	0.00	GFM	1009	Clear	-5
WS03	11/02/2011		KS	NM	-0.8	0.1	-0.0008	0.8	-0.0064	19.1	0	-10	NM	NM	NM	GFM	0994		10.0
WS03	25/02/2011		KAS	1.00	0.1	0.1	0.0001	0.8	0.0008	19.0	0	-10	1	0.003	0	GFM	1006	Overcast	11.0
WS03	11/03/2011		KAS	0.00	0.1	0.1	0.0001	0.8	0.0008	19.0	-3	-10	1	0	0	GFM	997	Overcast	
WS04	28/01/2011		RJH	-4.00	-1	0.1	-0.001	0.2	-0.002	19.7	-1	-10	1	0	0	GFM	1008	Clear	-5
WS04	11/02/2011		KS	NM	0.7	0.1	0.0007	0.1	0.0007	19.8	-1	-10	NM	NM	NM	GFM	994		10
WS04	25/02/2011		KAS	1.00	0.2	0.1	0.0002	0.1	0.0002	19.9	-1	-10	1	0.001	0	GFM	1006	Overcast	11.0
WS04	11/03/2011		KAS	1.00	0.4	0.1	0.0004	0.2	0.0008	19.7	-1	-10	1	0.001	0	GFM	997	Overcast	

## APPENDIX F

## Appendix F: Preliminary Risk Assessment for Water Supply Pipes

Two publications have been reviewed in regard to potential risks to water supply pipes posed by contaminants in the ground:

- “Guidance for the Protection of Water Supply Pipes to be Used in Brownfield Sites” (UK Water Industry Research {UKWIR}, ref 10/WM/03/21, 2010 (re-issued version))
- The Selection of Materials for Water Supply Pipes to be Laid in Contaminated Land (Water Regulations Advisory Scheme {WRAS}, ref 9-04-03, October 2002)

Both reports present methodologies for the assessment of soil conditions and the specification of appropriate pipework materials to mitigate the presence of contaminants.

Although WRAS guidance is now superseded by the UKWIR document, samples were scheduled for analysis prior to this notice. As such samples were not scheduled for a full UKWIR suite. As such the results have been screened against both the WRAS and UKWIR values.

### WRAS Screen

A comparison between the chemical analysis results obtained from samples taken from the top 1.2m of soil *in both the initial and the supplementary investigation* and the older WRAS screening values is presented below. Only soils from the top 1.2m of the soil profile have been selected for comparison as 1.2m is the typical maximum depth at which water pipes are laid within the highway – with local service connections to properties typically much shallower. Note, the table below does not constitute a full screen against all WRAS parameters; e.g. sulphate, cyanide and coal tar have not been tested for.

### WRAS Threshold Screen

Analyte	WRAS Threshold Value (mg/kg)	Maximum Test Result (mg/kg)	Mean (where max. exceeds)
<b>Sulphate</b>	2000	<b>4800</b>	1720
Sulphur	5000	Not tested for	-
Sulphide	250	Not tested for	-
<b>pH</b>	<5 or >8	<b>6.2 to 8.5</b>	7.97
Antimony	10	Not tested for	-
<b>Arsenic</b>	10	<b>15</b>	9.5
<b>Cadmium</b>	3	<b>3.5</b>	1.1
Chromium (hexavalent)	25	Not tested for	-
Chromium (total)	600	39	-
Cyanide (free)	25	Not tested for	-
Cyanide (complexed)	250	Not tested for	-
Lead	500	400	-
Mercury	1	0.60	-
Selenium	3	<1.0	-
Thiocyanate	50	Not tested for	-
Coal Tar	50	Not tested for	-
Cyclohexane extractable	50	Not tested for	-
Phenol	5	Not tested for	-
<b>Polyaromatic Hydrocarbons</b>	50	<b>240</b>	22
Toluene extractable	50	0.02	-
<b>Petroleum Hydrocarbons</b>	50	<b>1200</b>	<b>290</b>

**Bold values** indicate testing result > WRAS threshold value

**Yellow highlight** indicates data exceedence

Table includes results from Initial and supplementary site investigation

The maximum concentrations of arsenic, cadmium, polyaromatic hydrocarbons, petroleum hydrocarbons and sulphate, and the maximum soil pH level recorded, exceed the WRAS threshold values.

### **UKWIR Screen**

The UKWIR approach is the most recent and supersedes the WRAS guidance, reflecting further studies undertaken since the WRAS document was published in 2002. Key features of the UKWIR report include:

- A pipework material-specific assessment procedure (Table 3.1 of the report). This allows chemical analysis results to be compared to various threshold criteria associated with six possible pipework material types
- The discounting of metallic pipework (other than copper or steel/ductile iron with protective wrapping) as a modern pipework material
- The specification of a different chemical testing suite to that recommended in the earlier WRAS document – including the use of physio-chemical parameters and exclusion of analysis for metals (given the above discounting of metallic pipework).

The chemical analysis for the site was scheduled prior to the publication of the re-issued UKWIR report (despite a re-issue data of 2010, the report was not available until January 2011). Therefore, some of the parameters required for a UKWIR screen are not available. The available laboratory results *from the investigation* from the top 1.2m of soil have been compared to the UKWIR thresholds. Summary of screen given in the table below:

#### **UKWIR Threshold Screen**

Parameter Group	WRAS Threshold Value (mg/kg)		Maximum Test Result (mg/kg) <sup>3</sup>
	PE	PVC	
Extended VOC suite	0.5	0.125 <sup>2</sup>	0.46
BTEX and MTBE	0.1	0.03	0.075
SVOCs <sup>1</sup>	2	1.4	2.8
Phenols	2	0.4	-
Cresols and Chlorinated phenols	2	0.04	-
Mineral Oil C11-C20	10	Pass	36.0
Mineral Oil C21-C40	500	Pass	275

Yellow highlight indicates exceedence of PVC threshold

Green highlight indicates exceedence of PE threshold

<sup>1</sup> Sum SVOCs, using half face value for compounds detected at less than detection limit (in accordance with UKWIR guidance)

<sup>2</sup> Sum VOCs using half face value for compounds detected at less than detection limit (in accordance with UKWIR guidance)

<sup>3</sup> Maximum value for sample from surface to 1.2m bgl

### **Summary**

It is possible that the concentrations of contaminants at the site could adversely affect drinking water quality, depending on the materials used for water distribution (South Staffordshire Water (SSW) pipes) and local connections to the SSW network (probably installed by the house builder). Further assessment of drinking water quality is needed.



## APPENDIX G

## Appendix G: Severity and Probability of Risk in Conceptual Site Models (after CIRIA552, Tables 6.3 to 6.5)

This report draws on guidance presented in CIRIA report 552, “Contaminated Land Risk Assessment, A Guide for Good Practice”, wherein the “severity” term in the Conceptual Site Model is classified with reference to the sensitivity of the hazard and the receptor, as follows:

Severity Category	Description	Examples
Severe	Acute risk to human health likely to result in “significant harm” as defined in EPA90, catastrophic damage to buildings or property, acute risk of major pollution of controlled waters, acute risk of harm to ecosystems (as defined in Contaminated Land Regulations 2006)	High cyanide concentrations at the surface of a recreation area Major spillage into controlled waters Explosion, causing building collapse
Medium	Chronic risk to human health likely to result in “significant harm” as defined in EPA90, chronic pollution of sensitive controlled waters, significant change at a sensitive ecosystems or species, significant damage to buildings or structures	Contaminant concentrations at a site in excess of SGVs, GAC or similar screening values Leaching of contaminants to sensitive aquifer Death of a species within a nature reserve
Mild	Pollution of non-sensitive waters, significant damage to buildings, structures, services or crops, damage to sensitive buildings, structures, services or the environment, which nonetheless result in “significant harm”	Pollution to (former) non-aquifer or to non-controlled surface watercourse. Damage to building rendering it unsafe to occupy (e.g. foundation or structural damage)
Minor	Harm, not necessarily resulting in “significant harm” but probably requiring expenditure to resolve or financial loss. Non-permanent risks to human health that are easily mitigated, e.g. by wearing PPE. Easily-repairable damage to structures or services	Contaminant concentrations requiring the wearing of PPE during site work, but no other long-term mitigation.  Discolouration of concrete

The likelihood of an event (probability) takes into account both the presence of hazard and receptor and the integrity of the pathway between hazard and receptor, and is assessed as follows:

Category	There is a pollution linkage and:
High	Event is likely in the short term and almost inevitable over the long term. Or, there is evidence of actual harm at/to the receptor
Likely	Event is possible in the short term and likely over the long term
Low	Event is unlikely in the short term and possible over the long term
Unlikely	Event is unlikely, even in the long term

Potential severity and probability have been assessed in the following matrix, to give an overall risk rating:

	<b>Severity</b>			
<b>Probability</b>	Severe	Medium	Mild	Minor
High	Very high	High	Moderate	Low/moderate
Likely	High	Moderate	Low/moderate	Low
Low	Moderate	Low/moderate	Low	Very low
Unlikely	Low/moderate	Low	Very low	Very low

The above risk categories are likely to result in the following actions:

- Very high: urgent intervention / investigation needed, remediation likely to be required
- High: urgent intervention / investigation needed, remediation possibly required in short term and probably required in long term
- Moderate: investigation needed to clarify and refine risk; remediation may be required over the long term
- Low: it is possible that harm could arise to a receptor, but if realised, such harm is likely to be, at worst, mild
- Very low: it is possible that harm could arise to a receptor, but if realised, such harm is unlikely to be severe