

Peter Wade Consultancy

CONTAMINATION REPORT

REF:- PWC/1284_4/
FOR
I H EQUIPMENT

Peter Wade Consultancy

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CLIENT

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GENERAL BACKGROUND

GB.1 The site is off Springfield Street, Barnsley, South Yorkshire.

GB.2 The contamination report is to be read in conjunction with site remediation report Ref. PWC/1284

GB.3 Soil samples were taken from trial holes 1-8 to the laboratory for contamination testing. The samples were taken on 21.12.03. and the tests were completed by 22.01.04. The test positions are indicated on drawings in Appendix C.

The survey was carried out: -

Date : 21.12.03.

Weather : Wet & overcast.

Engineer : Mr P Wade

RESULTS OF SURVEY

The results of the laboratory chemical testing are appended to the rear of this report. (After page 19)

CONCLUSIONS

C.1 The mercury as Hg dry weight is in the range <0.10 mg/kg. The levels on site are generally below guidelines of 1mg/kg for domestic gardens.

C.2 The arsenic as As dry weight is in the range 7-34 mg/kg. The trigger level for domestic gardens is 10mg/kg the levels on site are above this guideline. The presence of alkaline soil means that slightly elevated levels of arsenic will be a reduced risk. The guideline for public open spaces is 40 mg/kg.

C.3 The cadmium as Cd dry weight is in the range 0-2.3 mg/kg. The levels on site are below guidelines of 3 mg/kg for domestic gardens.

C.4 The chromium as Cr dry weight is in the range of 15-63 mg/kg. The levels on site are below guidelines of 660 mg/kg for domestic gardens.

C.5 The copper as Cu dry weight was typically in the range of 35-64 mg/kg. Copper can be harmful to plants above a trigger level of 50 mg/kg. Levels in the region of 50 mg/kg – 100 mg/kg are considered acceptable. The levels on site are considered acceptable.

C.6 Lead as Pb dry weight was typically in the range of 72-670 mg/kg. The levels on site are generally well below guidelines of 500 mg/kg for domestic gardens.

C.7 Nickel as Ni dry weight is in the range 150 mg/kg. Nickel is harmful to plants usually above a trigger level of 35 mg/kg. The levels on site are considered unacceptable for domestic gardens and skin contact.

C.8 Zinc as Zn dry weight is in the range of 790 mg/kg. Concentrations above 130 mg/kg can be harmful to plants.

C.9 Cyanide as CN is in the range of <0.50 mg/kg. The levels on site are below guidelines of 50 mg/kg for domestic gardens.

C.10 Monohydric phenols dry weight was typically in the range of <0.50-2.7 mg/kg. The levels on site are below guidelines of 5 mg/kg for public open spaces.

C.11 The pH value was in the range 8.1-10.8, the samples were alkaline.

C.12 The soluble sulphates from a 2:1 water soil extract were in the range 0-0.22 mg/litre. No special measures to protect concrete are required.

C.13 Some of the metal concentrations (Copper, Nickel and Zinc) are slightly above trigger levels at which plants may suffer. It is to be noted however that plants were growing on the site and were healthy. These metals are not considered a health hazard and at these levels are not considered detrimental to typical garden planting.

RECOMMENDATIONS

R.1 As some of the area is intended for use as gardens, whilst it is not considered necessary to take steps to address the levels of metals, which are only marginally above trigger levels harmful to plants it is necessary to ensure that clean material is used exclusively in sensitive areas. It is a feature of the chemical testing that the contamination is isolated in pockets of high concentration. The averages are generally well within trigger limits. The contaminants relevant are hydrocarbons, which in the relevant concentrations should be evident by sight and smell.

R.2 Therefore it is not considered necessary to remove fill from site but in order to ensure satisfactory plant growth, and in consideration that fruit and vegetables may be grown, all rear gardens should have a 600mm thick layer of clean material/imported topsoil in order to ensure satisfactory plant growth.
This should be easily achievable due to the relatively small areas of rear gardens, which are less than 20% of the overall area of the site.
This sub topsoil material is to be selected from particular stockpiles tested and proved to be below acceptable trigger levels. No special measures are required for front gardens.

R.3 The above recommendations should be approved by the relevant authority prior to commencement of the development, and any further advice sought as necessary.



P Wade B.Tech (Hons), C.Eng., MICE, MIStructE.
12.0.04
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Substance	Units	Trigger	Sample Ref							
			C 1-1	C 1-2	C 1-3	C 1-4	C 1-5	C 1-6	C 1-7	C 1-8
Arsenic(Total)	mg/kg	10/40	34	26	16	18	10	7.4	16	8.7
Boron as B, hot water sol. dry wt.	mg/kg		0.65	1.9	0.43	2.6	1.1	0.59	0.52	2
Cadmium (Total)	mg/kg	3	0.55	0.64	<0.50	1.4	0.98	2.3	0.68	1
Chromium (Total)	mg/kg	600	20	24	63	15	19	20	21	250
Copper (Total)	mg/kg	50/130	64	37	8	50	35	45	48	39
Cyanide(Total)	mg/kg	25	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Lead (Total)	mg/kg	500	320	330	72	91	670	180	110	130
Mercury (Total)	mg/kg		4.5	1.3	<0.10	0.12	0.21	<0.10	0.34	<0.10
Nickel (Total)	mg/kg	35/70	20	22	47	22	16	17	18	27
Phenols(Total)	mg/kg	5	2.7	0.67	<0.50	5.6	<0.50	<0.50	1.1	1.8
Selinium (Total)	mg/kg	3	0.77	0.5	0.51	0.59	0.25	0.2	0.71	0.4
Sulphate Total as SO3	%		0.16	0.21	<0.010	0.46	0.15	0.16	0.09	0.22
Sulphide as S	mg/kg	250	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	110	<5.0
Toluene Extractable Matter	mg/kg	1300	3200	350	520	1600	<200	590	15000	6800
Zinc (Total)	mg/kg	130/300	93	94	130	88	290	220	160	170
pH Value			9.6	9	8.1	9.3	8.8	10.8	9.1	8.6
PAH screen dry wt	mg/kg		670	51	7	140	14	53	420	290

C1/1-5

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For the attention of Mr P Wade

Site Reference : **Springfield Street, Barnsley**

Laboratory Report *SA/04/CNT/100-107*
Report Date 23-Jan-04

CONTAMINATION ANALYSIS OF SOILS

Date Sampled Not specified
Date Received 13/01/04
Analysis by LJCLS approved sub-contract laboratory (UKAS accredited) Analysis Completion 22/01/04

Laboratory Reference	SA/04/100	SA/04/101	SA/04/102	SA/04/103	SA/04/104	
Determinand	**Method Ref**	**Sample Reference** 1284/1 C1-1	1284/2 C1-2	1284/3 C1-3	1284/4 C1-4	1284/5 C1-5	**Units**
Arsenic (Total)	30/30C	34	26	16	18	10	mg/kg
Boron (Soluble)	6	0.65	1.9	0.43	2.6	1.1	mg/kg
Cadmium (Total)	30	0.55	0.64	0.50	1.4	0.98	mg/kg
Chromium (Hexavalent)	30B	Not required	Not required	0.15	Not required	Not required	mg/kg
Chromium (Total)	30	20	24	63	15	19	mg/kg
Copper (Total)	30	56	37	58	50	35	mg/kg
Lead (Total)	30	320	330	72	91	670	mg/kg
Mercury (Total)	30C	4.5	1.5	0.10	0.12	0.21	mg/kg
Nickel (Total)	30	20	22	17	22	16	mg/kg
Selenium (Total)	30C	0.77	0.50	0.51	0.59	0.25	mg/kg
Zinc (Total)	30	93	94	130	88	290	mg/kg
Cyanide (Total)	14	0.50	< 0.50	0.56	< 0.50	0.50	mg/kg
Phenols (Total)	40A	2.7	0.67	< 0.50	5.6	0.50	mg/kg
Sulphate (Total) as SO3	45	0.16	0.21	0.010	0.46	0.15	%
Sulphide as S	47	5.0	< 5.0	5.0	5.0	5.0	mg/kg
Toluene Ext Matter	43	3200	350	520	1600	200	mg/kg
pH	39	8.6	9.0	8.1	9.3	8.8	pH units
Sulphur (Elemental)	51	150	< 100	100	100	100	mg/kg
PAH (Total)	30T	670	51	7.0	140	14	mg/kg
Material description		F-e crushed concrete brick, ash & clinker with topsoil & rootlets	F-e crushed concrete, brick, ash & clinker with topsoil, rootlets over brown clay & mudstone	Soft, brown clay & mudstone with fine ash & some rootlets	F-e crushed concrete, brick, ash & clinker with occ rootlets	F-e crushed concrete brick & ash with occasional containing rootlets	

Report Ref SA/04/100-107 123

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Site Reference : **Springfield Street, Barnsley**

Laboratory Report. ***SA/04/CNT/100-107***
Report Date. 23-Jun-04

CONTAMINATION ANALYSIS OF SOILS

Date Sampled Not specified
Date Received 13/01/04
Analysis by LJCLS approved sub-contract laboratory (UKAS accredited) Analysis Completion 22/01/04

Laboratory Reference	SA/04/105	SA/04/106	SA/04/107

Determinand	Method Ref	Sample Reference 1284/6	1284/7	1284/8	Units
		C:-6	C-7	C:-8	
Arsenic (Total)	30/30C	7.4	16	8.7	mg/kg
Boron (Soluble)	6	0.59	0.52	2.0	mg/kg
Cadmium (Total)	30	2.3	0.68	1.0	mg/kg
Chromium (Hexavalent)	30B	Not required	Not required	< 0.10	
Chromium (Total)	30	20	21	250	mg/kg
Copper (Total)	30	45	48	39	mg/kg
Lead (Total)	30	180	110	130	mg/kg
Mercury (Total)	30C	0.10	0.34	< 0.10	mg/kg
Nickel (Total)	30	17	18	27	mg/kg
Selenium (Total)	30C	0.20	0.71	0.40	mg/kg
Zinc (Total)	30	220	160	170	mg/kg
Cyanide (Total)	14	0.50	< 0.50	< 0.50	mg/kg
Phenols (Total)	40A	0.50	1.1	1.8	mg/kg
Sulphate (Total) as SO3	45	0.16	0.090	0.22	%
Sulphide as S	47	< 5.0	110	< 5.0	mg/kg
Toluene Ext Matter	43	590	15000	6800	mg/kg
pH	39	10.8	9.1	8.6	pH units
Sulphur (Elemental)	51	100	110	120	mg/kg
PAH (Total)	30/7	5.3	420	290	mg/kg
Material description		Fine crushed concrete, brick & ash with topsoil containing rootlets	Fine crushed concrete & brick with topsoil containing rootlets	Fine crushed concrete & brick with topsoil containing rootlets	

end of report

P. Dewhurst

P Dewhurst (Analytical Laboratory Manager)
pp L J Church Laboratory Services Ltd

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Report Ref. SA-04-100-107.123

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APPENDIX B

Site layout 1812/sk1

LAND AT STATION ROAD
BARNSLEY



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LANCASTERS POWELL LTD
UNIT 7
MORSTON CLAYCLIFFE OFFICE PARK
WHALEY ROAD
BARUGH GREEN

APPENDIX C

PWC Drawing

APPENDIX D

Geoenvironmental Assessment by AIG

AIG Consultants

Facsimile Cover Sheet

Date: 17th July 2002 Ref: 2742
Page 1 of: 7 + 1

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FAX MESSAGE

Springfield Mills, Barnsley

Below are our preliminary conclusions based on the ground investigation undertaken between 3rd and 12th July 2002. These findings may be modified in the light of laboratory testing results and during the more rigorous review of field data that will be undertaken prior to issue of our report.

Summary of Desk Top Study

AIGC have undertaken a preliminary investigation (desk study) of the proposed development land which is presented in report 2742/1 dated May 2002. A summary of the report is provided below.

The site is centred at National Grid Reference SE 335 064, approximately 1km west from Barnsley town centre. The site consists of a single parcel of land covering an area of approximately 2.7 hectares (6.7acres). The site is currently accessed from both Farrar Street and Perseverance Street.

The majority of the site is located directly on a sandstone unit of the Coal Measures Strata and no drift deposits are shown. The south west corner of the site is shown to be directly underlain by undivided Coal Measures strata. The Coal Measures strata consists of alternating units of sandstone, mudstone and coal

The site is potentially affected by three sources of ground gas, these are summarised below:

- Four closed landfill sites, located within 250m of the site,
- A backfilled reservoir within the centre of the site,
- Coal measures strata and local collieries which are commonly sources of mines gas.

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Facsimile Cover Sheet

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It is has therefore been recommended that a comprehensive gas risk assessment is undertaken to assess the impact of the potential gas risk to any proposed development at the site.

In addition, the site is located in an area that is susceptible to radon gas. Any development will require basic measures to protect against radon gas accumulation.

The site has been subjected to former industrial uses, including railway land industrial buildings (works, depots etc) and fuel tanks. Potential sources of contamination have been identified based on the historical and current land usage.

It was therefore recommended that a comprehensive, development specific ground investigation be carried out to assess the issues identified in this report.

Ground Investigation:

The ground investigation was undertaken to assess the issues identified within the desk study and comprised the excavation of 15 trial pits, 20 window sample holes, 4 light cable percussive boreholes and 4 rotary probeholes. A plan showing their locations is in preparation and will be forwarded shortly. A complete record of the strata encountered is provided on the exploratory hole logs and these will follow by post. However, a summary of the ground conditions is provided below.

The site has been split into four areas for ease of explanation. The overgrown field is referred to as **Area A**, the former railway embankment is referred to as **Area B**, the warehouse buildings and hardstanding areas as **Area C** and the disused yard as **Area D**.

Made Ground

Made Ground was identified in all trial pits across the site, with the exception trial pits 7 to 9 in Area A.

Area A

Made ground consisting of a topsoil with a small proportion of brick was encountered in TP10 to a depth of 0.45m bgl. Made ground was not encountered within any of the remaining exploratory holes excavated in this area.

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Area B

Within Area B (railway embankment and former sidings) made ground was encountered to a maximum depth of 3.2m bgl. It was noted that the depth of made increased from west to east, with made ground within the west of the site encountered to a depth of 0.80m.

Made ground generally consisted a cover of tarmac or concrete, where encountered, over an ash and clinker to approximately 0.75m, this was in turn underlain by clay fill.

Area C

Made ground within Area C was encountered to a maximum depth of 6.0m bgl, this thickness of made ground was encountered adjacent to a retaining wall within the centre of the site and consisted of ash and clinker, broken brick and demolition rubble. Other exploratory holes located near to this retaining wall encountered similar ground conditions.

Across the remainder of Area C, made ground was encountered to an average depth of 1.0m bgl and consisted a hardcore or concrete/tarmac hardstand over a mixture of ash and clinker, clay fill and demolition rubble. The depth of made ground was shown to increase towards the retaining wall.

Window sample holes drilled within the milk float storage area proved made ground to a maximum depth of 2.2m bgl. This depth of made ground was encountered next to the boundary with Area D.

Area D

Made ground within Area D was encountered to a maximum depth of 4.70m bgl and consisted of a mixture of clay fill, broken brick and ash and clinker.

Natural Ground

Where encountered, natural ground generally consisted of firm orange brown and grey mottled clay, typical of weathered coal measures strata. Hand vane tests were carried out where possible, both in-situ and on ex-situ samples. The results of the shear vane testing indicated shear strengths of between 65 and 120kPa, ie firm to stiff clays. The clay was underlain by a weathered thinly laminated greyish brown mudstone and /or yellowish brown sandstone.

Ground conditions within the trial pits are summarised in the table below.

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Facsimile Cover Sheet

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Summary Ground Conditions within Trial Pits
(Depths shown in metres)

Site Area	Expl Location	Final Depth	Depth Made Ground	Nature of Made Ground	Natural Ground	G/W
A	TP7	2.2	-	-	TOPSOIL 0.0 to 0.3, MUDSTONE 0.3 to 2.2	-
A	TP8	2.3	-	-	TOPSOIL 0.0 to 0.3, SANDSTONE 0.3 to 2.3	-
A	TP9	2.6	-	-	TOPSOIL 0.0 to 0.23, CLAY 0.23 to 1.6, MUDSTONE 1.6 to 2.6	2.2
A	TP10	3.6	0.45	Topsoil fill 0.0 to 0.45	Buried TOPSOIL 0.45 to 0.6, CLAY 0.6 to 1.8, MUDSTONE 1.8 to 3.6	-
B	TP1	2.1	0.8	Ash/Clinker fill 0.0 to 0.4, Cly fill 0.4 to 0.8	CLAY 0.8 to 0.9, SANDSTONE 0.9 to 2.1	-
B	TP2	3.2	1.5	Tarmac 0.0 to 0.05, Subbase 0.05 to 0.15, Ash/clinker fill 0.15 to 0.7, Cly fill 0.7 to 1.5	CLAY 1.5 to 1.65, SANDSTONE 1.65 to 3.2.	-
B	TP3	3.2	2.0	Tarmac 0.0 to 0.05, Red Shale fill 0.05 to 0.15, Ash/clinker fill 0.15 to 0.66, Cly fill 0.66 to 0.8, Gravelly Cly fill 0.8 to 2.0	SANDSTONE 2.0 to 3.2	-
B	TP4	3.7	3.2	Demo fill 0.0 to 0.3, Ash/Clinker fill 0.3 to 0.7, Cly Fill 0.7 to 3.2	MUDSTONE 3.2 to 3.7	-
C	TP5	3.1	>3.1	Concrete 0.0 to 0.2, Demo fill 0.2 to 0.4, Ash/Clinker fill 0.4 to 3.1	-	-
C	TP6	3.2	>3.2	Concrete 0.0 to 0.26, Demo fill 0.26 to 0.47, Ash/Clinker fill 0.47 to 3.1	-	-
C	TP14	2.5	0.7	Tarmac 0.0 to 0.05, Ash/clinker fill 0.05 to 0.2, Concrete 0.2 to 0.25, Cly Fill 0.2 to 0.7	CLAY 0.7 to 2.0, SANDSTONE 2.0 to 2.5.	-
C	TP15	1.3	>1.30	Hardcore 0.0 to 0.1, Demo fill 0.1 to 1.3	-	-
C	TP16	2.0	0.65	Hardcore 0.0 to 0.17, Demo fill 0.17 to 0.65	SANDSTONE 0.65 to 2.0	-
C	TP17	2.0	0.65	Hardcore 0.0 to 0.17, Demo fill 0.17 to 0.65	SANDSTONE 0.65 to 2.0	-
D	TP19	3.2.	2.5	Demo fill 0.0 to 0.4, Setts 0.4 to 0.5, Cly Fill 0.5 to 0.75, Ash/clinker fill 0.75 to 2.5	CLAY 2.5 to 3.2	-

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Facsimile Cover Sheet

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Trial pits 11, 12, 13, 18 and 20 were not excavated due to access restrictions.

Water seepages were generally not encountered in any trial pits or window sample holes. However, a slight seepage was noted within TP9 at 2.2m.

Stability within the made ground was generally good, however some pit side collapses were noted within the loose ash and clinker and demolition rubble fill.

Stability within the natural ground was good.

Several concrete obstructions were encountered during the ground investigation. It is concluded that relict foundations associated with former buildings located on the site could be present within the site.

Four **probeholes** were drilled across the site to depths between 20 and 25m bgl. The objective of drilling the probeholes was to install deep gas monitoring well into the Coal Measures strata in order to monitor for mines gas. The strata below the site was shown to be sandstone and mudstone, which is typical of Coal Measures strata. No coal seams were encountered in any of the probeholes.

Ground Contamination

Olfactory evidence of fuel contamination was noted at shallow depth within WS12 adjacent to an old above ground fuel tank. However, it is anticipated that the contamination is limited to the area immediately around the tank.

Visual evidence of contamination was noted within the haulage yard, within the east of the site, this comprised localised surface spillage of engine oils. However, no olfactory evidence of contamination was encountered.

Ash/clinker fill was encountered within the railway embankment (Area B), the former yard (Area D) and adjacent to the retaining wall (Area C). Ash and clinker is likely to contain concentrations of sulphate, toxic and phytotoxic metals and has the potential to be combustible, this may necessitate provision of a suitable capping layer over these materials.

Laboratory analysis of soils and made ground is currently being undertaken to identify any contamination within the site.

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Foundations

Made ground is not considered a suitable foundation material for residential properties. It is likely that site-wide reprofiling would be carried out as a precursor to the proposed redevelopment.

Within Area D and parts of Area C the site is underlain by made ground which has been found to be up to 6m deep. Several foundation solutions could be used within these areas. These could include rafts on engineered fill, piles and ground improvement by vibro-replacement i.e dwellings founded on stone columns installed through the existing made ground.

The made ground contains a substantial proportion of oversized material and it is recommended that where made ground is to be engineered to take raft foundations, the material should first be excavated, screened and crushed to an acceptable grading.

Engineering of the made ground would probably be best undertaken by turnover of the upper 2 to 3m of made ground. Turnover is considered an appropriate ground improvement solution since significant excavation of the made ground will be required in any case to remove relict foundations, structures and services etc and to form a relatively level development platform.

Because turnover enables inspection of the upper layers of fill, the developer and their prospective property purchasers are provided with the reassurance that no significant hazard is left undetected. This is considered advantageous from a perception viewpoint.

Within parts of Area A, B and C it is considered that Strip/Trench fill footings excavated through the shallow made ground (where encountered) and founded onto the natural clay soils of adequate bearing capacity or bedrock could be adopted.

Selection of the foundation solution is likely to be controlled by final site levels whereby it would be possible, via a cut and fill operation to produce a relatively level platform over the whole site.

Existing Services

Area D is affected by a deep, large diameter sewer. Dependent on the final layout, it is likely that this sewer will require realigning.

An electricity main runs approximately north south through Areas B and C, serving off-site properties. Again, dependent on final layout, this will likely require realigning.

Table 1 - Summary Ground Conditions within Trial Pits, Window Sample Holes and Boreholes (Depths shown in metres). Refer to Drawing 2742/5 for location of Areas A, B, C, D.

(Depths shown in metres)

Site Area	Exploratory Location	Final Depth	Depth to Made Ground	Nature of Made Ground	Natural Ground	GW
A	TP7	2.2	-	-	TOPSOIL 0.0 to 0.3, MUDSTONE 0.3 to 2.2	-
A	TP8	2.3	-	-	TOPSOIL 0.0 to 0.3, SANDSTONE 0.3 to 2.3	-
A	TP9	2.6	-	-	TOPSOIL 0.0 to 0.23, CLAY 0.23 to 1.6, MUDSTONE 1.6 to 2.6	2.2
A	TP10	3.6	0.45	Topsoil fill 0.0 to 0.45	Buried TOPSOIL 0.45 to 0.6, CLAY 0.6 to 1.8, MUDSTONE 1.8 to 3.6	-
A	BH2	4.25	-	-	TOPSOIL 0.0 to 0.25, CLAY 0.25 to 0.7, MUDSTONE 0.7 to 4.25	4.1
B	TP1	2.1	0.8	Ash/Clinker fill 0.0 to 0.4, Cly fill 0.4 to 0.8	CLAY 0.8 to 0.9, SANDSTONE 0.9 to 2.1	-
B	TP2	3.2	1.5	Tarmac 0.0 to 0.05, Subbase 0.05 to 0.15, Ash/clinker fill 0.15 to 0.7, Cly fill 0.7 to 1.5	CLAY 1.5 to 1.65, SANDSTONE 1.65 to 3.2.	-
B	TP3	3.2	2.0	Tarmac 0.0 to 0.05, Red Shale fill 0.05 to 0.15, Ash/clinker fill 0.15 to 0.66, Cly fill 0.66 to 0.8, Gravelly Cly fill 0.8 to 2.0	SANDSTONE 2.0 to 3.2	-
B	TP4	3.7	3.2	Demo fill 0.0 to 0.3, Ash/Clinker fill 0.3 to 0.7, Cly Fill 0.7 to 3.2	MUDSTONE 3.2 to 3.7	-
B	BH3	1.65	0.5	Topsoil, 0.0 to 0.05, Ash and Clinker Fill 0.05 to 0.5	SANDSTONE 0.5 to 1.65	
C	TP5	3.1	>3.1	Concrete 0.0 to 0.2, Demo fill 0.2 to 0.4, Ash/Clinker fill 0.4 to 3.1	-	-
C	TP6	3.2	>3.2	Concrete 0.0 to 0.26, Demo fill 0.26 to 0.47, Ash/Clinker fill 0.47 to 3.1	-	-
C	TP14	2.5	0.7	Tarmac 0.0 to 0.05, Ash/clinker fill 0.05 to 0.2, Concrete 0.2 to 0.25, Cly Fill 0.2 to 0.7	CLAY 0.7 to 2.0, SANDSTONE 2.0 to 2.5.	-
C	TP15	1.3	>1.30	Hardcore 0.0 to 0.1, Demo fill 0.1 to 1.3	-	-
C	TP16	2.0	0.65	Hardcore 0.0 to 0.17, Demo fill 0.17 to 0.65	SANDSTONE 0.65 to 2.0	-
C	TP17	2.0	0.65	Hardcore 0.0 to 0.17, Demo fill 0.17 to 0.65	SANDSTONE 0.65 to 2.0	-
C	BH1	3.6	3.6	Demo Fill 0.0 to 2.0, Gravelly Clay Fill 2.0 to 3.5, Concrete 3.5 to 3.6	-	
C	BH1A	7.8	5.4	Brick Fill 0.0 to 0.9, Ash/Brick Fill 0.9 to 5.4	Alluvial Clay 5.4 to 6.0, MUDSTONE 6.0 to 7.8	7.3
C	WS1	2.8	0.7	Concrete 0.0 to 0.1, Subbase 0.1 to 0.35, Clay fill 0.35 to 0.7	CLAY 0.7 to 1.5, MUDSTONE 1.5 to 2.8	-

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LS22 7RD

Analysis

		Laboratory Number	49446974	49446975	49446976	49446977
		Sampling Date	10/07/02	10/07/02	10/07/02	10/07/02
		Sample Point	WS6 1D 0.2-0.35	WS1 1D 0.4-0.7	TP1 1D 0.1	TP1 2D 0.85
Method Code	***Units***	***Determinands***				
R3.6	pH Units	pH (soil)		7.7	5.7	6.6
R*	mg/l	Sulphide (leach)		< 0.10	< 0.10	
R11.3	%	Solids air dried	84.2	85.7	86.6	82.4
R11.1	%	Total Solids			85.1	
R11.1	%	Total Ash Solids (DSB)			73.1	
R11.7	%	Stones greater than 10mm	60.4	61.5	28.5	0
R3.6	pH Units	pH (filtered)		7	6.3	
R3.3	uS/cm	Conductivity @ 20c		90	30	
R2.3.2	mg/l N	Nitrogen Ammoniacal		1.23	2.38	
R2.4.2	mg/l	Chloride		< 20.0	36.4	
R8B	% SO4	Sulphate (soil)		0.039	0.08	0.058
R5.5	g/l SO4	Sulphate (2:1 H2O ext)		0.08	0.04	0.02
R2.5.1	mg/kg	Cyanide(total) (DSB)		< 0.50	< 0.50	< 0.50
R*	kJ/kg	Calorific value			13700	
R2.21.2	mg/kg	Phenol monohydric (DSB)		2.2	< 1.50	< 1.50
R9B	ug/l	Arsenic (leach)		1.9	2.8	
R8B	mg/l	Cadmium(leach)		< 0.0002	0.0003	
R8B	mg/l	Chromium(leach)		< 0.002	< 0.002	
R8B	mg/l	Lead(leach)		0.005	0.01	
R9A	ug/l	Mercury (leach)		0.07	< 0.05	
R9B	ug/l	Selenium (Leach)		< 0.8	< 0.8	
R8B	mg/l	Copper(leach)		0.007	0.033	
R8B	mg/l	Nickel(leach)		< 0.005	0.014	
R8B	mg/l	Zinc (leach)		0.02	0.04	
R8B	mg/l	Boron (leach)		< 0.05	< 0.05	
R5.5	mg/l	Sulphate (leach)		12.3	5.1	
R8B	mg/kg	Arsenic (soil)		11.5	41.1	21.8
R8B	mg/kg	Cadmium (soil)		0.19	0.72	0.32
R8B	mg/kg	Chromium (soil)		24.1	19.7	26.7
R8B	mg/kg	Lead (soil)		25.8	124	59.3
R*	mg/kg	Mercury (soil)		< 0.10	0.21	0.4
R*	mg/kg	Selenium (soil)		2.87	5.23	3.55
R8B	mg/kg	Copper (soil)		18.6	212	39.3
R8B	mg/kg	Nickel (soil)		18.9	49.7	25.7
R*8B	mg/kg	Zinc (soil)		73.1	212	103
R*8B	mg/kg	Boron (soil) (water sol)		< 1.27	< 1.27	< 1.27

Steve Scott, Laboratory Manager

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AIG House
Audby Lane
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LS22 7RD

Analysis

		Laboratory Number	49446978	49446979	49446980	49446981
		Sampling Date	10/07/02	10/07/02	10/07/02	10/07/02
		Sample Point	TP2 1D 0.3	TP2 2D 0.85	TP3 1D 0.3	TP3 5D 2.5
Method Code	***Units***	***Determinands***				
R3.6	pH Units	pH (soil)	7.8	8	8	8
R*	mg/l	Sulphide (leach)	< 0.10		< 0.10	
R11.3	%	Solids air dried	92.2	88.5	85.3	89.7
R11.1	%	Total Solids	90.4		83.3	
R11.1	%	Total Ash Solids (DSB)	85.4		83.4	
R11.7	%	Stones greater than 10mm	31.9	40.6	42.5	36
R3.6	pH Units	pH (filtered)	7.3		8.1	
R3.3	uS/cm	Conductivity @ 20c	1400		144	
R2.3.2	mg/l N	Nitrogen Ammoniacal	1.1		0.71	
R2.4.2	mg/l	Chloride	< 20.0		< 20.0	
R8B	% SO4	Sulphate (soil)	1130	0.063	0.093	< 0.030
R5.5	g/l SO4	Sulphate (2:1 H2O ext)	1.85	0.21	0.08	< 0.02
R2.5.1	mg/kg	Cyanide(total) (DSB)	< 0.50	< 0.50	< 0.50	< 0.50
R*	kJ/kg	Calorific value	7590		6370	
R2.21.2	mg/kg	Phenol monohydric (DSB)	< 1.50	< 1.50	< 1.50	< 1.50
R9B	ug/l	Arsenic (leach)	< 0.8		1.7	
R8B	mg/l	Cadmium(leach)	< 0.0002		< 0.0002	
R8B	mg/l	Chromium(leach)	< 0.002		< 0.002	
R8B	mg/l	Lead(leach)	< 0.005		< 0.005	
R9A	ug/l	Mercury (leach)	< 0.05		< 0.05	
R9B	ug/l	Selenium (Leach)	< 0.8		1.1	
R8B	mg/l	Copper(leach)	0.005		0.015	
R8B	mg/l	Nickel(leach)	< 0.005		0.007	
R8B	mg/l	Zinc (leach)	0.01		0.01	
R8B	mg/l	Boron (leach)	0.05		< 0.05	
R5.5	mg/l	Sulphate (leach)	990		16.9	
R8B	mg/kg	Arsenic (soil)	37.2	15.6	27.6	4.64
R8B	mg/kg	Cadmium (soil)	0.53	0.34	0.67	0.18
R8B	mg/kg	Chromium (soil)	29.3	27.3	21.7	30.6
R8B	mg/kg	Lead (soil)	41.3	28.8	268	20.6
R*	mg/kg	Mercury (soil)	0.33	0.12	0.46	< 0.10
R*	mg/kg	Selenium (soil)	5.3	2.22	4.83	2.7
R8B	mg/kg	Copper (soil)	32.2	27.3	222	28.4
R8B	mg/kg	Nickel (soil)	30	29.3	34.7	37.2
R*8B	mg/kg	Zinc (soil)	84.8	82.7	284	99
R*8B	mg/kg	Boron (soil) (water sol)	1.79	< 1.27	< 1.27	< 1.27

Steve Scott, Laboratory Manager

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Audby Lane
Wetherby
LS22 7RD

Analysis

		Laboratory Number	49446982	49446983	49446984	49446985
		Sampling Date	10/07/02	10/07/02	10/07/02	10/07/02
		Sample Point	TP4 1D 0.5	TP4 4D 1.5	TP4 5D 3.5	TP5 1D 0.75
Method Code	***Units***	***Determinands***				
R3.6	pH Units	pH (soil)		5.4	7.6	8.8
R*	mg/l	Sulphide (leach)		< 0.10		< 0.10
R11.3	%	Solids air dried	91.6	83.8	92.3	87
R11.1	%	Total Solids	89.8			83
R11.1	%	Total Ash Solids (DSB)	73.8			85.1
R11.7	%	Stones greater than 10mm	49.5	0	44.9	23
R3.6	pH Units	pH (filtered)		6		8.4
R3.3	uS/cm	Conductivity @ 20c		60		440
R2.3.2	mg/l N	Nitrogen Ammoniacal		1.19		0.65
R2.4.2	mg/l	Chloride		< 20.0		< 20.0
R8B	% SO4	Sulphate (soil)		< 0.030	< 0.030	0.491
R5.5	g/l SO4	Sulphate (2:1 H2O ext)		0.06	< 0.02	1.47
R2.5.1	mg/kg	Cyanide(total) (DSB)		< 0.50	< 0.50	< 0.50
R*	kJ/kg	Calorific value	6450			2080
R2.21.2	mg/kg	Phenol monohydric (DSB)		< 1.50	< 1.50	< 1.50
R9B	ug/l	Arsenic (leach)		< 0.8		78.8
R8B	mg/l	Cadmium(leach)		< 0.0002		< 0.0002
R8B	mg/l	Chromium(leach)		< 0.002		0.002
R8B	mg/l	Lead(leach)		< 0.005		< 0.005
R9A	ug/l	Mercury (leach)		< 0.05		< 0.05
R9B	ug/l	Selenium (Leach)		< 0.8		1.2
R8B	mg/l	Copper(leach)		0.003		0.006
R8B	mg/l	Nickel(leach)		< 0.005		< 0.005
R8B	mg/l	Zinc (leach)		0.02		0.01
R8B	mg/l	Boron (leach)		< 0.05		0.06
R5.5	mg/l	Sulphate (leach)		20.6		214
R8B	mg/kg	Arsenic (soil)		10.1	2.76	77.5
R8B	mg/kg	Cadmium (soil)		0.09	0.17	1.11
R8B	mg/kg	Chromium (soil)		26.4	24.9	26.9
R8B	mg/kg	Lead (soil)		20.5	17.1	411
R*	mg/kg	Mercury (soil)		0.19	< 0.10	2.45
R*	mg/kg	Selenium (soil)		0.81	1.01	3.89
R8B	mg/kg	Copper (soil)		27.5	28.3	64.8
R8B	mg/kg	Nickel (soil)		33.3	40.8	21.1
R*8B	mg/kg	Zinc (soil)		83.7	94.2	137
R*8B	mg/kg	Boron (soil) (water sol)		< 1.27	< 1.27	< 1.27

Steve Scott, Laboratory Manager

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Analysis

		Laboratory Number	49446982	49446983	49446984	49446985
		Sampling Date	10/07/02	10/07/02	10/07/02	10/07/02
		Sample Point	TP4 1D 0.5	TP4 4D 1.5	TP4 5D 3.5	TP5 1D 0.75
Method Code	***Units***	***Determinands***				
R3.6	pH Units	pH (soil)		5.4	7.6	8.8
R*	mg/l	Sulphide (leach)		< 0.10		< 0.10
R11.3	%	Solids air dried	91.6	83.8	92.3	87
R11.1	%	Total Solids	89.8			83
R11.1	%	Total Ash Solids (DSB)	73.8			85.1
R11.7	%	Stones greater than 10mm	49.5	0	44.9	23
R3.6	pH Units	pH (filtered)		6		8.4
R3.3	uS/cm	Conductivity @ 20c		60		440
R2.3.2	mg/l N	Nitrogen Ammoniacal		1.19		0.65
R2.4.2	mg/l	Chloride		< 20.0		< 20.0
R8B	% SO4	Sulphate (soil)		< 0.030	< 0.030	0.491
R5.5	g/l SO4	Sulphate (2:1 H2O ext)		0.06	< 0.02	1.47
R2.5.1	mg/kg	Cyanide(total) (DSB)		< 0.50	< 0.50	< 0.50
R*	kJ/kg	Calorific value	6450			2080
R2.21.2	mg/kg	Phenol monohydric (DSB)		< 1.50	< 1.50	< 1.50
R9B	ug/l	Arsenic (leach)		< 0.8		78.8
R8B	mg/l	Cadmium(leach)		< 0.0002		< 0.0002
R8B	mg/l	Chromium(leach)		< 0.002		0.002
R8B	mg/l	Lead(leach)		< 0.005		< 0.005
R9A	ug/l	Mercury (leach)		< 0.05		< 0.05
R9B	ug/l	Selenium (Leach)		< 0.8		1.2
R8B	mg/l	Copper(leach)		0.003		0.006
R8B	mg/l	Nickel(leach)		< 0.005		< 0.005
R8B	mg/l	Zinc (leach)		0.02		0.01
R8B	mg/l	Boron (leach)		< 0.05		0.06
R5.5	mg/l	Sulphate (leach)		20.6		214
R8B	mg/kg	Arsenic (soil)		10.1	2.76	77.5
R8B	mg/kg	Cadmium (soil)		0.09	0.17	1.11
R8B	mg/kg	Chromium (soil)		26.4	24.9	26.9
R8B	mg/kg	Lead (soil)		20.5	17.1	411
R*	mg/kg	Mercury (soil)		0.19	< 0.10	2.45
R*	mg/kg	Selenium (soil)		0.81	1.01	3.89
R8B	mg/kg	Copper (soil)		27.5	28.3	64.8
R8B	mg/kg	Nickel (soil)		33.3	40.8	21.1
R*8B	mg/kg	Zinc (soil)		83.7	94.2	137
R*8B	mg/kg	Boron (soil) (water sol)		< 1.27	< 1.27	< 1.27

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Steve Scott, Laboratory Manager

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Table 6 – Summary of Degree of Ground Contamination (Standard Suite) at Springfield Mills, Barnsley

Area of Site	Sample No. Location & Depth (m)	Soil Type	pH Value	Concentrations of Contaminants Considered Likely to Present Risks to Human Health Based on Residential Land Use with Plant Uptake (Concentrations are shown in mg/kg)															
				As (10)+	B (3)+	Cd (50)+	Cr (500)+	Cu (3)+	Hg (1)+	Ni (50)+	Pb (3)+	Se (130)+	Sn (50)+	Zn (200)+	Phenol (5)+	CN (25)+	Total SO4 (0.2%)◊	SW SO4 (1.2 g/l)◊	EXTRACTABLE S (50)◊
A	TP9 0.15	Topsoil	5.0	53.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	TP10 0.3	Topsoil	7.4	17.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	TP1 0.1	MG: Ash & Clinker Fill	5.7	41.1	-	-	-	-	5.2	-	-	-	-	-	-	-	-	-	-
B	TP1 0.85	Weathered Coal Measures	6.6	21.8	-	-	-	-	3.6	-	-	-	-	-	-	-	-	-	-
B	TP2 0.3	MG: Ash & Clinker Fill	7.8	37.2	-	-	-	-	5.3	-	-	-	-	-	-	1.1	1.9	55
B	TP2. 0.85	MG: Clay fill	8.0	15.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	TP3 0.3	MG: Ash & Clinker Fill	8.0	27.6	-	-	-	-	4.8	-	222	-	-	-	-	-	-	78
B	TP3 2.5	SANDSTONE	8.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	TP4 1.5	MG: Clay fill	5.4	10.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	TP4 3.5	SANDSTONE	7.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	TP5 0.75	MG: Ash & Clinker Fill	8.8	77.5	-	-	-	2.5	3.9	-	-	-	-	-	-	0.5	1.5	1,150
C	TP6 3.0	MG: Ash & Clinker Fill	8.5	36.7	-	-	-	-	-	-	-	-	-	-	-	0.3	-	320
C	TP14 0.5	MG: Clay fill	8.1	17.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	TP15 0.5	MG: Demo Rubble Fill	8.8	-	-	-	-	-	-	-	-	-	-	-	-	0.3	-	74
C	TP17 0.5	MG: Demo Rubble Fill	9.1	15.6	-	-	617	1.6	-	-	-	-	-	-	-	0.3	-	850
C	WS1 0.4 – 0.7	MG: Clay fill	7.7	11.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	TP19 0.8	MG: Ash & Clinker Fill	7.9	46.1	-	-	-	-	4.3	-	137	-	328	-	-	0.2	-	703
D	TP19 2.7	Weathered Coal Measures	7.6	14.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Key

- Parameter tested for but found not to be in Excess of relevant trigger level concentration
- Parameter not tested for

Source of guidance trigger level

* ICRCL Guidance Note 59/83, Second Edition (1987)

\+ Health and Safety Executive "Protection of Waters and the General Public during the Development of Contaminated Land", HSE, 1991

o Dutch E-3c Intervention Levels for Soil Remediation (1994)

◊ BRE Digest 363, Sulphate and Acid Resistance of Concrete in the Ground (1991)

TRIAL PIT LOG

AIG CONSULTANTS

CLIENT Ben Bailey Homes Ltd

SITE Springfield Mills, Barnsley

TP1

DATE 3 Jul 02 Co-ords Sheet 1 of 1

Ground Level Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
1D	0.10		MADE GROUND: ? Loose damp dark greyish brown silty sand of ash and clinker with a little broken brick and sandstone gravel. (Ash and Clinker Fill).	0.40			
2D	0.50		MADE GROUND: ? Firm moist yellowish brown clay with much fine to coarse subangular to subrounded gravel of sandstone. (Clay Fill).	0.80			
3D	0.85		? Firm moist brown sandy CLAY with a little fine to coarse subangular to subrounded gravel with some rootlets. (Buried Topsoil).	0.90			
			? Very weak yellowish brown fine grained thinly bedded SANDSTONE, recovered as a sandy fine to coarse tabular gravel. (Coal Measures Strata).				
4D	2.00			2.10			
			End of trial pit at 2.10 m				

Remarks

1. Groundwater: No flows encountered.
2. Stability: Good.
3. Ease of Excavation: Moderate, difficult below 1.5m.

Equipment/Methods	Logged by	JOB	FIGURE
JCB Sitemaster with 0.3m wide toothed bucket and breaker	JWH	2742	

TRIAL PIT LOG

AIG CONSULTANTS

CLIENT Ben Bailey Homes Ltd

SITE Springfield Mills, Barnsley

TP2

DATE 3 Jul 02 Co-ords Sheet 1 of 1

Ground Level Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
			MADE GROUND: Tarmac	0.05			
1D	0.30		MADE GROUND: ? Dense damp dark grey sandy fine to coarse gravel. (Subbase).	0.15			
			MADE GROUND: ? Loose damp dark grey sand and gravel of ash and clinker with a little coal. (Ash and Clinker Fill)	0.70			
2D	1.00		MADE GROUND: ? Firm moist yellowish brown clay with much fine to coarse subangular to subrounded gravel of sandstone, with a single brick at 1.2m. (Clay Fill).				
3D	1.30			1.50			
			? Firm moist brown sandy CLAY with a little fine to coarse subangular to subrounded gravel with some rootlets. (Buried Topsoil).	1.65			
4D	2.00		? Very weak yellowish brown fine grained thinly bedded SANDSTONE, recovered as a clayey sandy fine to coarse tabular gravel. (Coal Measures Strata).				
			End of trial pit at 3.20 m	3.20			

Remarks

1. Groundwater: No flows encountered.
2. Stability: Good.
3. Ease of Excavation: Moderate, difficult below 2.5m.

Equipment/Methods	Logged by	JOB	FIGURE
JCB Sitemaster with 0.3m wide toothed bucket and breaker	JWH	2742	

TRIAL PIT LOG

AIG CONSULTANTS

CLIENT Ben Bailey Homes Ltd

SITE Springfield Mills, Barnsley

TP3

DATE 3 Jul 02 Co-ords Sheet 1 of 1

Ground Level Scale *1:25*

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
			MADE GROUND: Tarmac	*0.05*			
1D	*0.30*		MADE GROUND: ? Dense damp reddish brown clayey fine to coarse angular gravel of burnt red shale. (Red Shale Fill).	0.15			
2D	0.75		MADE GROUND: ? Dense damp dark greyish brown sand and gravel of ash and clinker with some whole and broken bricks (10%) and a little gravel of coal and glass. (Ash and Clinker Fill).	0.66			
3D	1.20		MADE GROUND: Firm moist greyish brown sandy clay with much broken brick (25%) and fine to coarse gravel of mudstone. (Clay Fill).	0.80			
4D	1.50		MADE GROUND: Firm moist yellowish brown sandy clay *with much fine to coarse subangular gravel of mudstone* and sandstone. Some bands of buried topsoil between 0.9 and 1.5m. (Clay Fill).	2.00			
5D	2.50		? Very weak yellowish brown fine grained thinly bedded SANDSTONE, recovered as a clayey sandy fine to coarse tabular gravel. (Coal Measures Strata).	3.20			
			End of trial pit at 3.20 m				

Remarks
1. Groundwater: No flows encountered.
2. Stability: Good.
3. Ease of Excavation: Moderate, difficult below 2.5m.

Equipment/Methods	Logged by	JOB	FIGURE
JCB Sitemaster with 0.3m wide toothed bucket and breaker	JWH	2742	

TRIAL PIT LOG

AIG CONSULTANTS

CLIENT Ben Bailey Homes Ltd

SITE Springfield Mills, Barnsley

TP4

DATE 3 Jul 02 Co-ords Sheet 1 of 1

Ground Level Scale 1:25

sample no & type	depth (m)	in-situ test	description	depth (m)	level (m)	ground water	legend
1D	0.15		MADE GROUND: ? Loose damp grey gravelly sand with much broken and whole brick (30%) and concrete (10%). (Demo Rubble Fill).	0.30			
2D	0.50		MADE GROUND: ? Loose damp dark grey sand and gravel of ash and clinker with a little coal. (Ash and Clinker Fill).	0.70			
3D	0.80		MADE GROUND: ? Firm moist greyish brown sandy clay with a little fine to coarse angular gravel of mudstone. (Clay Fill).	0.90			
4D	1.50		MADE GROUND: ? Firm moist orange brown clay with a little broken brick. (Clay Fill).	3.20			
5D	3.50		? Very weak greyish brown thinly bedded MUDSTONE, recovered as a clayey fine to coarse tabular gravel. (Coal Measures Strata).	3.70			
			End of trial pit at 3.70 m				

Remarks

1. Groundwater: No flows encountered.
2. Stability: Good.
3. Ease of Excavation: Moderate, difficult below 2.5m.
4. Brick wall in northern and eastern faces of pit, to 3.1m bgl.

Equipment/Methods	Logged by	JOB	FIGURE
JCB Sitemaster with 0.3m wide toothed bucket and breaker	JWH	2742	

PROBEHOLE LOG

AIG CONSULTANTS

CLIENT Ben Bailey Homes Ltd

SITE Springfield Mills, Barnsley

PH3

DATE 5 July 02 Co-ords 0E 0N Sheet 1 of 2

Ground Level 0.0mAOD Scale 1:100

sample no & type	depth (m)	casing depth (m)	well/ backfill	description	depth (m)	level (m)	ground water	legend
				MADE GROUND: Backfill				
					1.80	-1.80		
				SANDSTONE				
					10.50	-10.50		
				MUDSTONE				
				Continued on next sheet				

Remarks

1. Groundwater not encountered.
2. Hole installed with a 8m deep, 50mm dia monitoring well.

Equipment/Methods	Logged by	JOB	FIGURE
Mustang tracked drilling rig equiped with 100mm tri-cone bit and air flush.	JWH	2742	

BOREHOLE LOG

AIG CONSULTANTS

CLIENT Ben Bailey Homes Ltd

SITE Springfield Mills, Barnsley

BH3

DATE 9 July 02 Co-ords Sheet 1 of 1

Ground Level Scale 1:50

sample no & type	depth (m)	casing depth (m)	U100 SPT & N value	well/ backfill	description	depth (m)	level (m)	ground water	legend
1D	0.40				? Loose damp dark brown silty SAND with *occasional fine to coarse subangular to subrounded gravel, with rootlets. (Topsoil).*	0.05			
2D	0.80		51/150mm		MADE GROUND: Loose damp dark grey silty sand *of ash and clinker with a little fine angular gravel* of brick. (Ash and Clinker Fill).	0.50			
3D	1.40		50/1mm		Very weak yellowish brown fine grained SANDSTONE, recovered as a sandy fine to coarse angular gravel. (Coal Measures Strata).	1.65			
					End of borehole at 1.65 m				

Remarks

1. No groundwater encountered.
2. *Chiselling from 1.4 - 1.6m for 1 hour.*
3. Hole installed with 50mm dia, 1.5m deep monitoring well.

Equipment/Methods	Logged by	JOB	FIGURE
Cable percussion drill rig fitted with 150mm tools.	JWH	2742	

APPENDIX E

Gas Report

RECEIVED 2 3 MAY 2002
12462

Report prepared for:

JOHN HARRISON
AIG CONSULTANTS
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LS22 7RD

RCM → JH

Radon Protective Measures Site Report

Advisory report on the requirement for radon protective measures in new dwellings

Stage 2 Geological Assessment for BR211 (1999)

Client's Reference:

2742 - SPRINGFIELD

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Radon (RPM) Site Report

a British Geological Survey (BGS) product

British Geological Survey

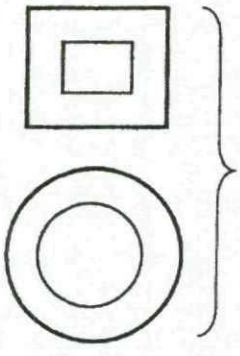
Section 1: Location and extent of report area

Area centred at: *SE 33500 06400*
Radius of site area: *250 metres*



Topography based on the latest 1:50,000 scale Ordnance Survey Maps with the permission of The Controller of Her majesty's Stationery Office, Crown Copyright. Ordnance Survey licence number GD272191/2000. Display scale may vary.

KEY:



INNER RECTANGLE or CIRCLE defines site area (details provided by client).

OUTER LINE shows extent of TOTAL SEARCH AREA comprising the site area and automatically generated buffer zone. The requirement for radon protective measures indicated in Section 2 is based on a geological assessment of the Total Search Area.

Please see Section 4 for details of how the search is carried out

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Section 2: Requirement for radon protective measures

The RPM GIS has determined that:

BASIC RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

This assessment was derived from 1:250,000 scale data.
Where protective measures are indicated, guidance can be found in BR211(1999) *Radon: guidance on protective measures for new dwellings.*

Important Note: The level of radon protection indicated in Annex A of *BR211 Radon: Guidance on protective measures for new dwellings (1999 edition)* is the minimum requirement for this site. Thus if Annex A indicates basic protection and this RPM Site Report indicates no protection then basic protection should be installed. See Section 4 for more details.

Please see Section 4 for details of how the assessment is carried out

Section 3: Geological units within the search area

Below is a listing, if available, of the possible combinations of Solid Geology units and overlying Drift (Superficial) Geology units within the total search area.

These have been derived (as indicated) from searches of either:

a) Combined 1:250,000 Solid and 1:625,000 Drift geology maps
b) 1:50,000 Solid, Drift and Artificial geology maps

1:250,000 data

1. MIDDLE COAL MEASURES (FORMATION)(SANDSTONE 3D00); No drift
2. MIDDLE COAL MEASURES (FORMATION)(ARGILLACEOUS ROCKS, UNDIFFERENTIATED); No drift

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Section 4: Determining the level of radon protection.

BR 211 (1999) sets out a two-stage procedure to help determine the level of radon protection required in new dwellings and extensions.

In Stage 1 of the procedure, the 5 km grid square radon potential maps (Appendix A, BR211,1999) produced by the National Radiological Protection Board (NRPB) are used to make the primary determination of the level of radon protection needed. The NRPB maps are based on the average estimated proportion of homes exceeding the radon Action Level for each 5 km square of the Ordnance Survey National Grid.

In Stage 2, a second series of maps produced by the BGS (Appendix B, BR211,1999) is used to decide whether it is necessary to consider upgrading the requirement for protection indicated by Stage 1. This procedure has the objective of avoiding cases of underprotection that might occur had the guidance depended solely on the average radon level in the 5 km grid square indicated by the NRPB maps. The BGS maps in Appendix B (BR211, 1999) show those 5 km grid squares that are underlain, completely or in part, by geological units that require either basic or full protection to be installed in new dwellings.

A geological assessment may need to be carried out where the site falls within a shaded grid square on the BGS map in Annex B of BR211 (1999). The geological assessment checks whether a site is on or close to a geological unit which potentially exceeds the action levels for either basic or full radon protection. Consideration must be given to installing basic or full radon protection if the geological assessment shows that this is indicated. If a site falls within one of the shaded squares, it does not necessarily mean that it must have radon protection. This is because some of the grid squares contain bed rocks and unconsolidated (drift) deposits with lower radon potential than the maximum levels shown on the 5 km grid maps in *Appendix B (BR211, 1999).*

In many cases the geological radon potential varies considerably within a grid square. In other cases, only a very small area (sometimes only a few hundred square metres) with a radon potential exceeding the thresholds for basic or full protection occurs within the shaded grid square. The level of protection that might be required is thus site specific, and can be determined by reference to the relevant radon potential map in BR211 (1999) followed by a geological assessment of the site.

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The geological assessment in this report is produced by the BGS Radon Protective Measures Geographical Information System (RPM GIS), which has been developed to provide Stage 2 Geological Assessments (RPM Site Reports). The assessment is derived from a geologically based interpretation of radon measurements in dwellings which were provided to the BGS by the NRPB without prejudicing confidentiality undertakings to householders and the Department of the Environment, Transport and the Regions (DETR). The reliability of a geological radon potential assessment is approximately proportional to the number of radon measurements available and the scale of the geological maps.

The RPM GIS currently comprises 1:250,000 scale data with more detailed information for twenty 1:50,000 scale geological map sheets covering the most radon-prone parts of Derbyshire, Northamptonshire, Nottinghamshire, Leicestershire, Lincolnshire, Oxfordshire, Shropshire, Somerset and Yorkshire. The RPM-GIS is being upgraded to 1:50,000 scale over the next 12 months as new digital maps become available through the BGS DIGIMAP programme.

The search area (circle or rectangle) for a site is increased by a buffer zone of 50 m in areas with 1:50,000 scale data and 500m in areas with 1:250,000 scale data. This is to allow for potential inaccuracies in the position of the geological boundaries. In many cases a number of combinations of bed rock and drift with differing geological radon potentials will occur within the total search area. Following the precautionary principle, the requirement for protective measures is derived from the highest geological radon potential encountered within the total search area.

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Section 5: Follow-up radon protective measures site report

For most parts of the UK, a higher resolution assessment of radon protective measures requirements can also be provided by BGS. This will comprise:

i. Assessment by a qualified geologist of the relevant 10,000, 1:10,560 or 1:50,000 scale geological map(s) covering the total search area from BGS archives.
ii. Precise identification of the level of radon protective measures indicated for all geological units encountered within the site and the immediately surrounding area.

The basic charge for a Radon Follow-up Report is **£80+VAT**. Reports for very large or geologically complex sites may, however, have to be supplemented with additional £40+VAT increments to allow for each extra half-hour of time taken – in such cases, enquiry staff will confirm with the client before proceeding.

The Radon follow-up reports can be ordered from:-
Geological Enquiries, British Geological Survey, Keyworth, Nottingham NG12 5GG; Tel: 0115-936-3192; Fax: 0115-936-3192; e-mail: geohelp@bgs.ac.uk. An on-line ordering facility will be available in the near future from Services on the BGS web site *http://www.bgs.ac.uk*.

Section 6: What is radon ?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters poorly ventilated enclosed spaces such as some basements, buildings, caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level exceeds the Action Level, measures should be taken to reduce the concentration.

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Section 7: Radon in workplaces

The Ionising Radiation Regulations, 1999, require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace.**

BRE publications may be obtained from Construction Research Communications Ltd, 151 Roseberry Avenue, London EC1R 4QX (Tel: 0171 505 6622; Fax: 0171 505 6606).

Section 8: Radon in existing dwellings

Useful information is given in the following free publications which can be obtained by writing to: DETR Free Literature, PO Box 236, Wetherby, West Yorkshire, LS23 7NB.
Radon - A Householder's Guide
Radon - You Can Test for It
Radon - A Guide for Homebuyers and Sellers
Radon - A Guide to Reducing Levels in Your Home
Information in the booklets is also available on the DETR website at:
http://www.environment.detr.gov.uk/radioactivity/index.htm

Householders are recommended to follow advice in **Radon - a householder's guide.** The guide outlines simple solutions for dealing with the radon problem depending on whether or not the home has been tested for radon. In radon affected homes, the problem of radon can usually be tackled with simple, effective and relatively inexpensive measures. These measures are comparable in cost to work such as damp-proofing and timber treatment. You can get practical advice about construction work to reduce radon levels from the Building Research Establishment (BRE) **Radon hotline** on **01923 664707.**

Advice about radon, its health risks and details of how to order the radon test may be obtained from the NRPB **Radon Freephone** on 0800 614529 or by post from **NRPB, Chilton, Didcot, Oxfordshire OX11 0RQ.**

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Report issued by: Christine Thomson
BGS Enquiries Service

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PETER WADE CONSULTANCY

METHODOLOGY (WORK PROCEDURE)
FOR
SITE RECLAMATION AND IMPROVEMENT WORKS

AT
STATION ROAD, BARNSLEY

REF:- PWC 1812
FOR
Sheldale Development Ltd

Peter Wade Consultancy

Consulting Engineers

Stockrail House
Waggon Lane
Upton
Pontefract
WF9 1FE

Tel: 01977 654300
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INTRODUCTION

Client: Sheldale Development Ltd

Developer: Sheldale Development Ltd

Site: Station Road, Barnsley.

Reference: This report is to be referenced in conjunction with PWC drawings: -

1812/G/01 Remediation work site plan.

1. GENERAL BACKGROUND

1.1 The site is now vacant but was originally occupied.

1.2 Site Location

1.2.1 The site is centred at National Grid Reference SE 335 064, approximately 1 km west of Barnsley town centre. The original site consisted of a single parcel of land covering an area of approximately 2.7 hectares (6.7acres). The site was accessed from Perseverance Street and Farrar Street. The site now under consideration is the northern section of that site.

1.3 Topography and Site Features

1.3.1 The site location and layout is shown on Drawings presented in Appendix B to this report. Site features highlighted in bold text below are shown labelled on Drawing No. 1812, presented in Appendix C.

1.3.2 A railway embankment carrying railway tracks bounds the site to the north. Terrace housing backs onto the north east of the site. Farrar Street beyond which lies terrace housing and industrial works bound the east of the site.

1.3.3 The south of the site is bounded both by a minor watercourse and residential properties.

1.3.4 The site adjacent to the rail land is raised and is understood to be former rail sidings. Ground levels in this area are approximately 4-5m, above ground levels in the central part of the site and there is an embankment between the two areas.

1.3.5 The topography of the site indicates that the site has been extensively repro filed. There are retaining walls and significant changes in ground level at several locations, suggesting the presence of significant volumes of made ground/fill.

1.4 Site Operations

1.4.1 The site is understood to be former rail sidings.

1.5 Services

1.5.1 There are no known services within the site.

2. PREVIOUS INVESTIGATIONS

AIG have undertaken a preliminary investigation (desk study) of the proposed development land, which is presented in report 2742/1, dated May 2002. A summary of the conclusions of the desk study report is provided below:

2.1 Site History

2.1.1 The review of historical plans indicated that the site has been the subject of previous industrial usage which may have given rise to ground contamination, the more significant of which include former rail land, fuel storage tanks and 'works'. In addition, it was concluded that a backfilled reservoir might be present. The type of material used to backfill the reservoir may give rise to potential contamination and gas issues.

2.2 Hazardous Gas

2.2.1 A site report obtained from the BGS advocates the adoption of basic measures to combat the risk of radon gas accumulation within new buildings. Other potential sources of ground gas at the site include four recorded landfill sites within 250m of the site and coal measures strata, which are commonly the source of mines gas.

2.2.2 It was concluded that the basic measures required for protection against radon should be considered a minimum, subject to confirmation following a program of gas monitoring (three to six months) to assess any more significant gas risk to the proposed development. Further testing has now been carried out. (Appendix E)

2.3 Mining

2.3.1 No coal outcrops are shown within the vicinity of the site. The shallowest coal seams of significant thickness beneath the site are indicated to be the Barnsley Rider Coal (up to 0.61m thick) approximately 25m below ground level and the Barnsley Coal (up to 3.1m thick) approximately 55m below ground level.

2.3.2 A coal mining report obtained from The Coal Authority (CA) states that, *'The property is within the likely zone of influence on the surface from workings in one seam of coal at 310m depth, the last date of working being 1915. Ground movement from the above mentioned coal workings should by now have ceased.* '

2.3.3 It was concluded that the surface of the site is not likely to be affected by instability caused by coat workings.

2.4 Contamination

The following potential sources of contamination were identified:

2.4.1 Rail land (former sidings).

2.4.2 It was concluded that the site could have been contaminated to some extent as a result of former and present uses and sources listed above.

2.4.3 With regard to the site's environmental setting and proposed end use, a minor aquifer underlies the site. There is one surface watercourse within 150m of the site. Therefore the environmental setting is considered to be of moderate sensitivity.

2.4.4 It was recommended that a schedule of chemical testing should be undertaken to investigate the presence of contaminants associated with former industrial uses.

2.4.5 It was recommended that a comprehensive ground investigation be carried out to assess the issues identified in the desk study report.

These findings were: -

2.5 *Executive Summary*

2.5.1 *AIG were commissioned by Ben Bailey Homes Ltd to undertake a ground investigation at the site of the Springfield Mills, Barnsley. It was understood that Ben Bailey Homes intended to redevelop the site with residential housing.*

2.5.2 *On the basis of the investigation work carried out. It was concluded that the site is redevelopable, subject to the findings of their report being incorporated into the development design.*

This was done (2742/2) and the following concluded:-

2.5.3 *The site is centred at National Grid Reference SE 335 064, approximately 1 km west from Barnsley town centre. The site consists of a single parcel of land covering an area of approximately 2.7 hectares (6.7acres). The site is currently used for storage, packaging and distribution of goods and car parking.*

2.5.4 *AIGC's investigation comprised 15 trial pits, 20 window sample holes, 4 light cable percussive boreholes and 4 rotary probeholes. Schedules of chemical and geotechnical analysis were carried out on samples retrieved.*

The following recommendations were made: -

2.5.5 *As a minimum, basic Radon protective measures are to be incorporated into all new buildings constructed on this site. The extent to which these measures may require upgrading is the subject of ongoing monitoring.* Monitoring completed see Appendix E.

2.5.6 *The made ground below the site has been proved to contain inorganic contamination. Where residual made ground remains beneath garden and landscaped areas it is recommended that a 700mm thick surface cover of "clean" subsoil including 150mm of topsoil be placed over the made ground (i.e. not beneath hard standing).*

Where ashy fill is encountered it is recommended that this is either removed or placed in areas of public open space or the surface cover is increased to 1,000mm. This increased thickness of cover will be required due to the potentially combustible nature of the ashy fill material.

Further investigation and remediation steps have refined this broad approach. (Refer to section 3 below)

2.5.7 *With regard to organic contamination at the site, elevated TPH concentrations have been recorded in three window sample holes. It is recommended that the contaminated fill in these areas is excavated and removed from site to a suitably licensed landfill facility.*

2.5.8 *For the purposes of describing ground conditions, the site has been divided into 4 areas (A -D, Drawing 2742/5). Within Area D and parts of Areas B and C the site is underlain by made ground, which has been found to be up to 5. 4m deep. It is considered that rafts on engineered fill would be the most suitable foundation solution for properties constructed in these areas.*

2.5.9 *Within parts of Area A, B and C it is considered that Strip/Trench fill footings excavated through the shallow made ground (where encountered) and founded onto the natural clay soils of adequate bearing capacity or bedrock could be adopted.*

2.5.10 *With regard to access road and pavement design, roads constructed over underlying firm and stiff cohesive deposits a minimum CBR value of 2% is considered appropriate. Where the made ground is re-engineered it is considered that a CBR value of 2% should also be achievable.*

2.5.11 *Due to the impermeable nature of the soils at shallow levels, it is not likely that soakaways will provide an effective means of surface water disposal.*

3. REMEDIATION PROPOSALS

3.1 Recent Site Investigation works.

3.1.1 A further PWC site investigation report has also indicated the site to have areas covered by uncompacted fill up to depths of 5 metres or more in various areas of the site. The fill material is comprised of a mixture of colliery spoil, shale etc, and demolition debris which include brick, stone, reinforced concrete, and the like. There are minor traces of contaminants and a slight Methane gas discharge was noted in one of the trial holes. A gas report is attached in Appendix E... passive ventilation will be required if any under floor space is created. The ground was otherwise satisfactory. Chemical testing was carried out; this report is attached as Appendix A.

3.1.2 The PWC findings broadly agree with the previous investigations and those recommendations form the basis of the following Engineering Remediation proposals.

3.2 Remediation Proposals.

3.2.1 Within the restrictions caused by the contaminants it is intended to stabilise the site by reclamation of the previous uncontrolled backfill and render it suitable for re use minimising the need for removal of spoil or importation of new fill. New houses will be founded on piles.

3.2.2 The design criteria for the site construction formation level is to withstand 35 kN/m^2. Recommended foundation design comprises of reinforced concrete rafts in some places. In other places strip footings or piles may be more appropriate.

3.3 In order to achieve these bearing capacities the areas of loose fill are to be excavated, treated by screening and crushing, where appropriate, and stockpiled on site. Approved fill from the stockpiles is to be placed and compacted in layers consistent with the bearing capacities required.

3.4 The site is to be completed to formation level and in order to prove the ground bearing capacity plate testing been done at positions selected by PWC generally in accordance with section 6.

4. *PROCEDURE*

4.1 The works are shown on drawing No: -

1812/ G/01 Remediation Works Site Plan.

4.1.1 The operations are to comply generally with: -

BS 5930, Code of Practice for Site Investigations,

The draft BS DD175: 1988 Code of Practice for the Investigation of Contaminated Land.

Building Research Establishment, The Measures of Gas Emissions from Contaminated Land and the advice provided in the Waste Management paper Nos. 26 and 27.

4.2 Excavate and remove to stockpile all filled material to level of a minimum 1m below formation levels consistent with the nature of the material and the load bearing requirements. This operation is to be carried out in phases with due regard to the overall scale of operations. The individual areas are to be as large as practically possible and to be excavated in a continuous operation. It is anticipated that approximately 15-20 specific areas will be identified consistent with site programme and access constrictions/requirements.

4.3 Remove all soft spots and backfill with nominal 75mm crusher run stone or crushed and screened material in 150mm layers.

4.4 Bring to construction level by back filling in nominal 200mm layers, subject to performance, using graded crusher run reclaimed material or other approved evenly graded material with fines not exceeding 5% by volume. Compaction to be achieved with a nominal 20 tonne vibrating roller towed by bulldozer or similar approved **heavy compaction**.

5. CUT AND FILLING OPERATIONS

5.1 Fill basic requirements

5.2 This specification is based on the required depth of fill of 1-5 metres and the degree of compaction employed.

5.3 Fill is generally to be the previously excavated material with removal by screening and hand picking of the unsuitable materials such as steelwork, timber etc.

5.4 Material unsuitable for use as engineered fill is to be stockpiled on site prior to subsequent disposal by burying on site or using in garden or non load bearing areas. This does **not** include contaminated fill. Such material is to pass through 25 mm sieve. Non-suitable material will be carted away.

5.5 The demolition debris from the site crushed brick, concrete and stone is to be passed through a crusher/screener to give a well-graded crushed product. This is also to be stockpiled in defined areas prior to using as compacted fill. The individual stockpiles are to be clearly identified and be of a controlled size consistent with the scale of operations. The stockpiles will be typically in the size 3000 – 6000 m^3. It is expected to chemical test 4 samples per stockpile. In particular any organic and chemical waste is to be separately stockpiled etc. Health hazardous waste if encountered must be not only separately stockpiled but also fenced to prevent unauthorised access.

Storage and disposal of unsuitable excavated material

5.6 Unsuitable material (contaminated) is to be stockpiled in categories as directed by the PWC Supervisor for disposal as appropriate.

5.7 Material as described above is not to be disposed of until written confirmation of the required disposal measures is given by the PWC Supervisor.

6. SITE TESTING REQUIREMENT

6.1 Plate bearing tests are to be carried out at positions as selected by the PWC Supervisor to prove design loading bearing capacity of 35 kN/m^2.

6.2 600mm diameter plate with jacking against a front-end loader all under the supervision of PWC or similar qualified Engineer.

6.3 Number of tests. The following plate bearing tests are to be carried out generally at 4 per hectare generally or as otherwise directed by the Engineer: -

1) At 500 below formation level or 500 below u/s foundation.
2) At formation level or u/s foundation.



P Wade B.Tech (Hons), C.Eng., MICE, MIStructE.
20.04.08
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APPENDIX A

Contamination Report