GROUND ENGINEERING
Newark Road, Peterborough PE1 5UA
Tel: 01733 566566
Fax: 01733 315280

REPORT ON A GROUND INVESTIGATION FOR A SITE AT 64 PETERBOROUGH ROAD CROWLAND PETERBOROUGH

Report Reference C12256

On behalf of:

Steve Gilbert Building Services Ltd
66 Peterborough Road,
Crowland,
Peterborough
PE6 OBA

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STEVE GILBERT BUILDING SERVICES

REPORT ON A GROUND INVESTIGATION AT 64, PETERBOROUGH ROAD CROWLAND PETERBOROUGH

Report Reference No. C12256 **November 2010**

INTRODUCTION

The client, Steve Gilbert Building Services Limited, is considering the purchase of the site of a petrol filling station at 64, Peterborough Road, Crowland, near Peterborough, for future commercial redevelopment.

Ground Engineering Limited was commissioned by the client to carry out six window sample boreholes to determine the nature of the near surface soils across the site.

This report summarises the findings of the boreholes and chemical laboratory testing on recovered samples and provides an assessment of any ground contamination encountered.

LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE

The site is located on the southern side of the Fenland village of Crowland which lies approximately 12km north-east of Peterborough as shown in Figure 1. The 50m long by 20m approximately rectangular shaped Petrol Filling Station site lies at National Grid Reference TF 240 094 and is situated close to the corner of Peterborough Road and the old A1073.

At the time of the investigation the site was occupied by Crowland Service Station which included a vehicle maintenance workshop, a Total petrol forecourt with a shop and house at the southern end. Four buried fuel tanks and an oil interceptor were located within the north-eastern and north-western corners respectively.

The site and surrounding topography was generally flat and level where the ground surface lies close to 0mOD. The River Welland and New River lie approximately 1km and 1.5km respectively to the north-west of the site.

The geological map for the area at 1:50,000 scale, Sheet 158 'Peterborough', shows the site to be directly underlain by the Nordelph Peat which overlies Marine Alluvium of the Barroway Drove Beds.

SITE WORK

The site work was carried out on 5 October 2010 and comprised the boring of six window sample boreholes at the locations given in Figure 2. Service plans provided by the client were consulted and a cable avoidance tool (CAT) was used to check for the absence of buried services prior to boring and excavation. The boreholes were commenced initially by the excavation, by hand, of service inspection pits to a depth of 1.20m in order to ensure the absence of buried services.

The boreholes were located to provide a general spread across the site in order to determine the nature of deposited made ground and check for petroleum contamination arising from the site's use as a petrol filling station. Specifically borehole WS1 was located adjacent the oil interceptor within the north-western corner; WS2 and WS3 located on opposite sides of the buried fuel tanks in the north-eastern corner; and WS4 to WS6 within the petrol forecourt and adjacent the workshops. Boreholes were not permitted inside the workshop and MOT Bay.

The window sample boreholes, WS1 to WS6, were each sunk to a depth of 4.00m. The boreholes were formed by a small track-mounted window sampling and super heavy dynamic probing rig. The window sampling equipment consisted of drive-in sample tubes of specially constructed and strengthened steel, lined with a plastic core-liner. The barrels were initially of 87mm internal diameter and were reduced in diameter with successive barrels with increasing depth. Upon extraction, a continuous 'undisturbed' profile of the soil was obtained within the plastic liners.

A soil gas and groundwater monitoring installation comprising 38mm diameter perforated plastic pipe, was inserted to a depth of between 3.00m and 4.00m within each of the completed boreholes WS1, WS2, WS4 and WS6. The annulus between the pipe and the borehole was backfilled with silica gravel to a depth of 1.00m. A bentonite seal was inserted between 0.50m and 1.00m, above which the tube was sealed by a gas valve and a lockable protective cover was fixed in concrete.

On completion, the remaining boreholes were backfilled with materials arising, which were compacted in thin layers.

The borehole records have been produced in accordance with British Standard BS 5930:1999 'Code of Practice for Site Investigations', and are given in Appendix 1. The records provide the descriptions and depths of the various strata encountered, details of all samples taken, and the groundwater conditions observed during excavation and on completion.

Return Site Visits

A return visit was made to site on 2 November 2010 to monitor the installations for groundwater levels and the concentrations of methane, carbon dioxide and oxygen as well as the atmospheric pressure and flow rate, using a Gasdata GFM430. Samples of groundwater were also recovered from the standpipe installations for future chemical analysis.

The results of the water and soil gas monitoring are presented on the respective borehole records and presented in Appendix 1.

LABORATORY TESTING

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the exploratory hole records.

The plastic liners recovered from the window sample boreholes were logged and sub-sampled in the laboratory by a Geoenvironmental Engineer. The soil descriptions are in accordance with BS5930:1999.

Laboratory Chemical Testing

Selected made ground and water samples were tested for a wide range of potential contaminants outlined by the Environment Agency (EA) and National House Building Council (NHBC) document R&D 66: 2008 'Guidance for the Safe Development of Housing on Land Affected by Contamination'.

Fourteen soil and four water samples were submitted to a UKAS Accredited Laboratory who carried out analyses for potential contaminants and organic matter, and the results are provided in Appendix 3.

The following suite of tests was carried out on near surface soil samples and is considered sufficient to screen for potential contaminants: total arsenic, total cadmium, total chromium, hexavalent chromium, total lead, total mercury, total selenium, water soluble boron, total copper, total nickel, total zinc, total cyanides, free cyanides, soluble sulphate, sulphides and pH-value, phenols and polyaromatic hydrocarbons (PAH), including benzo[a]pyrene and total and speciated petroleum hydrocarbons (TPH). The organic matter was also determined on selected soil samples.

GROUND CONDITIONS

The strata encountered in the window sample boreholes have been interpreted as comprising made ground overlying the Barroway Drove Beds. Whilst layers of peat were encountered within the Barroway Drove Beds, the overlying Nordelph Peat layer, as indicated by the geological map, appears to have been replaced by made ground.

Made Ground

A 0.10m to 0.14m thick surface layer of macadam or concrete was encountered in WS1 and WS3 to WS4. Within WS2, which was located within the neighbouring land to the north-east, made ground was encountered at the surface.

The made ground, which was present to depths of between 0.50m and 1.60m, comprised mixtures of typically soft brown, dark brown, grey and dark grey slightly sandy slightly gravelly clay, sandy gravel, and sand and gravel. The gravel fraction comprised angular to rounded brick, concrete, flint, coal and clinker.

Barroway Drove Beds

The Barroway Drove Beds comprised typically soft, locally very soft, dark brown, grey and black slightly sandy, slightly gravelly clay and silty organic clay. Layers of peat with a thickness of between 0.10m to 0.35m were encountered at depths between 1.60m and 2.25m in WS1, WS2, WS3 and WS5. A second layer of peat was encountered within WS1 and WS3 at a depth of 3.90m in WS1 and WS3.

The boreholes were completed within the soft, very soft clay or peat of the Barroway Drove Beds at a depth of 4.00m.

Groundwater

Water seepages were encountered within the Barroway Drove Beds at depths between 1.16m and 2.34m during boring.

Subsequent return visits to site on 2 November 2010 found the monitoring installations in WS1, WS2, WS4 and WS6 to have water standing within them at depths of between 0.68m and 1.19m.

Observations

Visual and olfactory evidence of hydrocarbon pollution was noted within the soil and water encountered during this investigation, particularly within the forecourt area and the area to the north between the buried fuel tanks and oil interceptor.

COMMENTS ON THE CHEMICAL TEST RESULTS

Samples of soil and water recovered from boreholes WS1 to WS6 were analysed in the laboratory to determine concentrations of a general suite of contaminants and petroleum hydrocarbons. The assessment criteria and findings are provided in the proceeding sections.

Soil Screening Values (SSVs) based on CLEA model

Atkins Limited has derived ATRISKsoil SSVs based on the 2009 guidance (SC050021/SR3 (the CLEA Report) and SC050021/SR2 (the TOX report)) for residential with plant uptake, residential without plant uptake and commercial/industrial uses. They have based these on the default assumptions provided in the CLEA report which, it is understood, will be used in the development of future Soil Guideline Values by DEFRA and the Environment Agency. Atkins SSVs 1% soil organic matter (SOM) has been derived using CLEA model v1.04 which was released January 2009. These are provided under licence to Ground Engineering Limited, and respective toxicology reports and technical details on the derivation of the SSVs can be provided on request.

Atkins Limited state that subsequent software updates implemented by the Environment Agency, v1.05 in September 2009 and v1.06 in October 2009 do not affect the derivation of the SSVs. In instances where the Environment Agency has published SGVs these have been presented as SSVs.

Groundwater Screening Values

The primary assessment tool employed for the generic screening of samples for the protection of 'Controlled Waters' consists of the Statutory Instrument 2000 No.3184 'The Water Supply (Water Quality) Regulations 2000'.

Statutory Instrument 2000 No.3184 'The Water Supply (Water Quality) Regulations 2000' amends the 1991 version, which provides a standard of 10µg/l for dissolved or emulsified hydrocarbons represented by total petroleum hydrocarbons (TPH) in the Chemtest

analysis. There is no amendment indicated in Statutory Instrument 2000 No.3184 and consequently with the absence of an amendment or update we refer to the 1991 standard, which is generally accepted within the industry.

Soil Assessment

The following standard land uses form the basis of the assessment in relation to soils:

- Residential usages with or without home grown produce, representative of most sensitive land usage such as private rear gardens.
- Commercial and industrial usage representative of buildings and areas covered by hardstanding and minimal landscaping.

The intended purpose of the SSVs is as "intervention values" in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards, but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users. Table 1 compares the test results with 1% SSVs in relation to the specified usage. The number of test results, which exceed these values, are also provided.

Table 1: Comparison of Chemical Test Results for Near Surface Soils with SSV (1% SOM)

Determinand	Number of Samples	Min Value (mg/kg)	Max Value (mg/kg)	Number of Samples Exceeding SSV for:			Measured 95th Percentile (mg/kg)	Soil Screening Criteria SSV (1% SOM)			
				Residential with home grown produce	Residential without with home grown produce	Commercial/ Industrial Landuse		Assessment Method	Residential with home grown produce (mg/kg)	Residential without with home grown produce (mg/kg)	Commercial/ Industrial Landuse (mg/kg)
Arsenic	6	20	40	1	1	0	32.82	SSV	32	35	640
Cadmium	6	0.15	0.61	0	0	0	0.42	SSV	10	83	230
Chromium	6	24	44	6	1	0	36.64	SSV	14	38	330
Chromium (hexavalent)	6	<0.5	<0.5	0	0	0	<0.5	SSV	14	38	330
Lead	6	20	91	0	0	0	62.98	SSV	166	235	5370
Mercury	6	<0.10	0.11	0	0	0	0.11	SSV	6	7	66
Selenium	6	<0.20	<0.20	0	0	0	0.20	SSV	350	595	13,000
Nickel	6	23	33	0	0	0	29.06	SSV	130	130	1800
Phenols	6	<0.3	<0.3	0	0	0	<0.30	SSV	162	262	686
BaP	6	<0.1	48	4	4	1	26.22	SSV	0.8	0.9	4
Boron	6	0.7	2.1	0	0	0	2.07	-	-	-	-
Copper	6	17	35	0	0	0	32.29	SSV	3970	8370	109,000
Zinc	6	50	100	0	0	0	90.49	SSV	16,900	46,800	917,000
Free Cyanide	6	<0.5	<0.5	0	0	0	<0.50	SSV	34	34	34
Sulphide	6	1.7	140	0	0	0	102.97	-	-	-	-

Discussion of Soil Results

The results of the laboratory analysis on the six near surface soil indicate that none of the determinands with the exception of arsenic, total chromium and benzo[a]pyrene exceeded the SSVs for residential usage. None of the values, with the exception of benzo[a]pyrene exceeded the respective SSVs for commercial/industrial usage.

The made ground was measured to contain elevated amounts of arsenic with concentrations of between 20mg/kg and 40mg/kg. One of the six results exceeded the respective arsenic SSV for residential use with home grown produce and one exceeded the SSV for residential use without home grown produce. Statistically the highest value is indicated, by the maximum value test, to be part of the same population and the measured 95th percentile of 32.82mg/kg, indicated by the six test results, exceeds the residential SSVs.

Measured total chromium concentrations of between 24mg/kg and 44mg/kg were measured in the six made ground samples. Six results exceeded the chromium residential use with home grown produce SSV of 14mg/kg. The toxicity of chromium depends upon its oxidation state, which generally comprises trivalent and hexavalent forms. Trivalent compounds are stable and most naturally occurring chromium is in the trivalent (chromic) state. Hexavalent chromium (chromate) rarely occurs naturally and its presence in soil is most likely to be from pollution. Hexavalent chromium is significantly more toxic than the trivalent form, and consequently the SSV assumes that all the chromium is present in the hexavalent form. The hexavalent chromium test results for the samples analysed were all less than 0.5mg/kg a concentration below the SSV of 14mg/kg and therefore the measured chromium concentrations would not be considered to present a significant risk to residential use with home grown produce usage.

The made ground was measured to contain elevated amounts of benzo[a]pyrene with concentrations of between less than 0.1mg/kg and 48mg/kg. Four of the six results exceeded the respective benzo[a]pyrene SSVs for residential use with and without home grown produce. Statistically the highest value is indicated, by the maximum value test, to be part of the same population and the measured 95th percentile of 26.22mg/kg, as indicate by the six test results,

exceeds the residential and commercial SSVs. The elevated results are thought to be due to the presence of coal or ash within the recovered soil samples.

Summary of Petroleum Concentrations Encountered

Visual or olfactory evidence of hydrocarbon fuel impacted soils was identified within the boreholes, particularly within the upper 1.50m although a petroleum odour was observed in the Barroway Drove Beds to a depth of between 3.00m and 4.00m in WS5. The results of laboratory testing indicated values of between less than 10mg/kg and 2200mg/kg as summarised below in Table 2. The soil results within WS1 and WS4 at a depth of 0.50m potentially exceed commercial SSVs, which range in the order of 150mg/kg for C5-C16 to 28,000mg/kg for C16-C35. Petroleum impacted groundwater was also encountered with a concentration of 5200 µg/l within WS6 which was located within the forecourt area.

Table 2: Summary of Petroleum Hydrocarbon Test Results in Soil and Groundwater

	Concentration of Total Petroleum Hydrocarbons (TPH) s = soil mg/kg w = water µg/l					
Approx depth (m)	Area between Oil Interceptor and Underground Fuel Tanks	Adjacent Underground Fuel Tanks		Forecourt		
	WS1	WS2	WS3	WS4	WS5	WS6
0.40					130s	
0.50	1100s			2200s		
0.60		450s	720s			<10s
0.70				<10w		
1.00	<10w					
1.05		<10w				
1.20						5200w
1.50	32s	<10s	<10s		850s	
2.50	<10s	<10s	<10s			
3.50			<10s			

Groundwater Assessment

Samples of groundwater recovered from the installations in borcholes WS2, WS2, WS4 and WS6 were analysed in the laboratory. In summary Table 3, given below, compares the test results; which include a suite of metals, PAH, phenols, and total petroleum hydrocarbons; with the adopted screening criteria and the fraction of test results, which exceed these values, are also provided.

Table 3: Comparison of Chemical Test Results with Water Supply Regulations

Determinand	Min Value	Max Value	The Water Supply (Water Quality) Regulations 1989-2000 Maximum Concentration/Value for Consumers Taps	Fraction of Samples Exceeding Water Supply Regulation
Arsenic (total) µg/l	13	19	10 µg/l	3/3
Boron (Water Soluble) µg/l	840	1400	1000 µg/l	2/3
Cadmium (total) µg/l	<0.08	<0.08	5.0 µg/l	0/3
Chromium (total) µg/l	7.9	17	50 µg/l	0/3
Copper (total) µg/l	<1	1.9	2000µg/l	0/3
Cyanide (total) mg/l	<0.05	<0.05	0.05 mg/l	0/3
Lead (total) µg/l	<1.0	2.8	25 µg/l	0/3
Mercury (total) µg/l	<0.50	0.65	1.0 µg/l	0/3
Nickel (total) µg/l	7.6	15	20 µg/l	0/3
pH value	6.7	7.2	6.5 minimum 10.0 maximum	0/3
Phenols mg/l	<0.03	<0.03	0.0005 mg/l	-/3
Selenium (total) µg/l	13	31	10 µg/l	3/3
Sulphate (soluble) mg/l	110	1800	250mg/l	1/3
Sulphide mg/l	<0.050	<0.050	No limit	-/3
Zinc (total) µg/l	14	75	5000 µg/l	0/3
Total Petroleum Hydrocarbons (TPH) µg/l	<10	5200	10 µg/l	1/4
PAHs µg/l	<0.2	5.5	0.10 µg/l	3/3

Discussion of Results of Water Analysis

The results of the laboratory analysis on water samples recovered from the borehole installations WS2, WS2, WS4 and WS6 indicated concentrations of arsenic, boron, selenium, sulphate, TPH and PAH elevated relative to the drinking water standards.

Petroleum impacted groundwater was also encountered with a concentration of 5200µg/l within WS6 which was located within the forecourt area.

Soil Gas

Soil gas monitoring of the borehole installations, WS1, WS2, WS4 and WS6, on 2 November 2010, encountered less than 0.1% methane and 0.1% to 4.5% by volume carbon dioxide. The in-situ measurements revealed flow rates from the boreholes of less than 0.1l/hr. Oxygen concentrations of 16.9% and 21.0% by volume were measured. The results indicate a Gas Screening Value (GSV) of 0.0045l/hr for methane and carbon dioxide. The worst case GSV for carbon dioxide falls into Characteristic Situation 1 as defined by the modified Wilson & Card classification referenced in CIRIA C665 'Assessing Risks Posed by Hazardous Ground Gases to Buildings' (2007). Characteristic Situation 1 indicates that no special precautions are required to offer protection to the proposed development from soil gases.

Overall it is considered there is a low to medium likelihood that methane or carbon dioxide soil gas could be generated from the organic soils and peat within the underlying Barroway Drove Beds.

COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED COMMERCIAL REDEVELOPMENT

Anticipated exposure scenarios relating to the site and future commercial redevelopment works including remedial options as applicable are discussed as follows.

This investigation may not have revealed the full extent of contamination on the site and appropriate professional advice should be sought if subsequent site works reveal materials that may appear to be contaminated. It should be noted that boreholes were not permitted inside the workshop and MOT Bay.

It would be prudent, and probably necessary from the planning authority's point of view, to carry out further ground investigation works, specific to any proposed future development. This work should prove in detail the nature of the ground conditions across the site and enable the production of an appropriate remediation plan.

Remediation would be necessary in order to remove sources of contamination, which if not removed could cause the deterioration of groundwater quality, beneath the site and immediate surroundings, and also be potentially of risk site users of future redevelopment. Potential sources of petroleum pollution across the site would include leakage from buried and surface fuel and oil tanks; fuel lines; drainage and oil interceptors; and contaminated soil and groundwater. In addition to current fuel tanks there is the possibility of there being old buried fuel tanks, relating to previous garage/filling station configurations.

Contaminated Soil and Groundwater

The made ground, which was present to depths of between 0.50m and 1.60m, comprised mixtures of typically soft brown, dark brown, grey and dark grey slightly sandy, slightly gravelly clay, sandy gravel, and sand and gravel. The gravel fraction comprised angular to rounded brick, concrete, flint, coal and clinker.

The results of the laboratory analysis on the six near surface soil samples indicate that none of the determinands with the exception of arsenic, total chromium and benzo[a]pyrene

exceeded the SSVs for residential usage. None of the values, with the exception of benzo[a]pyrene exceeded the respective SSVs for commercial/industrial usage.

Visual or olfactory evidence of hydrocarbon fuel impacted soils was identified within the boreholes, particularly within the upper 1.50m although a petroleum odour was observed in the Barroway Drove Beds to a depth of between 3.00m and 4.00m in WS5 which was located within the forecourt area. Impacted groundwater was also encountered within WS6 which was also located within the forecourt area.

Human Health - Construction Workers

No special precautions would be required during the development of the site by workers who may come into contact with the soil during groundworks, providing standard precautions are adopted which should generally include the procedures given by the Health and Safety Executive (The Blue Book).

For the protection of these workers during groundworks the following is recommended:

a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.

b) Washing facilities should be made available to groundworkers, so as to minimise the potential for inadvertent ingestion of soil.

c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

Remediation - Existing Drainage

Redundant foul drain runs and oil interceptors should be removed from beneath the site and precautions should ensure that any remaining effluent is directly disposed of off-site. The integrity of existing drainage and oil interceptors should be checked, and damaged sections

replaced prior to re-use within the development. Residual petroleum polluted soils should also be removed where encountered.

Remediation - Fuel Tanks and Fuel Lines

The presence of fuel tanks means that there must be medium to high risk that a pathway could develop linking the contained fuel with potential receptors. Whilst the investigation works documented by this survey does not provide any significant evidence that the fuel tanks have leaked there is evidence that leakage, possible from buried fuel lines beneath the forecourt has occurred as exemplified by the elevated TPH concentration in the soil and water encountered in WS4, WS5 and WS6. Elevated TPH results also indicate there to be a possible surface spillage within the near surface soils between the oil interceptor and the buried fuel tanks.

Consequently in order to eliminate this risk, the removal of all such sources would be recommended. All fuel tanks drums, waste oil tanks, fuel lines, oil interceptors and associated drain connections should be decommissioned prior to their removal which should also include the removal of obviously polluted soil. The latter measures should reduce the future risk to human health and water environment to low.

Remediation - Users of Future Commercial Development

The results indicate that the soils encountered beneath the site would be suitable beneath buildings and areas of hardstanding.

The risk of the encountered ground contamination affecting the site users when present beneath buildings and permanent areas of hardstanding would be considered to be low. This is because it would be unlikely that the workforce, children or general site users would normally be able to penetrate building floors or surface hardstanding layers necessary in order to uncover any contaminated soils beneath the site.

The underlying made ground would however be considered unsuitable for retention at the surface within landscaped areas. Therefore, a suitably thick cover or barrier layer should be used in order to break the pathway between the encountered soil contaminants and the children.

Remedial measures within areas scheduled for grass covered soft landscaping could include a surface covering of 0.30m of certified 'clean' fill to provide a suitable pathway break. Where plants with deep root systems, shrubs, or similar, are proposed consideration may be given to thickening the surface layer of clean material to 0.60m.

Overall it is considered there is a low to medium likelihood that methane or carbon dioxide soil gas could be generated from the organic soils and peat within the underlying Barroway Drove Beds. Also hydrocarbon vapours could emanate from petroleum polluted ground. In the absence of further soil gas monitoring, it would be prudent to incorporate gas protection measures into building design. As a minimum requirement consideration should be given to incorporating a well constructed ground slab, a low permeability gas membrane, minimal penetration of the ground slab by services and possibly an under floor void.

OFF-SITE DISPOSAL OF SOIL ARISINGS

Excavated material and excess spoil should always be classified prior to removal from site as required by 'Duty of Care' (Environmental Protection Act, 1990) legislation. This means that material has to be given a proper description and waste classification prior to removal. The certificates of chemical analysis should be sent to the Environmental Agency or a suitably licensed waste disposal contractor for classification of the material prior to disposal off-site during the development works.

GROUND ENGINEERING LIMITED

J. H. GIBB

B.Sc.(Hons.), M.Sc.(Eng.), C. Geol., F.G.S.

Senior Geo-Environmental Engineer

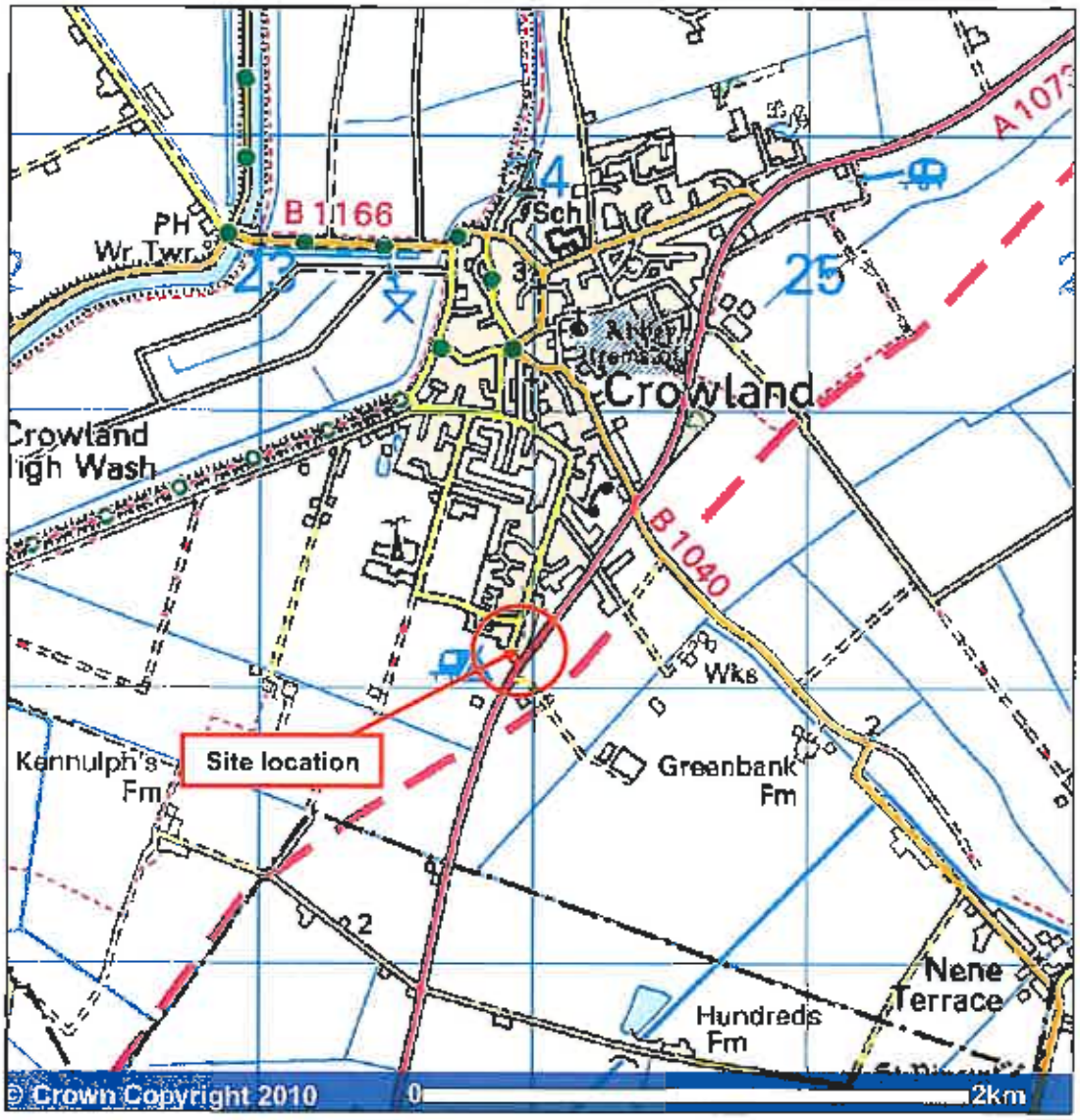
S. J. FLEMING

M.Sc., M.C.S.M., C.Geol., F.G.S.

Director

Figures 1 & 2

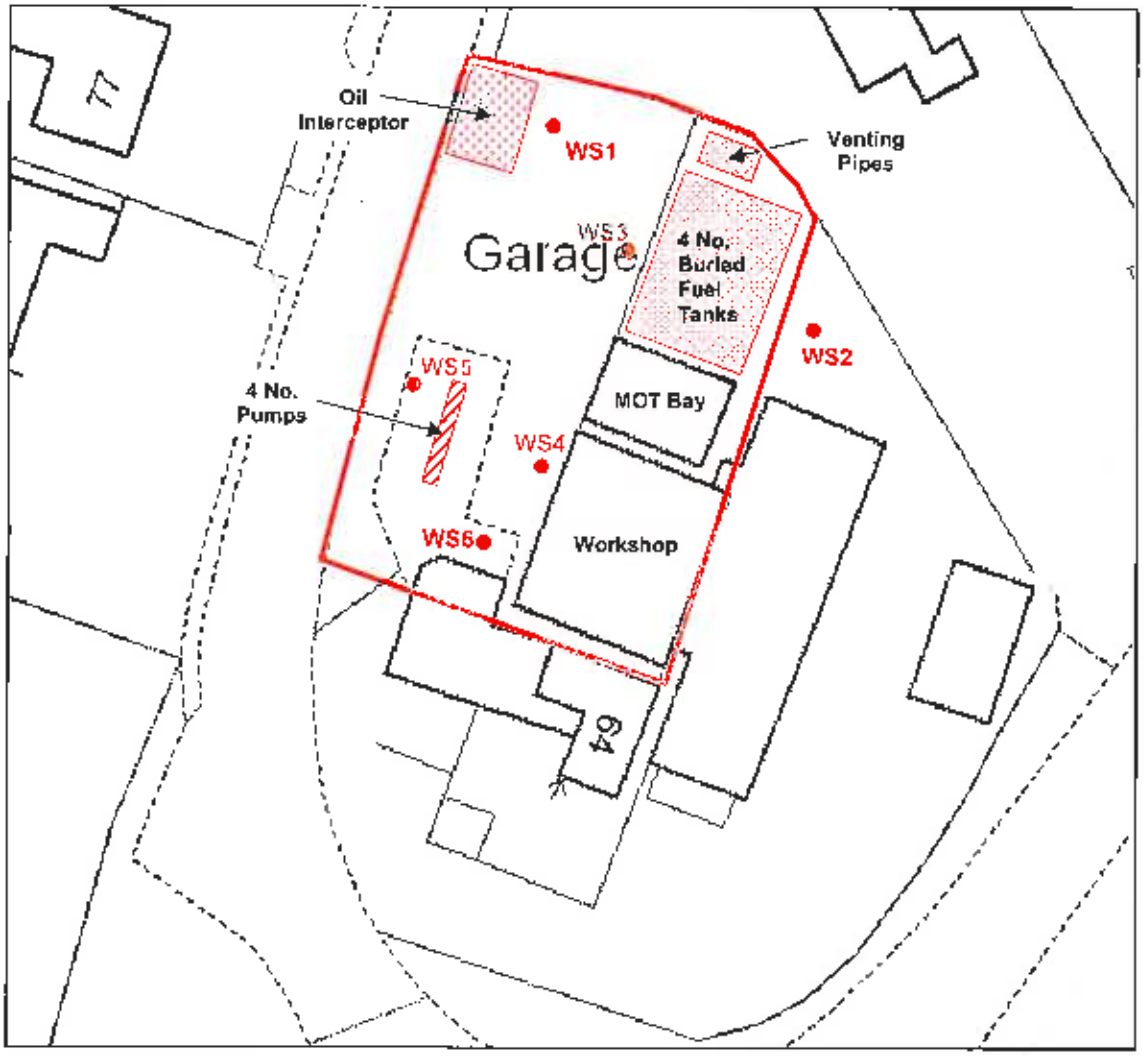
Site Location Plan



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Project : 64, Peterborough Road, Crowland **Client : Steve Gilbert Building Services Limited**	GROUND ENGINEERING LIMITED Peterborough Tel : 01733 566566	**Project No. C12256** **Figure 1**

Borehole Location Plan



KEY

- Window Sample Boreholes WS1 to WS6

Project : 64, Peterborough Road, Crowland **Client : Steve Gilbert Building Services Limited**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No. C12256** **Figure 2**

Appendix 1

Records
of
Boreholes WS1 to WS6
Gas/water monitoring results

GROUND ENGINEERING

Geo-Environmental Specialists
01733 566566

Site: 64 PETERBOROUGH ROAD, CROWLAND

WINDOW SAMPLE WS1

Date: 05/10/10

Hole Size: 87mm dia to 2.00m
77mm dia to 3.00m
67mm dia to 4.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.20	D1				MADE GROUND - MACADAM.		0.10	
0.50	D2				MADE GROUND - Light brown and black, very gravelly SAND. Gravel of angular to sub-rounded flint, concrete, brick and limestone.		0.20	
0.80	D3				MADE GROUND - Grey and green grey and brown, gravelly SAND. Gravel of sub-angular to sub-rounded flint, brick, concrete and coal. Hydrocarbon odour.		0.60	
1.20	D4		▼s		MADE GROUND - Soft, dark grey and dark brown, slightly sandy, slightly gravelly CLAY. Gravel of angular to rounded flint, limestone, concrete, brick and coal.		1.30	
1.20-2.00	U1				Soft, grey and dark grey slightly sandy, slightly gravelly, silty organic CLAY. (BARROWAY DROVE BEDS)		1.60	
2.00-3.00	U2				Soft, dark brown and black, very organic CLAY with plant matter. (BARROWAY DROVE BEDS)		1.90	
2.34	W1		▼		Black PEAT. (BARROWAY DROVE BEDS)		2.25	
3.00-4.00	U3		▼		Soft, grey and light grey organic CLAY with some peaty matter. (BARROWAY DROVE BEDS)		3.90	
					Dark brown PEAT. (BARROWAY DROVE BEDS)		4.00	
					Borehole completed at 4.00m depth			

REMARKS
1. Starter pit dug from GL to 1.20m depth
2. Gas monitoring standpipe installed to 4.00m depth

Project No 12256

Scale 1:50

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KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼ Depth to Water on completion
J - Jar Sample
M - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▽s Standpipe Level

Groundwater Strikes

Depth m					
No Struck	Rose to	Rate	Cased	Sealed
1	3.00	2.34			

Groundwater Observations

Depth m			
Date	Hole	Casing	Water
05/10/10	4.00		2.34
02/11/10	4.00	1.00	0.99

GROUND ENGINEERING

Geo-Environmental Specialists
01733 566566

Site: 64 PETERBOROUGH ROAD, CROWLAND

WINDOW SAMPLE
WS2

Date: 05/10/10

Hole Size: 87mm dia to 2.00m
77mm dia to 3.00m
67mm dia to 4.00m

Ground Level:

Samples and In-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.00-0.50	B1				MADE GROUND - Brown and grey, slightly gravelly, sandy CLAY. Gravel of angular to rounded flint.		0.40	
0.30	D1							
0.50-1.00	B2				MADE GROUND - Soft, brown and dark brown, slightly sandy, slightly gravelly CLAY. Gravel of ash and brick.			
0.60	D2							
0.90	D3		▼s				1.20	
1.20	D4							
1.20-2.00	U1				Soft, brown and grey brown mottled, slightly gravelly CLAY. Gravel of sub-angular to rounded flint. (BARROWAY DROVE BEDS)		1.80	
2.00-3.00	U2				Dark brown PEAT. (BARROWAY DROVE BEDS)		1.90	
					Soft, grey and light grey organic CLAY with some peaty matter.			
3.00-4.00	U3				(BARROWAY DROVE BEDS)			
					Borehole completed at 4.00m depth		4.00	

REMARKS
1. Starter pit dug from GL to 1.20m depth
2. Gas monitoring standpipe installed to 3.40m depth

Project No
12256

Scale 1:50

Page 1/1

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼ Depth to Water on completion
J - Jar Sample
M - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes

Depth m				
No Struck	Rose to	Rate	Cased	Sealed

Groundwater Observations

Date	Depth m Hole	Depth m Casing	Depth m Water
05/10/10	4.00		dry
02/11/10	3.40	1.00	1.05

GROUND ENGINEERING

Geo-Environmental Specialists
01733 566566

Site: 64 PETERBOROUGH ROAD, CROWLAND

WINDOW SAMPLE WS3

Date: 05/10/10

Hole Size: 87mm dia to 2.00m
67mm dia to 4.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	D.D. Level m
Depth m	Type	Result					
0.00-0.50	B1			MADE GROUND - CONCRETE.		0.14	
0.30	D1			MADE GROUND - Brown SAND and GRAVEL of angular flint.		0.40	
0.50-1.00	B2			MADE GROUND - Soft, grey and dark grey slightly sandy, slightly gravely, organic CLAY. Hydrocarbon odour.			
0.60	D2						
0.90	D3						
1.20	D4						
1.20-2.00	U1					1.30	
				Firm, grey and dark grey organic CLAY with peaty matter. (BARROWAY DROVE BEDS)		1.50	
				Dark brown PEAT. (BARROWAY DROVE BEDS)		1.60	
2.00-4.00	U2			Soft, light grey, grey and brown mottled organic CLAY with some peaty matter.			
				(BARROWAY DROVE BEDS)		3.90	
				Dark brown PEAT. (BARROWAY DROVE BEDS)		4.00	
				Borehole completed at 4.00m depth			

REMARKS 1. Starter pit from GL to 1.20m depth

Project No 12256

Scale 1:50

Page 1/1

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼ Depth to Water on completion
J - Jar Sample
M - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▽s Standpipe Level

Groundwater Strikes						Groundwater Observations			
	Depth m						Depth m		
No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water
1	2.00	1.77				05/10/10	4.00		1.77

GROUND ENGINEERING

Geo-Environmental Specialists
01733 566566

Site: 64 PETERBOROUGH ROAD, CROWLAND

WINDOW SAMPLE
WS4

Date: 05/10/10

Hole Size: 87mm dia to 2.00m
77mm dia to 4.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.00-0.50	B1				MADE GROUND - MACADAM.		0.10	
0.20	D1				MADE GROUND - Brown and dark brown, clayey, sandy GRAVEL of angular to sub-rounded brick and roadstone. Hydrocarbon odour.		0.60	
0.50-1.00	B2							
0.50	D2		▼s		MADE GROUND - Soft, brown and dark grey, slightly sandy, slightly gravelly CLAY. Gravel of angular to sub-rounded brick, flint and ash. Hydrocarbon odour.			
0.80	D3							
1.20	D4		▽ 1				1.40	
1.20-2.00	U1		▼▼ 1		Firm, grey and dark brown, slightly gravelly organic CLAY. Gravel of angular to sub-rounded flint. (BARROWAY DROVE BEDS)		1.60	
1.43	W1				Soft becoming very soft, dark grey, silty organic CLAY.			
2.00-4.00	U2				(BARROWAY DROVE BEDS)			
					Borehole completed at 4.00m depth		4.00	

REMARKS
1. Starter pit dug from GL to 1.20m depth
2. Gas monitoring standpipe installed to 3.30m depth

Project No
12256

Scale 1:50

Page 1/1

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼ Depth to Water on completion
J - Jar Sample
M - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes

No	Struck	Depth m Rose to	Rate	Cased	Sealed
1	1.20	1.43			

Groundwater Observations

Date	Depth m Hole	Casing	Water
05/10/10	4.00		1.43
02/10/10	3.30	1.00	0.68

GROUND ENGINEERING

Geo-Environmental Specialists
01733 566566

Site: 64 PETERBOROUGH ROAD, CROWLAND

WINDOW SAMPLE
WS5

Date: 05/10/10

Hole Size: 87mm dia to 2.00m
67mm dia to 3.00m
57mm dia to 4.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.00-0.50	B1			MADE GROUND - CONCRETE.		0.14	
0.20	D1			MADE GROUND - Brown and grey brown, gravelly SAND. Gravel of angular to rounded flint, limestone and clinker.		0.30	
0.40	D2			MADE GROUND - Soft, dark grey and black, slightly gravelly, sandy CLAY. Gravel of angular flint and brick. Hydrocarbon odour.		0.50	
0.50-1.00	B2			Firm, brown and grey mottled CLAY.			
0.80	D3			(BARROWAY DROVE BEDS)			
1.16	W1						
1.20	D4					1.60	
1.20-2.00	U1			Dark brown and dark grey PEAT. (BARROWAY DROVE BEDS)		1.80	
2.00-3.00	U2			Soft, grey and light grey organic CLAY with some peaty matter. (BARROWAY DROVE BEDS)		2.10	
				Soft, grey and dark brown, slightly sandy, slightly gravelly CLAY. Gravel of angular flint. (BARROWAY DROVE BEDS)		2.70	
3.00-4.00	U3			Soft, grey and dark brown, silty, organic CLAY with some peaty matter. Hydrocarbon odour.			
				(BARROWAY DROVE BEDS)			
				Borehole completed at 4.00m depth		4.00	

REMARKS 1. Starter pit dug from GL to 1.20m depth

Project No 12256

Scale 1:50 | Page 1/1

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼ Depth to Water on completion
J - Jar Sample
M - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▽s Standpipe Level

Groundwater Strikes

No	Struck	Rose to	Depth m Rate	Cased	Sealed
1	1.20	1.16			

Groundwater Observations

Date	Depth m Hole	Casing	Water
05/10/10	4.00		1.16

GROUND ENGINEERING

Geo-Environmental Specialists
01733 566566

Site: 64 PETERBOROUGH ROAD, CROWLAND

WINDOW SAMPLE
WS6

Date: 05/10/10

Hole Size: 87mm dia to 2.00m
67mm dia to 4.00m

Ground Level:

Samples and in-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.00-0.50	B1				MADE GROUND - MACADAM.		0.10	
					MADE GROUND - Brown and black, claycy, sandy GRAVEL of angular flint, brick, concrete and clinker.		0.40	
0.30	D1							
0.50-1.00	B2							
0.60	D2				MADE GROUND - Soft, brown, slightly sandy, slightly gravelly CLAY. Gravel of angular to sub-rounded flint, brick and clinker. Hydrocarbon odour.			
0.90	D3							
1.20	D4							
1.20-2.00	U1							
							1.60	
					Firm, grey and dark grey very organic CLAY. Hydrocarbon odour. (BARROWAY DROVE BEDS)		1.90	
2.00-4.00	U2				Soft, grey and dark brown organic CLAY with some peaty matter. Strong hydrocarbon odour. (BARROWAY DROVE BEDS)		2.30	
					Very soft, grey and light grey, silty CLAY. (BARROWAY DROVE BEDS)		2.70	
					Very soft, grey and light grey, silty CLAY with some peaty matter. (BARROWAY DROVE BEDS)			
					Borehole completed at 4.00m depth		4.00	

REMARKS
1. Starter pit dug from GL to 1.20m depth
2. Gas monitoring standpipe installed 3.60m depth

Project No
12256

Scale 1:50

Page 1/1

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼ Depth to Water on completion
J - Jar Sample
M - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes

No	Depth m Struck	Rose to	Rate	Cased	Sealed
1	3.00	2.42			

Groundwater Observations

Date	Depth m Hole	Casing	Water
05/10/10	4.00		2.42

Gas Monitoring Record

Site: **64 Peterborough Road, Crowland PE6 0BA**

Report Ref: **C12256**

Date	Borehole No.	Methane (% v/v)		Methane LEL %		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Flow Rate (l/hr)	Atmosph. Pressure (mb)	Depth of Well (mbgl)	Depth to Groundwater (mbgl)
		Peak	Steady	Peak	Steady	Peak	Steady	Min.	Max.				
02/11/10	WS1	<0.1	<0.1	<0.1	<0.1	0.8	0.8	17.4	17.4	<0.1	1008	3.64	0.99
02/11/10	WS2	<0.1	<0.1	<0.1	<0.1	4.5	4.5	16.9	16.9	<0.1	1008	3.36	1.05
02/11/10	WS4	<0.1	<0.1	<0.1	<0.1	1.8	1.8	17.8	17.8	<0.1	1007	3.19	0.68
02/11/10	WS6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	20.9	21.0	<0.1	1008	3.49	1.19

LEL – Lower Explosive Limit

Appendix 2

Laboratory Chemical Test Results
(9 Pages)

Chemtest
The right chemistry to deliver results

Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070

Ground Engineering Limited
Newark Road
Peterborough

PE1 5UA

FAO John Gibb
29 November 2010

Dear John Gibb

Test Report Number **121017**
Your Project Reference **C12256 - 64 Peterborough Road, Crowland, PE6 0BA**

Please find enclosed the results of analysis for the samples received 8 October 2010.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely

Authorised Signatory

☐ Darrell Hall	Director
☑ Phil Hellier	Director
☐ Keith Jones	Technical Manager
☐ John Crawford	Quality Manager
☐ Malcolm Avis	Director

2183

Notes to accompany report:

- *The sign < means 'less than'*
- *Tests marked 'U' hold UKAS accreditation*
- *Tests marked 'M' hold MCertS (and UKAS) accreditation*
- *Tests marked 'N' do not currently hold UKAS accreditation*
- *Tests marked 'S' were subcontracted to an approved laboratory*
- *n/a means 'not evaluated'*
- *i/s means 'insufficient sample'*
- *u/s means 'unsuitable sample'*
- *Comments or interpretations are beyond the scope of UKAS accreditation*
- *The results relate only to the items tested*

Ground Engineering Limited
Newark Road
Peterborough

PE1 5UA

FAO John Gibb

LABORATORY TEST REPORT

Results of analysis of 14 samples
received 8 October 2010

C12256 - 64 Peterborough Road, Crowland, PE6 0BA

Chemtest
The right chemistry to deliver results

Report Date
29 November 2010

Login Batch No					121017					
Chemtest LIMS ID					AF36213	AF36214	AF36215	AF36216	AF36217	AF36218
Sample ID					WS1	WS1	WS1	WS2	WS2	WS2
Sample No					D2	I1A	U2A	D2	U1A	U2A
Sampling Date					07/10/2010	07/10/2010	07/10/2010	07/10/2010	07/10/2010	07/10/2010
Depth					0.5m	1.5m	2.5m	0.5m	1.5m	2.5m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH		-	M	7.8			8.2		
2300	Cyanide (free)	57125	mg kg-1	M	<0.50			<0.50		
	Cyanide (total)	57125	mg kg-1	M	<0.50			<0.50		
2325	Sulfide	18496258	mg kg-1	M	11			110		
2625	Organic matter		%	M	5.3			8.1		
2120	Boron (hot water soluble)	7440428	mg kg-1	M	2.1			1.4		
	Sulfate (2:1 water soluble) as SO4	14808798	g l-1	M	0.13			0.17		
2490	Chromium (hexavalent)	18540299	mg kg-1	N	<0.5			<0.5		
2450	Arsenic	7440382	mg kg-1	M	26			40		
	Cadmium	7440439	mg kg-1	M	0.23			0.61		
	Chromium	7440473	mg kg-1	M	31			44		
	Copper	7440508	mg kg-1	M	34			35		
	Mercury	7439976	mg kg-1	M	0.11			0.11		
	Nickel	7440020	mg kg-1	M	26			33		
	Lead	7439921	mg kg-1	M	37			91		
	Selenium	7782492	mg kg-1	M	<0.20			<0.20		
	Zinc	7440666	mg kg-1	M	71			100		
2670	Total Petroleum Hydrocarbons		mg kg-1	M	1100	32	< 10	450	< 10	< 10
2700	Naphthalene	91203	mg kg-1	M	0.81			0.54		
	Acenaphthylene	208968	mg kg-1	M	0.55			1.7		
	Acenaphthene	83329	mg kg-1	M	1.1			3		
	Fluorene	86737	mg kg-1	M	2			3		
	Phenanthrene	85018	mg kg-1	M	14			35		
	Anthracene	120127	mg kg-1	M	2.4			11		
	Fluoranthene	206440	mg kg-1	M	21			76		
	Pyrene	129000	mg kg-1	M	16			64		
	Benzo[a]anthracene	56553	mg kg-1	M	8.9			38		

All tests undertaken between 11/10/2010 and 15/10/2010

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Ground Engineering Limited
Newark Road
Peterborough

PE1 5UA

FAO John Gibb

LABORATORY TEST REPORT

Results of analysis of 14 samples
received 8 October 2010

C12256 - 64 Peterborough Road, Crowland, PE6 0BA

Chemtest
The right chemistry to deliver results

Report Date
29 November 2010

Login Batch No					121017					
Chemtest LIMS ID					AF36219	AF36220	AF36221	AF36222	AF36223	AF36224
Sample ID					WS3	WS3	WS3	WS3	WS4	WS5
Sample No					D2	U1A	U2A	U3A	D2	D1
Sampling Date					07/10/2010	07/10/2010	07/10/2010	07/10/2010	07/10/2010	07/10/2010
Depth					0.6m	1.5m	2.5m	3.5m	0.5m	0.4m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓							
2010	pH		-	M	7.6				7.9	8.0
2300	Cyanide (free)	57125	mg kg-1	M	<0.50				<0.50	<0.50
	Cyanide (total)	57125	mg kg-1	M	<0.50				<0.50	<0.50
2325	Sulfide	18496258	mg kg-1	M	140				28	50
2625	Organic matter		%	M	7.8				8.6	2.2
2120	Boron (hot water soluble)	7440428	mg kg-1	M	2.1				1.8	1.7
	Sulfate (2:1 water soluble) as SO4	14808798	g l-1	M	0.22				0.21	0.14
2490	Chromium (hexavalent)	18540299	mg kg-1	N	<0.5				<0.5	<0.5
2450	Arsenic	7440382	mg kg-1	M	21				28	24
	Cadmium	7440439	mg kg-1	M	0.15				0.26	0.20
	Chromium	7440473	mg kg-1	M	32				25	24
	Copper	7440508	mg kg-1	M	18				25	17
	Mercury	7439976	mg kg-1	M	<0.10				<0.10	<0.10
	Nickel	7440020	mg kg-1	M	23				27	23
	Lead	7439921	mg kg-1	M	22				26	20
	Selenium	7782492	mg kg-1	M	<0.20				<0.20	<0.20
	Zinc	7440666	mg kg-1	M	50				77	65
2670	Total Petroleum Hydrocarbons		mg kg-1	M	720	< 10	< 10	< 10	2200	130
2700	Naphthalene	91203	mg kg-1	M	< 0.1				0.27	0.15
	Acenaphthylene	208968	mg kg-1	M	0.12				< 0.1	1.1
	Acenaphthene	83329	mg kg-1	M	0.16				< 0.1	0.8
	Fluorene	86737	mg kg-1	M	< 0.1				< 0.1	0.7
	Phenanthrene	85018	mg kg-1	M	0.43				< 0.1	3.6
	Anthracene	120127	mg kg-1	M	0.3				< 0.1	1.4
	Fluoranthene	206440	mg kg-1	M	0.65				8.6	7.1
	Pyrene	129000	mg kg-1	M	0.54				5.8	5.5
	Benzo[a]anthracene	56553	mg kg-1	M	0.29				3.2	3.4

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Ground Engineering Limited
Newark Road
Peterborough

PE1 5UA

FAO John Gibb

LABORATORY TEST REPORT

Results of analysis of 14 samples
received 8 October 2010

C12256 - 64 Peterborough Road, Crowland, PE6 0BA

Chemtest
The right chemistry to deliver results

Report Date
29 November 2010

Login Batch No				121017	
Chemtest LIMS ID				AF36225	AF36226
Sample ID				WS5	WS6
Sample No				U1A	D2
Sampling Date				07/10/2010	07/10/2010
Depth				1.5m	0.6m
Matrix				*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓		
2010	pH		-	M	7.2
2300	Cyanide (free)	57125	mg kg^{-1}	M	<0.50
	Cyanide (total)	57125	mg kg^{-1}	M	<0.50
2325	Sulfide	18496258	mg kg^{-1}	M	1.7
2625	Organic matter		%	M	1.7
2120	Boron (hot water soluble)	7440428	mg kg^{-1}	M	0.7
	Sulfate (2:1 water soluble) as SO4	14808798	g l^{-1}	M	0.07
2490	Chromium (hexavalent)	18540299	mg kg^{-1}	N	<0.5
2450	Arsenic	7440382	mg kg^{-1}	M	20
	Cadmium	7440439	mg kg^{-1}	M	0.27
	Chromium	7440473	mg kg^{-1}	M	28
	Copper	7440508	mg kg^{-1}	M	27
	Mercury	7439976	mg kg^{-1}	M	<0.10
	Nickel	7440020	mg kg^{-1}	M	23
	Lead	7439921	mg kg^{-1}	M	71
	Selenium	7782492	mg kg^{-1}	M	<0.20
	Zinc	7440666	mg kg^{-1}	M	91
2670	Total Petroleum Hydrocarbons		mg kg^{-1}	M	850	< 10
2700	Naphthalene	91203	mg kg^{-1}	M	< 0.1
	Acenaphthylene	208968	mg kg^{-1}	M	0.32
	Acenaphthene	83329	mg kg^{-1}	M	0.13
	Fluorene	86737	mg kg^{-1}	M	< 0.1
	Phenanthrene	85018	mg kg^{-1}	M	0.38
	Anthracene	120127	mg kg^{-1}	M	0.15
	Fluoranthene	206440	mg kg^{-1}	M	1.1
	Pyrene	129000	mg kg^{-1}	M	0.88
	Benzo[a]anthracene	56553	mg kg^{-1}	M	0.54

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Ground Engineering Limited
Newark Road
Peterborough

PE1 5UA

FAO John Gibb

LABORATORY TEST REPORT

Results of analysis of 14 samples
received 8 October 2010

C12256 - 64 Peterborough Road, Crowland, PE6 0BA

Chemtest
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Report Date
29 November 2010

					121017					
					AF36213	AF36214	AF36215	AF36216	AF36217	AF36218
					WS1	WS1	WS1	WS2	WS2	WS2
					D2	I1A	U2A	D2	U1A	U2A
					07/10/2010	07/10/2010	07/10/2010	07/10/2010	07/10/2010	07/10/2010
					0.5m	1.5m	2.5m	0.6m	1.5m	2.5m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Chrysene	218019	mg kg^{-1}	M	10			46		
	Benzo[b]fluoranthene	205992	mg kg^{-1}	M	7.9			42		
	Benzo[k]fluoranthene	207089	mg kg^{-1}	M	10			44		
	Benzo[a]pyrene	50328	mg kg^{-1}	M	9.5			48		
	Dibenzo[a,h]anthracene	53703	mg kg^{-1}	M	0.84			8.8		
	Indeno[1,2,3-cd]pyrene	193395	mg kg^{-1}	M	5.8			35		
	Benzo[g,h,i]perylene	191242	mg kg^{-1}	M	5.8			35		
	Total (of 16) PAHs		mg kg^{-1}	M	120			490		
2920	Phenols (total)		mg kg^{-1}	N	<0.3			<0.3		

All tests undertaken between 11/10/2010 and 15/10/2010

' Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Ground Engineering Limited
Newark Road
Peterborough

PE1 5UA

FAO John Gibb

LABORATORY TEST REPORT

Results of analysis of 14 samples
received 8 October 2010

C12256 - 64 Peterborough Road, Crowland, PE6 0BA

Chemtest
The right chemistry to deliver results

Report Date
29 November 2010

					121017					
					AF36219	AF36220	AF36221	AF36222	AF36223	AF36224
					WS3	WS3	WS3	WS3	WS4	WS5
					D2	U1A	U2A	U3A	D2	D1
					07/10/2010	07/10/2010	07/10/2010	07/10/2010	07/10/2010	07/10/2010
					0.6m	1.5m	2.5m	3.5m	0.5m	0.4m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Chrysene	218019	mg kg-1	M	0.59				3.5	3.9
	Benzo[b]fluoranthene	205992	mg kg-1	M	0.46				4.7	4.8
	Benzo[k]fluoranthene	207089	mg kg-1	M	0.67				2.2	2.9
	Benzo[a]pyrene	50328	mg kg-1	M	< 0.1				4.3	4
	Dibenzo[a,h]anthracene	53703	mg kg-1	M	< 0.1				0.55	0.52
	Indeno[1,2,3-cd]pyrene	193395	mg kg-1	M	< 0.1				3	2.8
	Benzo[g,h,i]perylene	191242	mg kg-1	M	< 0.1				2.5	2.9
	Total (of 16) PAHs		mg kg-1	M	4.2				39	46
2920	Phenols (total)		mg kg-1	N	<0.3				<0.3	<0.3

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Ground Engineering Limited
Newark Road
Peterborough

PE1 5UA

FAO John Gibb

LABORATORY TEST REPORT

Results of analysis of 14 samples
received 8 October 2010

C12256 - 64 Peterborough Road, Crowland, PE6 0BA

Chemtest
The right chemistry to deliver results

Report Date
29 November 2010

					121017	
					AF36225	AF36226
					WS5	WS6
					U1A	D2
					07/10/2010	07/10/2010
					1.5m	0.6m
					SOIL	*SOIL*
2700	Chrysene	218019	mg kg-1	M		0.72
	Benzo[b]fluoranthene	205992	mg kg-1	M		1.1
	Benzo[k]fluoranthene	207089	mg kg-1	M		0.76
	Benzo[a]pyrene	50328	mg kg-1	M		0.64
	Dibenzo[a,h]anthracene	53703	mg kg-1	M		< 0.1
	Indeno[1,2,3-cd]pyrene	193395	mg kg-1	M		0.61
	Benzo[g,h,i]perylene	191242	mg kg-1	M		0.72
	Total (of 16) PAHs		mg kg-1	M		8.1
2920	Phenols (total)		mg kg-1	N		<0.3

* Accreditation status

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Chemtest
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Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070

Ground Engineering Limited
Newark Road
Peterborough

PE1 5UA

FAO John Gibb
29 November 2010

Dear John Gibb

Test Report Number **114527**
Your Project Reference **C12256 - 64 Peterborough Road, Crowland, PE6 0BA**

Please find enclosed the results of analysis for the samples received 4 November 2010.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely

Authorised Signatory

☐	Darrell Hall	Director
☑	Phil Hellier	Director
☐	Keith Jones	Technical Manager
☐	John Crawford	Quality Manager
☐	Malcolm Avis	Director

Notes to accompany report:

- *The sign < means 'less than'*
- *Tests marked 'U' hold UKAS accreditation*
- *Tests marked 'M' hold MCertS (and UKAS) accreditation*
- *Tests marked 'N' do not currently hold UKAS accreditation*
- *Tests marked 'S' were subcontracted to an approved laboratory*
- *n/e means 'not evaluated'*
- *I/s means 'insufficient sample'*
- *u/s means 'unsuitable sample'*
- *Comments or interpretations are beyond the scope of UKAS accreditation*
- *The results relate only to the items tested*

UKAS TESTING
2183

ISO 14001 sira UKAS

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Ground Engineering Limited
Newark Road
Peterborough

PE1 5UA

FAO John Gibb

LABORATORY TEST REPORT

Results of analysis of 4 samples
received 4 November 2010

C12256 - 64 Peterborough Road, Crowland, PE6 0BA

Chemtest
The right chemistry to deliver results

Report Date
29 November 2010

Login Batch No					114527			
Chemtest LIMS ID					AF44615	AF44616	AF44617	AF44618
Sample ID					WS1	WS2	WS4	WS6
Sample No								
Sampling Date					02/11/2010	02/11/2010	02/11/2010	02/11/2010
Depth					1m	1.05m	0.7m	1.2m
Matrix					*WATER*	*WATER*	*WATER*	*WATER*
SOP↓	Determinand↓	CAS No↓	Units↓	*				
1010	pH	PH	-	U	7.0	6.7		7.2
1300	Cyanide (total)	57125	mg l^{-1}	U	< 0.05	< 0.05		< 0.05
	Cyanide (free)	57125	mg l^{-1}	U	< 0.05	< 0.05		< 0.05
1325	Sulfide	18496258	mg l^{-1}	U	<0.050	<0.050		<0.050
1270	Hardness	HARD_TOT	mg CaCO3 l^{-1}	U	1800	3600		1100
1220	Sulfate	14808798	mg l^{-1}	U	110	1800		210
1450	Arsenic	7440382	µg l^{-1}	U	24	19		13
	Boron	7440428	µg l^{-1}	U	1100	1400		840
	Cadmium	7440439	µg l^{-1}	U	<0.080	<0.080		<0.080
	Chromium (total)	7440473	µg l^{-1}	U	17	16		7.9
	Copper	7440508	µg l^{-1}	U	<1.0	1.9		<1.0
	Mercury	7439976	µg l^{-1}	U	0.58	0.65		<0.50
	Nickel	7440020	µg l^{-1}	U	7.6	14		15
	Lead	7439921	µg l^{-1}	U	<1.0	<1.0		2.8
	Selenium	7782492	µg l^{-1}	U	27	31		13
	Zinc	7440666	µg l^{-1}	U	22	75		14
1675	TPH aliphatic >C5-C6		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aliphatic >C6-C8		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aliphatic >C8-C10		µg l^{-1}	N	<0.1	<0.1	<0.1	720
	TPH aliphatic >C10-C12		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aliphatic >C12-C16		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aliphatic >C16-C21		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aliphatic >C21-C35		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aliphatic >C35-C44		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aromatic >C5-C7		µg l^{-1}	N	<0.1	<0.1	<0.1	270
	TPH aromatic >C7-C8		µg l^{-1}	N	<0.1	<0.1	<0.1	190
	TPH aromatic >C8-C10		µg l^{-1}	N	<0.1	<0.1	<0.1	4000

All tests undertaken between 05/11/2010 and 12/11/2010

* Accreditation status

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Ground Engineering Limited
Newark Road
Peterborough

PE1 5UA

FAO John Gibb

LABORATORY TEST REPORT

Results of analysis of 4 samples
received 4 November 2010

C12256 - 64 Peterborough Road, Crowland, PE6 0BA

Chemtest
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Report Date
29 November 2010

					114527			
					AF44615	AF44616	AF44617	AF44618
					WS1	WS2	WS4	WS6
					02/11/2010	02/11/2010	02/11/2010	02/11/2010
					1m	1.05m	0.7m	1.2m
					WATER	*WATER*	*WATER*	*WATER*
1675	TPH aromatic >C10-C12		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aromatic >C12-C16		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aromatic >C16-C21		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aromatic >C21-C35		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	TPH aromatic >C35-C44		µg l^{-1}	N	<0.1	<0.1	<0.1	<0.1
	Total Petroleum Hydrocarbons		µg l^{-1}	N	<10	<10	<10	5200
1700	Naphthalene	91203	µg l^{-1}	N	<0.01	<0.01		<0.01
	Acenaphthylene	208968	µg l^{-1}	N	<0.01	<0.01		0.79
	Acenaphthene	83329	µg l^{-1}	N	<0.01	<0.01		1.4
	Fluorene	86737	µg l^{-1}	N	<0.01	<0.01		0.7
	Phenanthrene	85018	µg l^{-1}	N	<0.01	0.12		1.2
	Anthracene	120127	µg l^{-1}	N	<0.01	<0.01		0.47
	Fluoranthene	206440	µg l^{-1}	N	<0.01	0.67		0.57
	Pyrene	129000	µg l^{-1}	N	<0.01	0.28		0.37
	Benzo[a]anthracene	56553	µg l^{-1}	N	<0.01	<0.01		<0.01
	Chrysene	218019	µg l^{-1}	N	<0.01	<0.01		<0.01
	Benzo[b]fluoranthene	205992	µg l^{-1}	N	<0.01	<0.01		<0.01
	Benzo[k]fluoranthene	207089	µg l^{-1}	N	<0.01	<0.01		<0.01
	Benzo[a]pyrene	50328	µg l^{-1}	N	<0.01	<0.01		<0.01
	Dibenzo[a,h]anthracene	53703	µg l^{-1}	N	<0.01	<0.01		<0.01
	Indeno[1,2,3-cd]pyrene	193395	µg l^{-1}	N	<0.01	<0.01		<0.01
	Benzo[g,h,i]perylene	191242	µg l^{-1}	N	<0.01	<0.01		<0.01
	Total (of 16) PAHs		µg l^{-1}	N	<0.2	1.07		5.5
1920	Phenols (total)		mg l^{-1}	N	< 0.03	< 0.03		< 0.03

All tests undertaken between 05/11/2010 and 12/11/2010

* Accreditation status

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