Exploration Associates

Forge Lane, Former Steelworks, Thornhill, Dewsbury

Interpretative Report on Ground Investigation

1291148
April 2000

Client:
Kirklees Metropolitan Council
Property Services Consultancy
Kirkgate Buildings
Byram Street
Huddersfield
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1. INTRODUCTION

It is proposed to develop the site of a former steelworks for combined residential housing and light industrial use. On the instructions of Kirklees Metropolitan Council, Property Services Consultancy, and following a site investigation carried out by Exploration Associates in 1997 for the same client, an investigation was made by Exploration Associates to provide further information regarding contamination at the site.

A report to include additional assessment of the ground conditions and additional information on contamination levels was confirmed in a letter ref:cp/dd870930/mg/mb/gc-s105 dated 22nd June 1999.

The investigation was carried out in general accordance with the relevant British Standards[1,2]. General notes on the techniques employed during site investigations carried out by Exploration Associates are given in the Enclosures.

Monitoring of water levels and gas concentrations was carried out in wells installed under the first phase of investigation at this site during the period 6th February 1997 and 28th November 1997. The results of this monitoring and associated water testing results are appended to this report.

2. THE SITE

The site is located at National Grid reference SE 237 198 as shown on the Site Location Plan (Drawing 1).

The site layout at the time of the investigation and the Exploratory Hole Locations are indicated on Drawing 3. The site is approximately rectangular and elongated from north west to south east with maximum dimensions of approximately 270m by 200m. The north western edge of the site is bounded by Forge Lane. The north eastern edge of the site is bounded by the Calder and Hebble Navigation Long Cut. The eastern edge of the site runs due south from the canal to the fence forming the south western boundary, which is occupied by housing, gardens and allotments.

The site generally decreases in level from Forge Lane towards the south east. Forge Lane is at an approximate level of 44.50m AOD. The site boundary adjacent to Forge Lane generally comprises a steep bank up to 7m high.

A series of terraces and concrete ramps occupy the northwestern area of the site. An extensive area of concrete hardstanding extends towards the south east. Numerous H section steel stanchions in concrete bases were noted in this general area.

An abandoned gravel pit is located towards the centre of the south western site boundary. The area around the gravel pit is generally elevated above the overall site, with an embankment running along the north eastern side of the gravel pit.

The central site area between the gravel pit and the canal is generally level although piles of tipped material occupied the west central area of the site towards the drain. Large concrete and sandstone blocks were noted within this tipped material.

At the time of the investigation the site was occupied by rough grass, saplings and occasional mature trees.

A former gravel pit occupies an area of the site adjacent to the southwestern boundary. This gravel pit is indicated on historical map excerpts presented in Exploration Associates Report No.127001 of April 1997. The gravel pit is believed to have been started some time between 1893 and 1907. No increase in the extent of the gravel pit was noted from historical records between 1912 and 1933. The glass works formerly occupying part of the site was cleared at some time during this period. The approximate extent of the gravel pit in 1933 in indicated on the exploratory hole location plan.

3. FIELDWORK

The fieldwork was carried out during the period 23rd to 25th June 1999.

Five boreholes were sunk at the positions shown on the Exploratory Hole Location Plan (Drawing 2) by soft ground cable percussive boring techniques to depths of between 6.00m (Borehole 4A) and 11.00m (Borehole 1A). Ten trial pits were excavated mechanically to depths of between 0.80m (Trial Pit 1A) and 4.80m (Trial Pit 9A) at positions also shown on the Exploratory Hole Location Plan. The depths of the boreholes and trial pits, descriptions of the strata encountered and comments on the groundwater conditions revealed during the fieldwork operations are given on the borehole and trial pit records (Enclosure A).

Disturbed samples were taken at the depths shown on the records. Bulk disturbed samples were recovered to enable more representative descriptions to be made. Groundwater samples were recovered from Boreholes 1A, 2A, 3A and 5A and Trial Pits 6A, 8A and 9A.

Standpipe piezometers were installed in Boreholes 1A and 4A to enable subsequent measurements of groundwater levels to be made. The piezometers were fitted with Casagrande type plastic tips. 50mm diameter slotted standpipes were installed in Boreholes 2A, 3A and 5A to enable subsequent measurements of gas and groundwater levels to be made. Details of the installations are given on the relevant borehole records in Enclosure A.

5.2 Strata Encountered

The strata encountered is considered on the basis of two sub-divisions of the site:

1. The Former Gravel Pit Area
2. Other Areas

The Former Gravel Pit Area

Borehole 3A and Trial Pits 6A to 10A were located within or on the boundary of the known extent of the former gravel pit. Boreholes 1A and 2A were located to the south and southwest of this boundary respectively.

Borehole 3A encountered predominantly granular made ground to 1.50m, with an increased fines and organic matter to 3.40m. From 3.40m to 4.00m made ground comprising soft, locally peaty, clay was encountered. Beneath made ground gravel was encountered to 5.20m overlying sand to 7.50m. Bedrock, comprising siltstone was encountered at 7.50m and proved to the base of the borehole at 8.50m.

Trial Pit 6A, excavated wholly within the boundary of the former gravel pit, encountered topsoil over made ground to 2.00m. Made ground comprised soft black locally peaty clay. This in turn overlay natural sand proved to the base of the pit at 3.00m.

Trial Pit 7A was excavated across a boundary of the former gravel pit and appears to confirm this boundary. The south western end of Trial Pit 7A encountered made ground comprising predominantly rubble with concrete slabs to 2.20m. The central section of Trial Pit 7A encountered made ground with rubble to 0.80m overlying made ground comprising soft black clay proved to a depth of 2.40m. The northeastern end of the pit encountered made ground with rubble to 0.80m overlying clay to 1.00m which in turn overlay sand proved to a depth of 2.20m.

Trial Pit 8A was excavated within the boundary of the former gravel pit and encountered coarse granular made ground to 1.00m overlying made ground comprising soft organic clay proved to the base of the pit at a depth of 3.00m.

Trial Pits 9A and 10A were located adjacent to the southwestern and across the southeastern boundaries of the former gravel pit respectively.

Trial Pit 9A was excavated from the top of a bank, possibly representing an old railway embankment. Made ground comprising predominantly sand was encountered to depths up to 3.60m overlying natural sand proved to a depth of 4.80m. A layer of cohesive made ground up to 0.50m thick locally occurred between these two strata.

Trial Pit 10A was excavated across a boundary of the former gravel pit and appears to confirm this boundary. The southeastern end of the pit, beneath the bank, encountered granular made ground to 1.20m depth overlying sand to a proved depth of 2.60m. The north western end of the pit, beneath the pond area, encountered vegetation and clay to 0.70m overlying peaty made ground to 0.85m which in turn overlay natural sand proved to a depth of 1.40m.

Borehole 1A was located to the south of the former gravel pit. Granular made ground was encountered to 1.50m overlying cohesive made ground to 3.10m. A thin layer of sand was encountered at the base of the made ground, to a depth of 3.40m, overlying gravel to 10.50m. Bedrock comprising siltstone was encountered at 10.50m and proved to the base of the borehole at 11.00m.

Borehole 2A was located to the south west of the former gravel pit. Granular made ground was encountered to 1.20m overlying soft clay to 2.30m. This in turn overlay predominantly sand to 7.60m. Bedrock comprising sandstone was encountered at 7.60m and proved to the base of the borehole at 7.70m.

Other Areas

The remaining exploratory holes were located on the north western half of the site and comprised Boreholes 4A and 5A and Trial Pits 1A to 5A.

Trial Pits 1A and 2A were located towards the north western end of the site and were excavated wholly in made ground. Trial Pit 1A encountered granular made ground to 0.80m where it was terminated on a concrete slab. Trial Pit 2A encountered coarse granular made ground to its termination at 3.00m.

Trial Pit 5A, located towards the western part of the site encountered granular made ground to 0.70m overlying gravel, proved to the base of the pit at 3.00m.

Boreholes 4A and 5A and Trial Pits 3A and 4A were located towards the northeastern site boundary.

Trial Pits 3A and 4A encountered similar strata comprising granular made ground to 0.50m and 1.50m respectively overlying firm and firm to stiff clay to 2.75m and 2.10m respectively. Beneath this clay sand was encountered to the termination of Trial Pits 3A and 4A at 3.00m and 2.60m respectively.

Borehole 5A, located towards the northern end of the site, encountered granular made ground to 3.50m, overlying cohesive made ground to 5.40m. This in turn overlay soft to firm clay to 5.90m and sand and gravel to 7.50m. Bedrock comprising siltstone was encountered at 7.50m and proved to the base of the borehole at 9.50m.

Borehole 4A, located adjacent to the canal, encountered granular made ground to 0.60m overlying firm cohesive made ground to 3.20m. Soft, locally peaty, clay was encountered beneath made ground to 5.00m. Bedrock, comprising mudstone, was encountered at 5.00m and proved to the base of the borehole at 6.00m.

5.3 Groundwater

Ingresses were recorded in Boreholes 1A, 2A, 3A and 5A at 3.40m rising to 3.00m, 3.10m rising to 2.00m, 3.40m rising to 2.00m and 6.00m rising to 4.50m respectively.

Ingresses were recorded in Trial Pits 6A, 7A, 8A and 10A at 2.80m; 1.50m and 2.20m; 1.10m and 2.60m respectively. A standing water level of 2.70m was noted in Trial Pit 8A. Seepage was noted in Trial Pits 3A, 4A, 5A, 9A and 10A at 2.75m, 2.50m, 2.70m, 1.70m and 0.00m respectively and the stratum was noted as damp at 2.50m in Trial Pit 5A.

6. CONTAMINATION ASSESSMENT

6.1 General

Chemical analysis was carried out for a range of parameters on sixteen samples of soil and seven samples of water from the boreholes and trial pits. The soil samples were predominantly from made ground and the uppermost part of the natural strata. One of the water samples was taken from the surface of the disused gravel pit (TP9A/0.00m).

The full results of all analyses carried out are presented in Enclosure B.

6.2 Classification of Contaminant Levels

Assessment of analytical results has been based on guidelines published by Interdepartmental Committee for the Redevelopment of Contaminated Land (ICRCL)[4].

These guidelines provide figures to aid assessment of the degree of contamination present in terms of the proposed end use of the site.

ICRCL guidance consists of threshold trigger levels for a range of contaminants associated with former coal carbonisation sites. The trigger levels referred to are:

Threshold Level: If concentrations recorded are below this level the site may be considered uncontaminated.

Action Level: If concentrations recorded exceed this level then some form of remedial work will be required to allow development to proceed.

Where no action trigger value is present, judgement is required to assess the risks that may be posed to users of the proposed development.

The ICRCL guidelines indicate threshold levels for particular determinands in relation to the proposed end use of the site. These end use categories comprise:

- Domestic gardens, allotments and play areas
- Parks, playing fields and open spaces
- Landscaped areas
- Buildings and hard cover.

In this case the results have been compared with the first of these categories "domestic gardens, allotments and play areas" for Table 3 determinands, and for domestic gardens for Table 4 determinands.

For the purposes of this assessment, the ICRCL threshold trigger value for arsenic has not been adopted. Reference to waste management guidelines [5] indicates that arsenic concentrations of up to 30mg/kg are typical of uncontaminated soils. In addition the Geochemical Atlas of England and Wales [6] states that 95% of all soils in England and Wales have arsenic concentrations of less than 29mg/kg. On this basis a revised threshold value of 30mg/kg has been used for this assessment.

Assessment of the results has also been carried out with reference to guidelines for waste disposal [5]. These guidelines provide figures that classify materials as follows:-

A	-	Uncontaminated
B	-	Slightly contaminated
C	-	Contaminated
D	-	Heavily contaminated
E	-	Unusually heavily contaminated.

A classification of this type is generally adopted by Local Authorities for accepting waste materials to landfill sites.

The tables of values used for general classification are appended to this report.

6.3 Contamination Results

Soil Sample Analysis

With reference to ICRCL Table 3 (domestic gardens and allotments) and Table 4 (domestic gardens, allotments and play areas) it can be seen that contamination above the threshold trigger levels are present only in the form of arsenic (5 values). Concentrations of sulphate have been assessed with respect to attack on concrete, (see Section 6.4).

With regard to Kelly, the following determinands fell into Classes C and D, that is ranging from contaminated (C) to heavily contaminated (D).

Arsenic	BH1A/1.50m	62mg/kg	Class C
	TP6A/2.00m	71mg/kg	Class C
	TP8A/1.50m	111mg/kg	Class D
	TP9A/0.50m	78mg/kg	Class C
pH	TP9A/0.50m	48mg/kg	Class C
Sulphur	TP8A/1.50m	1500mg/kg	Class D

Other tests carried out on soil samples with results are as follows:

Chloride values ranged from <12mg/kg (BH2A/2.50m and BH3A/3.50m) to 97mg/kg (TP8A/1.50m) and are relevant regarding classification of concrete design especially if pH values fall below 5.5.

The following tests were also carried out:

Loss of Ignition		Organic Matter	
BH2A/0.50m	13.7%	BH2A/1.50m	1.8%
BH5A/2.50m	4.7%	BH3A/1.50m	13.6%
TP4A/1.20m	22.8%	TP10A/0.75m	46.4%

Two samples were also tested for slag reactivity; from TP3A at 0.30m and TP7A at 1.20m with swelling percentage results of -0.05 and 1.45 respectively.

Water Samples Analysis

The results of testing on water samples were compared to cut off values for uncontaminated leachate proposed in guidelines for waste disposal[5]. These values were supplemented, where necessary, by additional information from Dutch Intervention Guidelines[7] and values presented in the Water Supply (Water Quality) Regulations 1989.

No samples indicated elevated contaminant levels above the "uncontaminated" boundary values except for Ammoniacal Nitrogen (BH5A/4.50m) value of 1.2g/l and TP9A/0.00m 3.8g/l.

Values for ammonia were compared against an upper limit for background of 200µg/l and upper limits of 1000µg/l and 3000µg/l for "further information needed" and "polluted levels" respectively, proposed in the Dutch Intervention Guidelines. On this basis the values above exceeded background levels and exceeded the limit for "further information needed".

VOC tests were carried out as well and all determinands fell below detection limits apart from a value of 4µg/l of chlorobenzene in BH1A at 3.10m.

At the time of reporting a programme of monitoring and testing of water from standpipes has yet to be decided.

6.4 Chemical Attack on Buried Concrete

Available laboratory test results indicate that the sulphate content of 2:1 extract from the made ground materials and natural soils generally ranges from 0.09g/l to 1.84g/l, SO_4, allied to pH values in the range 4.8 to 8.1. Tests on groundwater indicate pH values in the range of 6.8 to 7.2.

On this basis it is considered that concrete should be designed in accordance with Class 2 of BRE Digest 363[8].

The possible presence of oils and phenols resulting from localised spillages cannot be discounted on a site with a history of industrial use and if present these may cause attack on buried rubber or plastic. Such material should be removed where it is identified and service pipes be surrounded by clean inert backfill. It has been noted that aqueous phenol attacks uPVC and HDPE pipes above certain levels. It is recommended that the appropriate manufacturer is contacted regarding advice on proposed construction and usage.

6.5 Implications and Recommendations for Development

The analytical testing carried out has indicated three main areas of concern with regard to contaminant levels as follows:

(i) Exposure of users to contaminants
(ii) Exposure of construction workers of contaminants
(iii) Off-site disposal of material.

In addition, the results of analyses of water are discussed.

Exposure of end users to contaminants

The area has been assessed based on the lower threshold trigger values presented in ICRCL Guidelines[4]. These values are for more sensitive areas namely domestic gardens, allotments and play areas (Group A metals).

On this basis the area proposed for development should be considered contaminated with arsenic. If the proposed development completely covers the area with hardstanding and buildings these should adequately prevent exposure to end users. However this will depend on final planning proposals.

Arsenic, mercury, PAH and phenols may pose a hazard to health. Copper, nickel and zinc contamination is unlikely to pose a hazard to health but may cause phytotoxic effects (hazardous to plants). In the area of any proposed housing it is recommended that either the end users are isolated from the near surface materials by the use of capping layers and imported topsoils or the made ground and near surface materials are removed from the area of development.

Exposure of construction workers to contaminants

The available data suggests that a degree of risk to the health and safety of construction workers may be associated with site development. Accordingly protective equipment (clothing, masks, eyewear, etc) should be used in accordance with current legislation and good practice.

Off-site disposal of material

If material generated by redevelopment is required to be disposed of off site the local waste regulatory authority will require the material to be classified according to the degree of contamination. On the basis of the available data, and without pre-empting any classification currently in use by the local waste regulatory authority, it is considered possible that made ground and near surface materials removed from site may be classified as contaminated (Class C and D) and as such may require disposal at a suitably licensed disposal facility.

If off site disposal is necessary the waste regulatory authority should be consulted to determine whether leachate testing of the soil samples may be carried out to re-classify materials.

Water Assessment

The testing carried out indicates that the level of contamination in groundwater is within accepted levels with the exception of ammoniacal nitrogen. Elevated levels of ammoniacal nitrogen have been detected in water samples from borehole wells and trial pits in addition to surface water samples from the canal, ditch and pond during both this phase and the previous phase of investigation (our ref.127001). On this basis these results appear to represent elevated levels of ammoniacal nitrogen across the site region and not specifically restricted to the site area. The presence of ammoniacal nitrogen in water bodies entering the site and adjacent to the site suggests that the source of this contaminant lies off site. Therefore any attempt to reduce the level of ammoniacal nitrogen in water within the site area is likely to be unsuccessful.

For and on behalf of Exploration Associates

D J L Small
Project Geologist

C S Eccles
Principal Engineer

Exploration Associates
APH/DJLS/AC/129148/April 2000

REFERENCES

1. BS 5930: 1981. *Code of Practice for Site Investigations*. British Standards Institution.

2. BS 1377: Parts 1 to 9: 1990. *Methods of Test for Soils for Civil Engineering Purposes*. British Standards Institution.

3. British Geological Survey. 1:63,360, *Geological Survey of England and Wales*. Sheet No.77, Huddersfield. Solid and Drift editions.

4. ICRCL Guidance Note 59/83: 1987. *Guidance on the Assessment and Redevelopment of Contaminated Land*. Interdepartmental Committee on the Redevelopment of Contaminated Land.

5. Kelly, R.T., 1980. *Site Investigations and Materials Problems*. Proceedings of Conference on Reclamation of Contaminated Land. Society of Chemical Industry.

6. Webb, J.S. (Ed) et al, 1978. *Woolfson Geochemical Atlas of England and Wales*. Oxford University Press.

7. *Environmental Program for the Netherlands 1988 to 1991*. The Hague Flaatsuitgeverif, 1987.

8. B.R.E. Digest 363, 1996. *Sulphate and Acid Resistance of Concrete in the Ground.*

ENCLOSURE A

Exploratory Hole Records

	Sheet
Summary of Descriptive Methods	
List of Symbols	Key Sheet
Trial Pit Records	TP1A to TP10A
Borehole Records	BH1A to BH5A

Summary of Descriptive Methods

1. Terminology used in Soil Descriptions

The procedure and principles given in BS 5930; 1981, Section 8 have generally been adopted in producing soil descriptions but most of the modifications detailed by Norbury et al (1984) have been incorporated. These generally relate to the description of composite soil types referred to in Table 6 and Section 41.3.3.3 of BS 5930. The modifications relating to various mixtures of soil types are summarised below.

i) Predominantly Coarse Soils

BS 5930 Section 8 recommends that the secondary constituents of coarse soils should precede the main soil type. This may become ambiguous if qualifying adjectives also form part of the description. Norbury et al overcame this by suggesting that the secondary constituent may be placed after the main soil type, as outlined in Table B1.

ii) Mixtures of Coarse and Fine Soils

BS 5930 Section 8 Section 41.3.2.1 states that mixtures of coarse and fine soils with more than 35% of fine soil shall be described as clay or silt, otherwise they should be described as sand or gravel. This may lead to misleading descriptions, if strictly adhered to, since a material that in engineering terms behaves as clay may only have a clay content of between 10% and 20%. Thus the above approach is not adopted where it would lead to a description which would not reflect the engineering behaviour of the material. In such cases the percentage unit is relaxed.

iii) Predominantly Fine Soils

Fine soils generally consist of mixtures of silt and clay and are described in BS 5930 as either silt or clay with classification in accordance with plasticity. Borderline cases between silt and clay materials are often difficult to distinguish and where secondary constituent fine soils have an influence on mass behaviour the qualifying terms "very silty" and "very clayey" are used. Coarse secondary constituents may be included either before or after the main soil type, as outlined in Table B2, depending on the grain sizes of the secondary constituents.

Term Before	Principal Term	Term After	Approx % of Secondary Constituent
Slightly (sandy*)	SAND, GRAVEL COBBLES or BOULDERS	with a little (sand*) or occasional (cobbles+)	<5
(Sandy*)		with some (sand*) or some (cobbles+)	5 - 20#
Very (Sandy*)		with much (sand*) or many (cobbles+)	20 - 40#
		and (sand*) or and (cobbles+)	about 50#

* Fine or coarse soil type as appropriate
\+ Very coarse soil type as appropriate
\# Or described as a fine soil depending on mass behaviour

Table B1
Scale of Secondary Constituents with coarse soils

For clays, the extended strength scale is outlined in Table B3. The term hard is not assigned a specific range of shear strengths by BS5930 which indicates that soils possessing shear strengths greater than 150 kPa may be either very stiff or hard. The terms are defined more precisely in Table B3.

References

BS 5930 ; 1981 Code of Practice for Site Investigations. British Standards Institution.

Norbury D.R., Child G.H. and Spink T.W; 1984 A Critical Review of Section 8 (BS 5930). Soil and Rock Description. Proc 20th Regional Meeting of the Geological Society. Site Investigation Practice. Assessing BS 5930. Univ of Surrey pp 353-369 (Original Proceedings).

Term Before	Principal Term	Term After	Approx % of Secondary Constituent
Slightly (sandy*)	CLAY or SILT	with a little (sand*) or occasional (cobbles+)	<35
(Sandy*)		with some (sand*) or some (cobbles+)	35 - 65
Very (Sandy*)		with much (sand*) or many (cobbles+)	>65#

* Coarse soil type as appropriate
\+ Very coarse soil type as appropriate
\# Or described as a coarse soil depending on mass behaviour.

Table B2
Scale of Secondary Constituents with fine soils

Term	Field Identification	Undrained Shear Strength (kPa)
Very soft	Exudes between fingers when squeezed in hand.	<20
Soft	Moulded by light finger pressure.	20 - 40
Soft to firm	Can be moulded by strong finger pressure.	40 - 50
Firm		50 - 75
Firm to Stiff	Cannot be moulded by finger pressure	75 - 100
Stiff	Can be indented by thumb.	100 - 150
Very Stiff	Can be indented by thumbnail	150 - 300
Hard	No manual indentation possible.	>300

Table B3
Field Assessment of Strength of Clays

KEY TO SYMBOLS ON EXPLORATORY HOLE RECORDS

All linear dimensions are in metres or millimetres

DESCRIPTIONS

**	:	Drillers Description

SAMPLES

U ( )	:	Undisturbed 102mm diameter sample, ( ) denotes number of blows to drive sampler
U ( )F, U ( )P	:	F - not recovered, P - partially recovered
U38	:	Undisturbed 38mm diameter sample
P(F),(P)	:	Piston sample, F - not recovered, P - partially recovered
B	:	Bulk sample - disturbed
D	:	Jar Sample - disturbed
W	:	Water Sample
CBR	:	California Bearing Ratio mould sample
G	:	Gas Sample and depth of hole at time of sampling

CORE RECOVERY AND ROCK QUALITY

TCR	:	Total Core Recovery %
SCR	:	Solid Core Recovery %
RQD	:	Rock Quality Designation %
FI	:	Fracture Index (discontinuities per metre) NI - not intact, NR - not recordable, NA - not applicable

GROUNDWATER

$\underline{\nabla}$	:	Groundwater strike
$\underline{\blacktriangledown}$	:	Groundwater level after standing period
Date/Water	:	Date of shift (day/month)/Depth to water at end of previous shift shown above the date and depth to water at beginning of shift given below the date.

IN SITU TESTING

S	:	Standard Penetration Test - split barrel sampler
C	:	Standard Penetration Test - solid 60° cone
V(H)(R)	:	Vane Test (Hand) (R) demonstrates remoulded strength
K(F), (C), (R), (P)	:	Permeability Test (falling, constant or rising head, packer)
PT	:	Pressuremeter Test
HP	:	Hand Penetrometer Test

MEASURED PROPERTIES

N	:	Standard Penetration Test - blows required to drive 300mm after seating drive
$^{x}/_{y}$	:	Denotes x blows for y mm within the Standard Penetration Test
$^{x'}/_{y}$	:	Denotes x blows for y mm within the seating drive
c_u	:	Undrained Shear Strength (kN/m^2)
CBR	:	California Bearing Ratio

ROTARY DRILLING SIZES

Index Letter	NOMINAL DIAMETER (mm)	
	Borehole	Core
N	75	54
H	99	76
P	120	92
S	146	113

Exploratory Hole Symbols	Project Forge Lane Former Steelworks, Thornhill, Dewsbury Kirklees Metropolitan Council	Contract 129148
Exploration Associates		Figure Key Sheet

Summary of Descriptive Methods

1. Terminology used in Soil Descriptions

The procedure and principles given in BS 5930; 1981, Section 8 have generally been adopted in producing soil descriptions but most of the modifications detailed by Norbury et al (1984) have been incorporated. These generally relate to the description of composite soil types referred to in Table 6 and Section 41.3.3.3 of BS 5930. The modifications relating to various mixtures of soil types are summarised below.

i) Predominantly Coarse Soils

BS 5930 Section 8 recommends that the secondary constituents of coarse soils should precede the main soil type. This may become ambiguous if qualifying adjectives also form part of the description. Norbury et al overcame this by suggesting that the secondary constituent may be placed after the main soil type, as outlined in Table B1.

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BS 5930 Section 8 Section 41.3.2.1 states that mixtures of coarse and fine soils with more than 35% of fine soil shall be described as clay or silt, otherwise they should be described as sand or gravel. This may lead to misleading descriptions, if strictly adhered to, since a material that in engineering terms behaves as clay may only have a clay content of between 10% and 20%. Thus the above approach is not adopted where it would lead to a description which would not reflect the engineering behaviour of the material. In such cases the percentage unit is relaxed.

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Slightly (sandy*)	SAND, GRAVEL COBBLES or BOULDERS	with a little (sand*) or occasional (cobbles+)	<5
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References

BS 5930 ; 1981 Code of Practice for Site Investigations. British Standards Institution.

Norbury D.R., Child G.H. and Spink T.W; 1984 A Critical Review of Section 8 (BS 5930), Soil and Rock Description. Proc 20th Regional Meeting of the Geological Society. Site Investigation Practice. Assessing BS 5930. Univ of Surrey pp 353-369 (Original Proceedings).

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Slightly (sandy*)		with a little (sand*) or occasional (cobbles+)	<35
(Sandy*)	CLAY or SILT	with some (sand*) or some (cobbles+)	35 - 65
Very (Sandy*)		with much (sand*) or many (cobbles+)	>65#

* Coarse soil type as appropriate
\+ Very coarse soil type as appropriate
\# Or described as a coarse soil depending on mass behaviour.

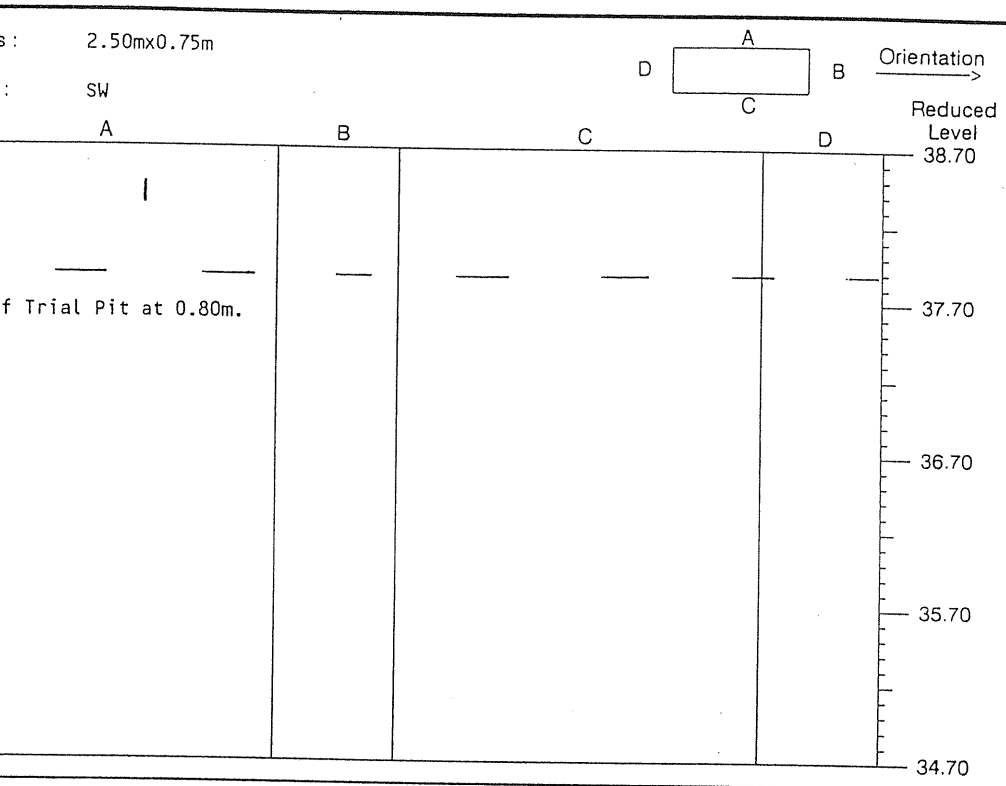
Table B2
Scale of Secondary Constituents with fine soils

Term	Field Identification	Undrained Shear Strength (kPa)
Very soft	Exudes between fingers when squeezed in hand.	<20
Soft	Moulded by light finger pressure.	20 - 40
Soft to firm	Can be moulded by strong finger pressure.	40 - 50
Firm		50 - 75
Firm to Stiff	Cannot be moulded by finger pressure	75 - 100
Stiff	Can be indented by thumb.	100 - 150
Very Stiff	Can be indented by thumbnail	150 - 300
Hard	No manual indentation possible.	>300

Table B3
Field Assessment of Strength of Clays

Dimensions : 2.50mx0.75m

Orientation : SW



Strata

Depth (m)	No.	Description
0.00-0.80	1	MADE GROUND:Rough grass onto dark brown,dark grey brown sandy angular fine to coarse gravel including brick,timber and occasional ash At 0.80m:concrete slab

Samples and Tests

Depth (m)	Type	Results
0.50	B	

Date of Excavation 23/06/99
Equipment JCB 3CX
Stability Sides stable

Groundwater
No. Struck Behaviour
Not encountered during excavation

Ground Level 38.70 m OD
Coordinates 939.67 mE
1086.13 mN

Logged by DJLS
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

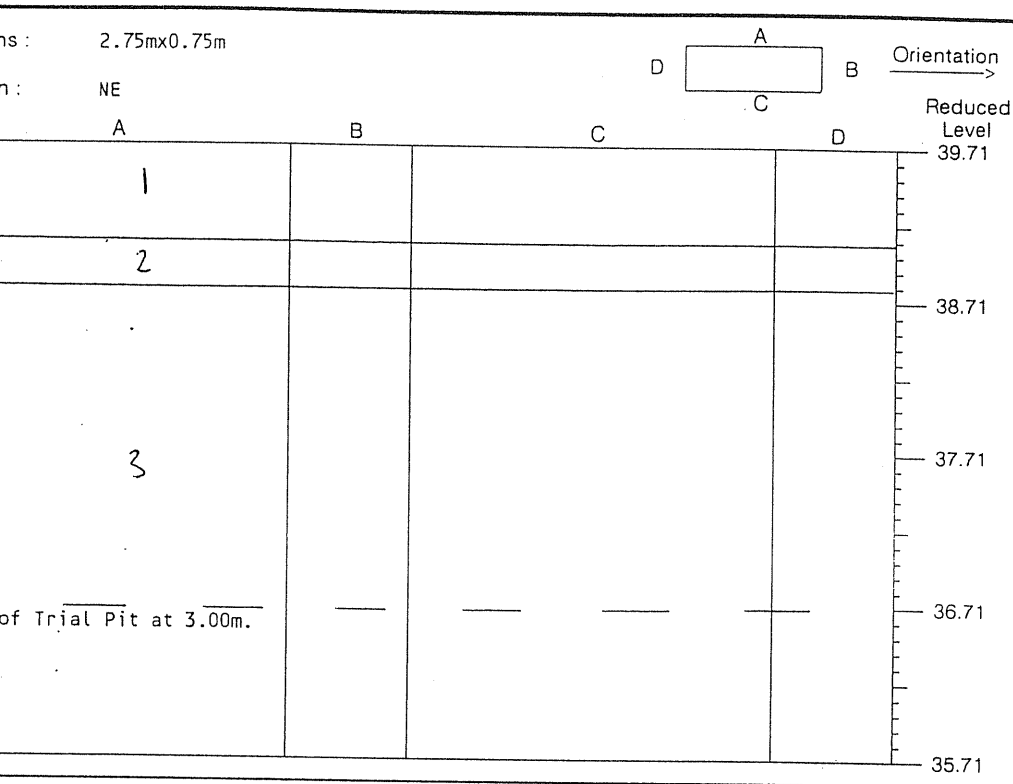
Project
Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Trial Pit TP1A

Dimensions : 2.75mx0.75m

Orientation : NE



Strata

Depth (m)	No.	Description
0.00-0.60	1	MADE GROUND:Thin turf onto angular cobbles of brick with a little black sandy gravel of ash
0.60-0.90	2	MADE GROUND:Compact light brown sandstone cobbles and boulders
0.90-3.00	3	MADE GROUND:Grey,dark grey,light brown clayey angular gravel and cobbles of mudstone and sandstone,occasional boulders of brown sandstone(up to 350mmϕ) Below 2.00m:dark brown weakly cemented in places At 2.70m:locally light grey with occasional black gravel of coal

Samples and Tests

Depth (m)	Type	Results
1.00	B	

Date of Excavation 23/06/99
Equipment JCB 3CX
Stability Slight spalling from 0.30m

Groundwater
No. Struck Behaviour
Not encountered during excavation

Ground Level 39.71 m OD
Coordinates 928.71 mE
1014.32 mN

Logged by DJLS
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

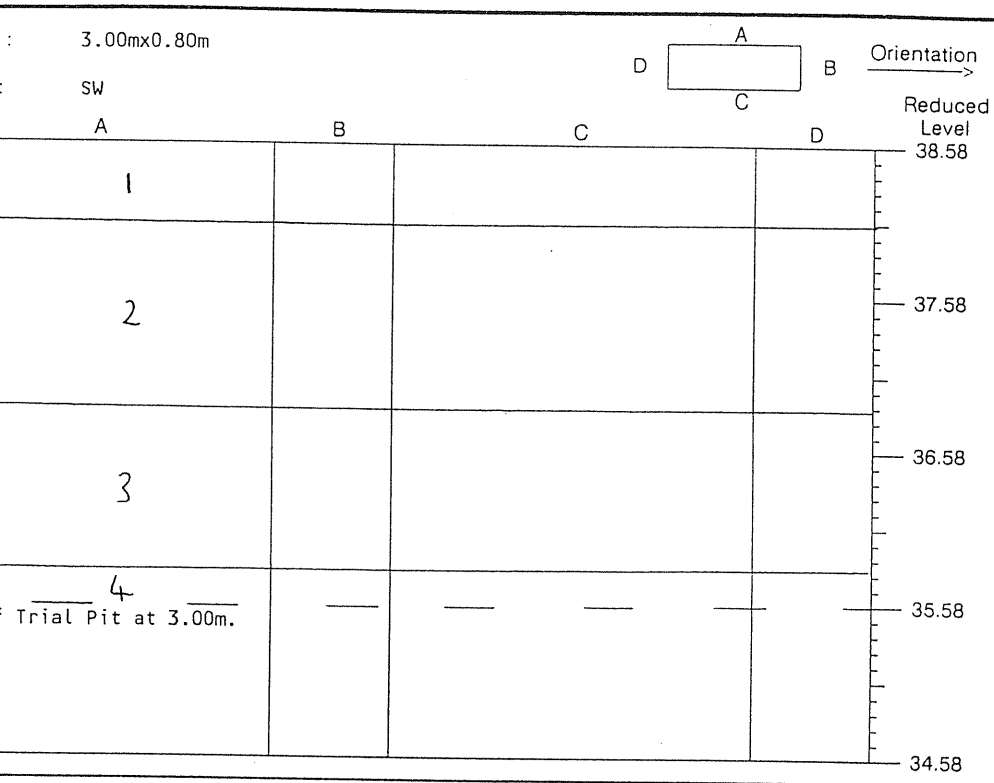
Project
Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Trial Pit TP2A

Dimensions : 3.00mx0.80m

Orientation : SW



Strata

Depth (m)	No.	Description
0.00-0.50	1	MADE GROUND:Rough grass onto dark brown,reddish brown,grey brown sandy angular fine to coarse gravel and occcasional cobbles including brick and occasional slag At 0.50m:sandstone blocks(Face D)
0.50-1.70	2	Firm to stiff grey brown slightly sandy CLAY with some subangular fine to coarse gravel including sandstone
1.70-2.75	3	Firm grey silty CLAY with a little fine and medium gravel.Locally mottled dark grey,becoming soft sandy with depth
2.75-3.00	4	Brown,grey brown slightly clayey silty fine medium locally coarse SAND

Samples and Tests

Depth (m)	Type	Results
0.30	B	

Date of Excavation 23/06/99
Equipment JCB 3CX
Stability Spalling from 2.75m

Groundwater

No.	Struck	Behaviour
1	2.75	Seepage

Ground Level 38.58 m OD
Coordinates 1018.00 mE
1110.48 mN

Logged by DJLS
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

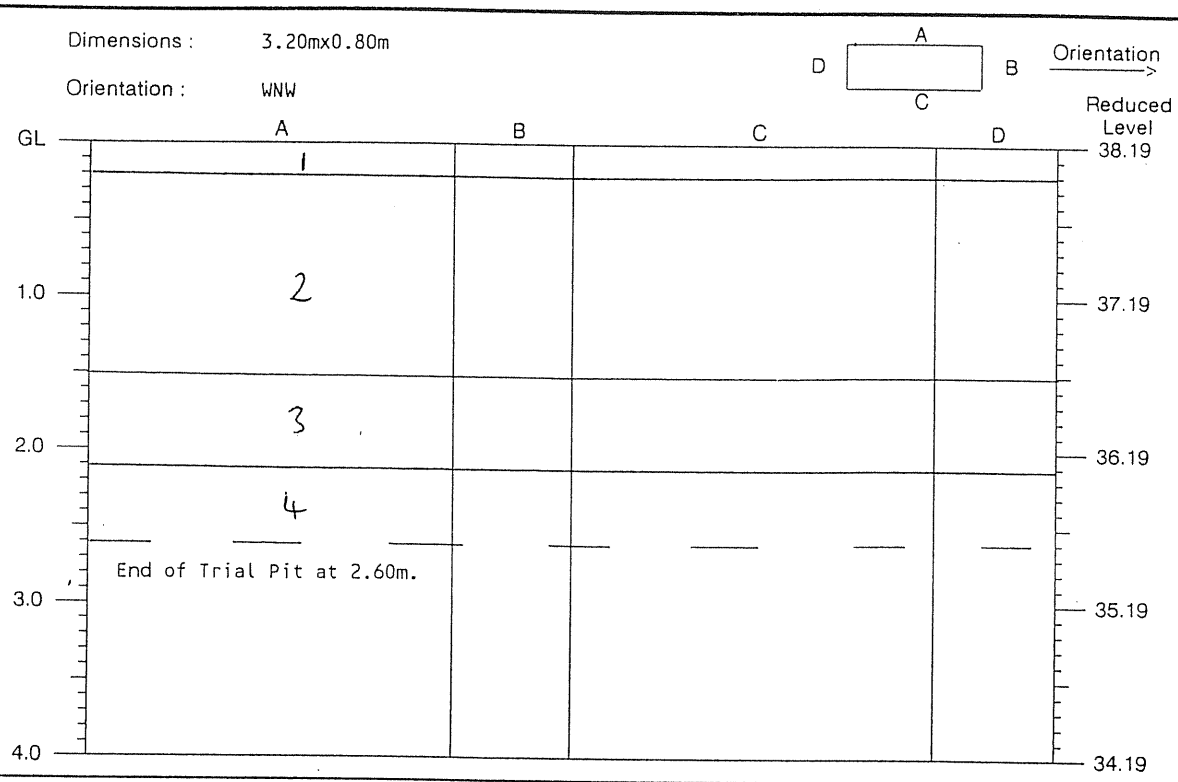
Project: Forge Lane Former Steelworks,Thornhill, Dewsbury Kirklees M.B.C.

Contract 129148

Trial Pit TP3A

Dimensions : 3.20mx0.80m

Orientation : WNW



Strata

Depth (m)	No.	Description
0.00-0.20	1	Rough grass and vetch onto brown sandy TOPSOIL
0.20-1.50	2	MADE GROUND:Dark grey brown,grey sandy angular fine to coarse gravel including ash,brick and occasional green glass fragments
1.50-2.10	3	Firm to stiff brown sandy CLAY with a little subangular to subrounded fine to coarse gravel
2.10-2.60	4	Brown,locally orange brown slightly clayey silty fine to coarse SAND

Samples and Tests

Depth (m)	Type	Results
1.20	B	

Date of Excavation 23/06/99
Equipment JCB 3CX
Stability Spalling from 0.20m and 2.10m

Groundwater

No.	Struck	Behaviour
1	2.50	Seepage

Ground Level 38.19 m OD
Coordinates 1057.59 mE
1077.49 mN

Logged by DJLS
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

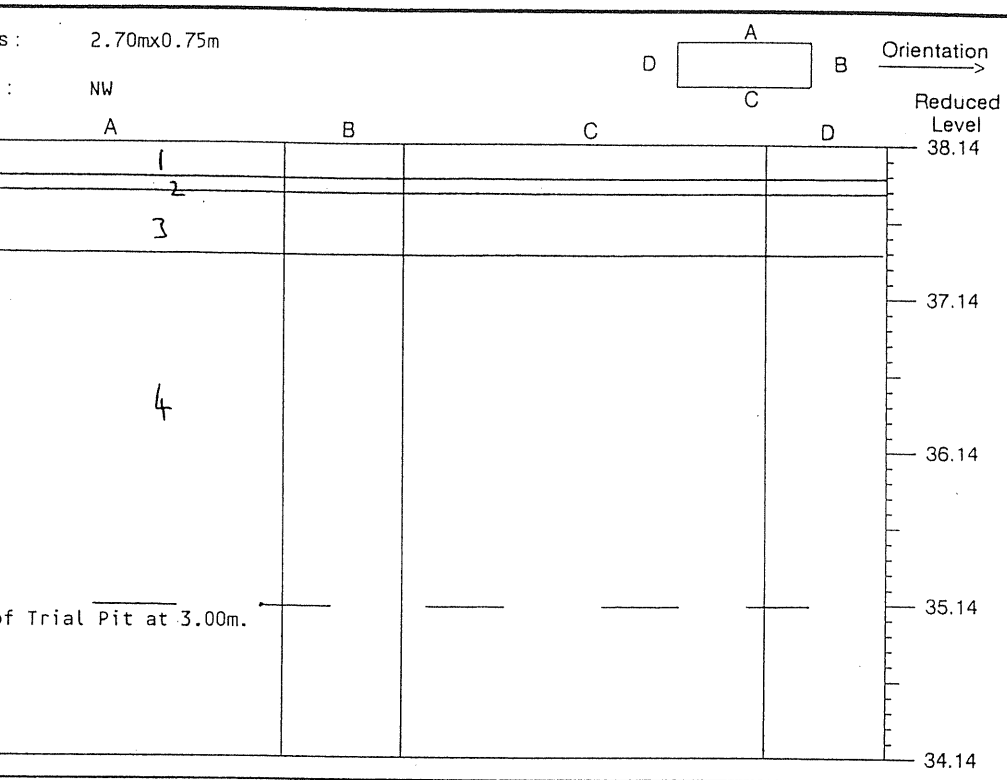
Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Trial Pit TP4A

Dimensions : 2.70mx0.75m

Orientation : NW



Strata

Depth (m)	No.	Description
0.00-0.20	1	Rough grass and briar onto brown sandy TOPSOIL with a little gravel of brick
0.20-0.30	2	MADE GROUND:Grey ashy hardcore
0.30-0.70	3	MADE GROUND:Brown,grey brown fine and medium sand with occasional brick
0.70-3.00	4	Brown,light brown sandy subrounded fine to coarse GRAVEL and cobbles

Samples and Tests

Depth (m)	Type	Results
2.00	B	

Date of Excavation 23/06/99
Equipment JCB 3CX
Stability Slight spalling from 0.70m

Groundwater

No.	Struck	Behaviour
1	2.50	Damp
2	2.75	Seepage

Ground Level 38.14 m OD
Coordinates 1003.33 mE
994.95 mN

Logged by DJLS
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

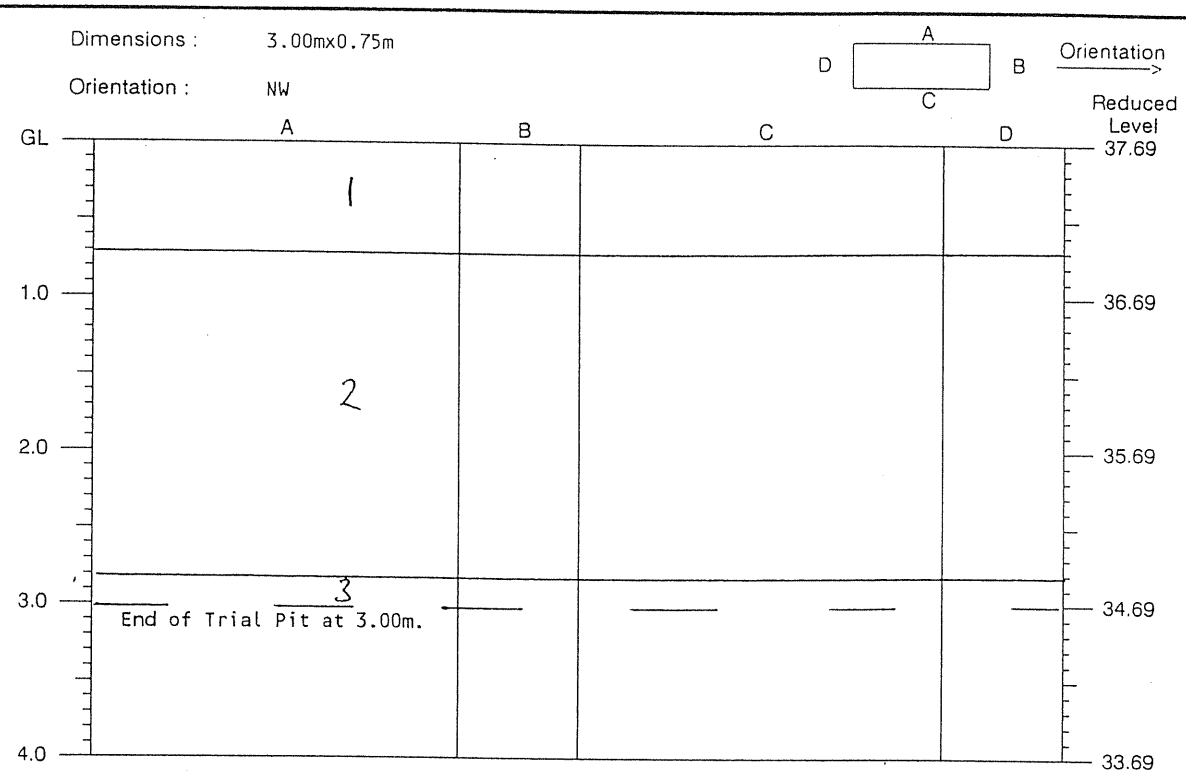
Project
Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Trial Pit TP5A

Dimensions : 3.00mx0.75m

Orientation : NW



Strata

Depth (m)	No.	Description
0.00-0.70	1	Rough grass,cinquefoil,dogrose,vetch and briar onto brown sandy TOPSOIL with a little angular fine to coarse gravel of brick and metal
0.70-2.80	2	MADE GROUND:Soft black silty locally peaty? clay with occasional gravel including brick.Occasional black fibrous vegetable matter.Odourous.Locally blue spent oxide
2.80-3.00	3	Grey silty fine to coarse SAND

Samples and Tests

Depth (m)	Type	Results
2.00	B	
2.80	WX4	

Date of Excavation 23/06/99
Equipment JCB 3CX
Stability Spalling from 2.80m

Groundwater

No.	Struck	Behaviour
1	2.80	Ingress.Slight sheen on water

Ground Level 37.69 m OD
Coordinates 1066.23 mE
998.43 mN

Logged by DJLS
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

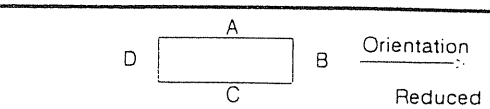
Project
Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

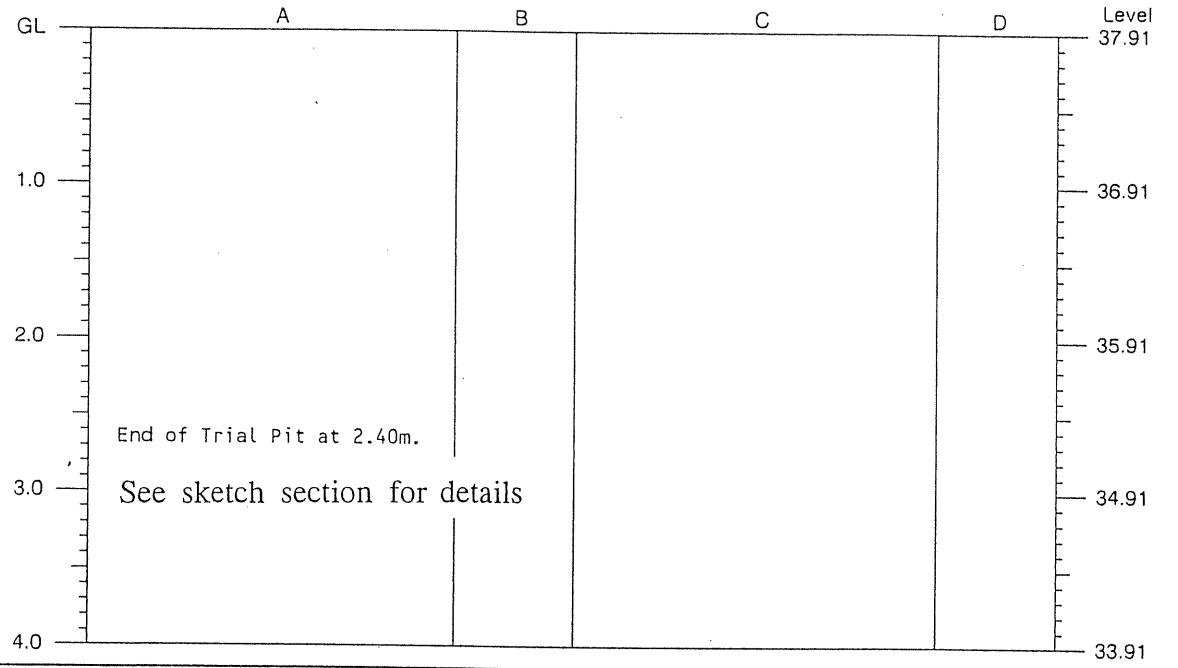
Contract 129148

Trial Pit TP6A

Dimensions : 6.60mx0.75m

Orientation : SW





Strata

Depth (m)	No.	Description
0.00-0.10	1	Rough grass including vetch and hawthorn scrub onto brown sandy TOPSOIL with rootlets
0.10-2.00	2	MADE GROUND:Grey brown,orange brown slightly clayey subangular fine to coarse gravel including brick,timber and sandstone(up to 150mmx400mmϕ)Rare orange brown slag At 1.50m(chainage 1.50m)concrete slab with abundant brick cobbles
0.80-2.40	3	MADE GROUND:Soft black very silty clay with some red brick.Slight odour At 2.20m(chainage 2.10m)concrete slab(chainage 2.00m to 5.70m)
0.80-2.20	4	Brown clayey fine and medium SAND grading to silty slightly clayey fine to coarse sand(chainage 3.60m -6.60m)

Samples and Tests

Depth (m)	Type	Results
1.20	B	

Date of Excavation 23/06/99
Equipment JCB 3CX
Stability Slight spalling from 2.20m

Groundwater

No.	Struck	Behaviour
1	1.50	Seepage/ingress
2	2.20	Seepage/ingress

Ground Level 37.91 m OD
Coordinates 1038.57 mE
1000.32 mN

Logged by DJLS
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project
Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Trial Pit TP7A

Exploration Associates

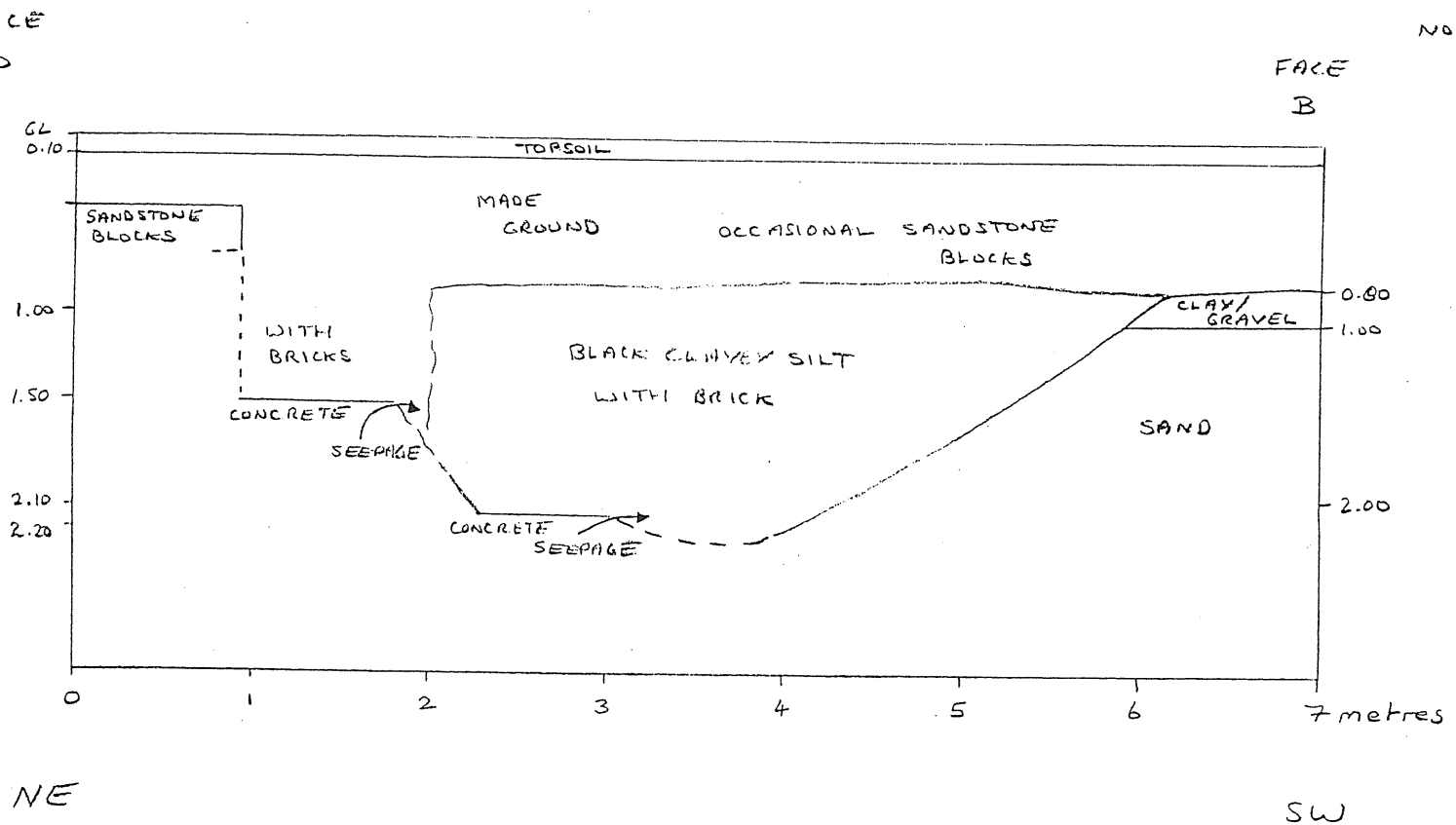
Trial Pit Sketch Section

Project

Forge Lane Former Steelworks, Thornhill, Dewsbury Kirklees M.B.C.

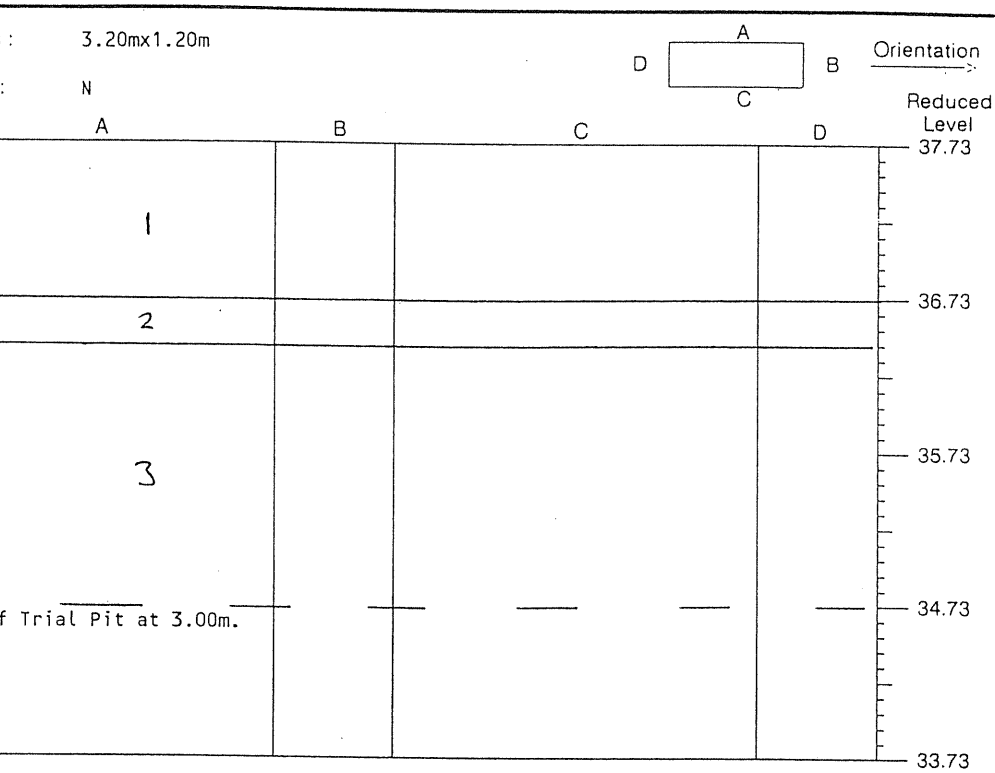
Contract 129148

Figure TP7A



Dimensions : 3.20mx1.20m

Orientation : N



Strata

Depth (m)	No.	Description
0.00-1.00	1	MADE GROUND:Undergrowth including nettles,rose bay willow herb,thistles onto demolition rubble including masonry,reinforced concrete(up to 150mmx2000mmφ)timber,metal,brick,rope and hawser
1.00-1.30	2	MADE GROUND:Grey,dark grey silty clay with a little vegetable matter
1.30-3.00	3	MADE GROUND:Soft black very silty clay,odourous with occasional black vegetable matter and a little fine to coarse gravel

Samples and Tests

Depth (m)	Type	Results
1.50	B	
2.70	WX3	

Date of Excavation 23/06/99
Equipment JCB 3CX
Stability Spalling from 1.00m

Groundwater

No.	Struck	Behaviour
1	1.10	Seepage/ingress.S.W.L. 2.70

Ground Level 37.73 m OD
Coordinates 1081.91 mE
1025.51 mN

Logged by DJLS
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

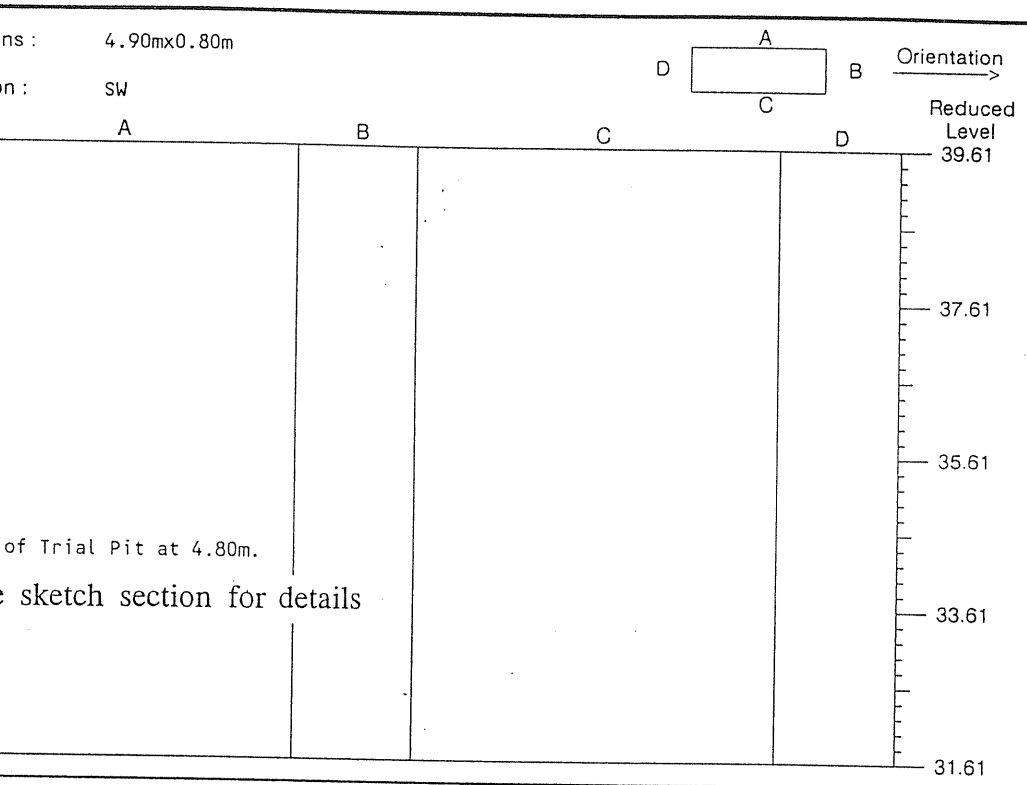
Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Trial Pit TP8A

Dimensions : 4.90mx0.80m

Orientation : SW



Strata

Depth (m)	No.	Description
0.00-3.60	1	MADE GROUND:Undergrowth including nettles,rosebay willow herb and sycamore saplings onto brown,dark grey brown fine to coarse sand with some subangular fine to coarse gravel and cobbles including brick,ash and timber.Abundant rootlets/turf in places.Occasional tree trunks,parallel to slope(150mmϕ) At base of slope:single iron rail(3.60m from top of slope)
0.00-0.50	2	MADE GROUND:Firm grey brown brown clay with subangular fine to coarse gravel including sandstone
3.60-4.80	3	Brown clayey fine and medium SAND Below 4.00m:less clayey fine to coarse

Samples and Tests

Depth (m)	Type	Results
0.00	WX4	
0.50	B	

Date of Excavation 23/06/99
Equipment JCB 3CX
Stability Slight spalling,severe spalling in brown sand

Groundwater

No.	Struck	Behaviour
1	1.70	Seepage(measured from bench)

Ground Level 39.61 m OD
Coordinates 1100.30 mE
993.67 mN

Logged by DJLS
Checked by

Remarks Water sample taken from gravel pit

See key sheet and appendices for explanations.

Form 2.0

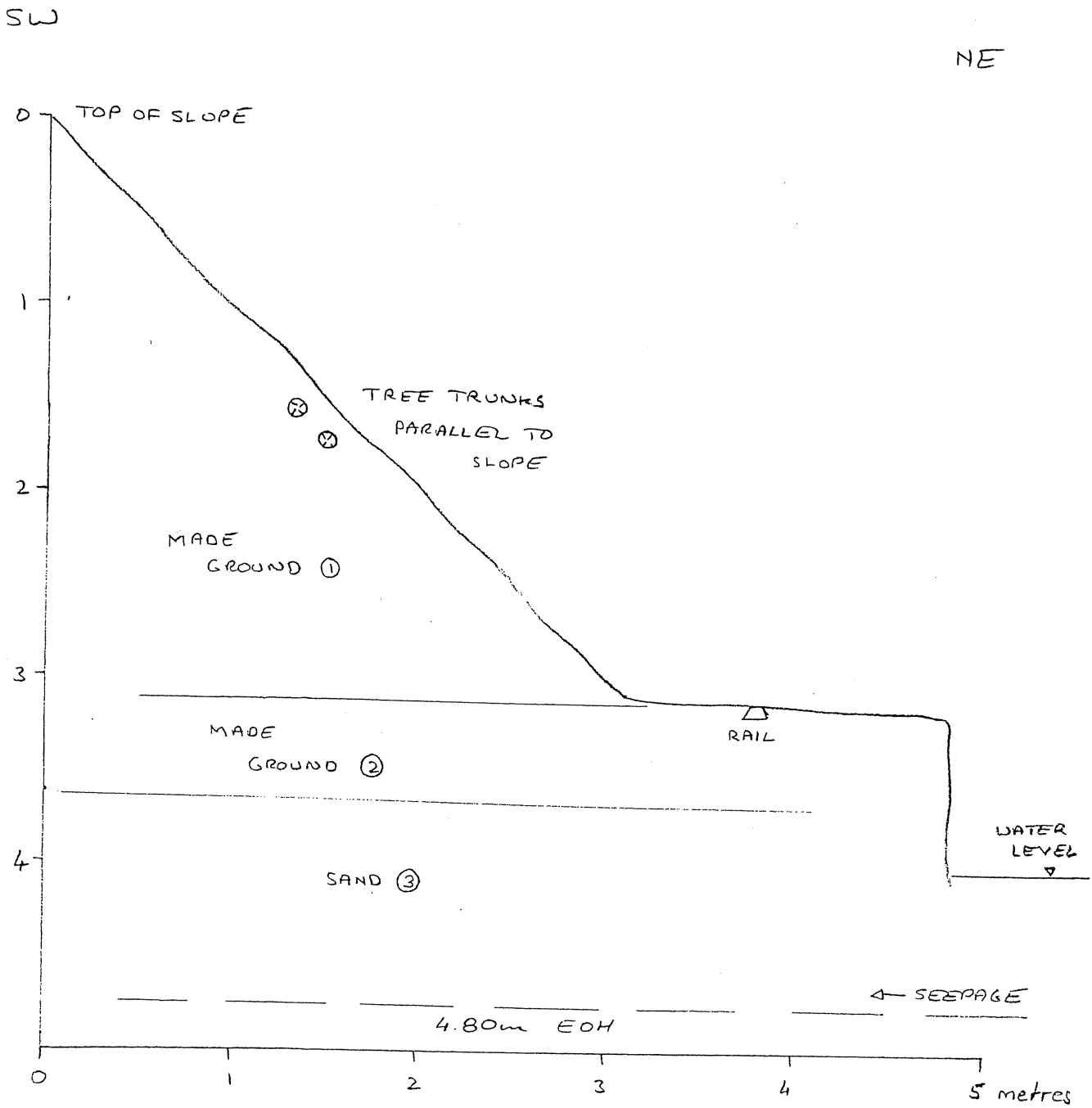
Trial Pit Record

Exploration Associates

Project
Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Trial Pit TP9A

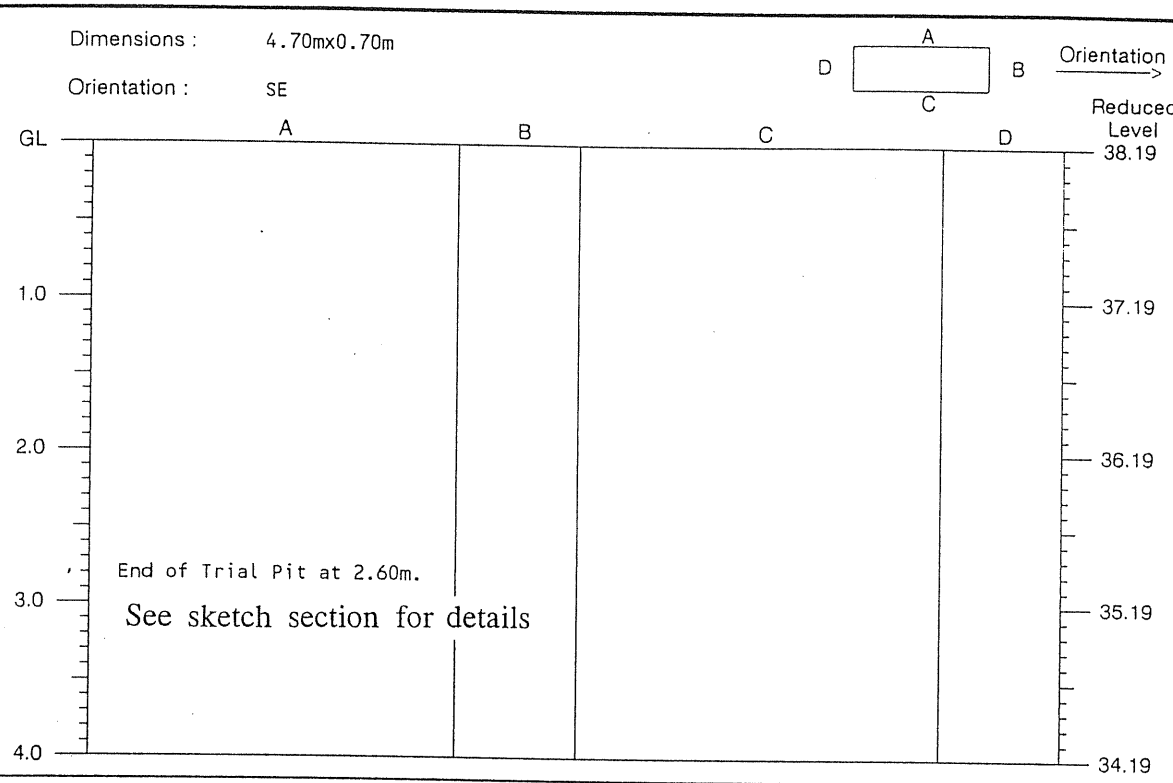


NOT TO
SCALE

Trial Pit Sketch Section	Project Forge Lane Former Steelworks, Thornhill, Dewsbury Kirklees M.B.C.	Contract 129148
Exploration Associates		Figure TP9A

Dimensions : 4.70mx0.70m

Orientation : SE



Strata

Depth (m)	No.	Description
0.00-1.20	1	MADE GROUND:Rough grass onto black fine and medium sand with some subangular fine to coarse gravel and occasional cobbles including ash and red brick and timber
1.20-2.60	2	Brown slightly clayey silty fine to coarse SAND
0.00-0.70	3	Pond vegetation onto grey brown grey silty CLAY with occasional vegetable matter
0.70-0.85	4	MADE GROUND:Black,mottled orange brown peaty silty clay,slight odour
0.85-1.40	5	Brown slightly clayey silty fine to coarse SAND,locally grey at top of stratum

Samples and Tests

Depth (m)	Type	Results
0.75	B	

Date of Excavation 23/06/99
Equipment JCB 3CX
Stability Severe spalling in sand

Groundwater

No.	Struck	Behaviour
1	0.00	Seepage(5)
2	2.60	Ingress(2)

Ground Level 38.19 m OD
Coordinates 1151.16 mE
1005.37 mN

Logged by DJLS
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project
Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Trial Pit TP10A

Exploration Associates

Trial Pit Sketch Section

Project

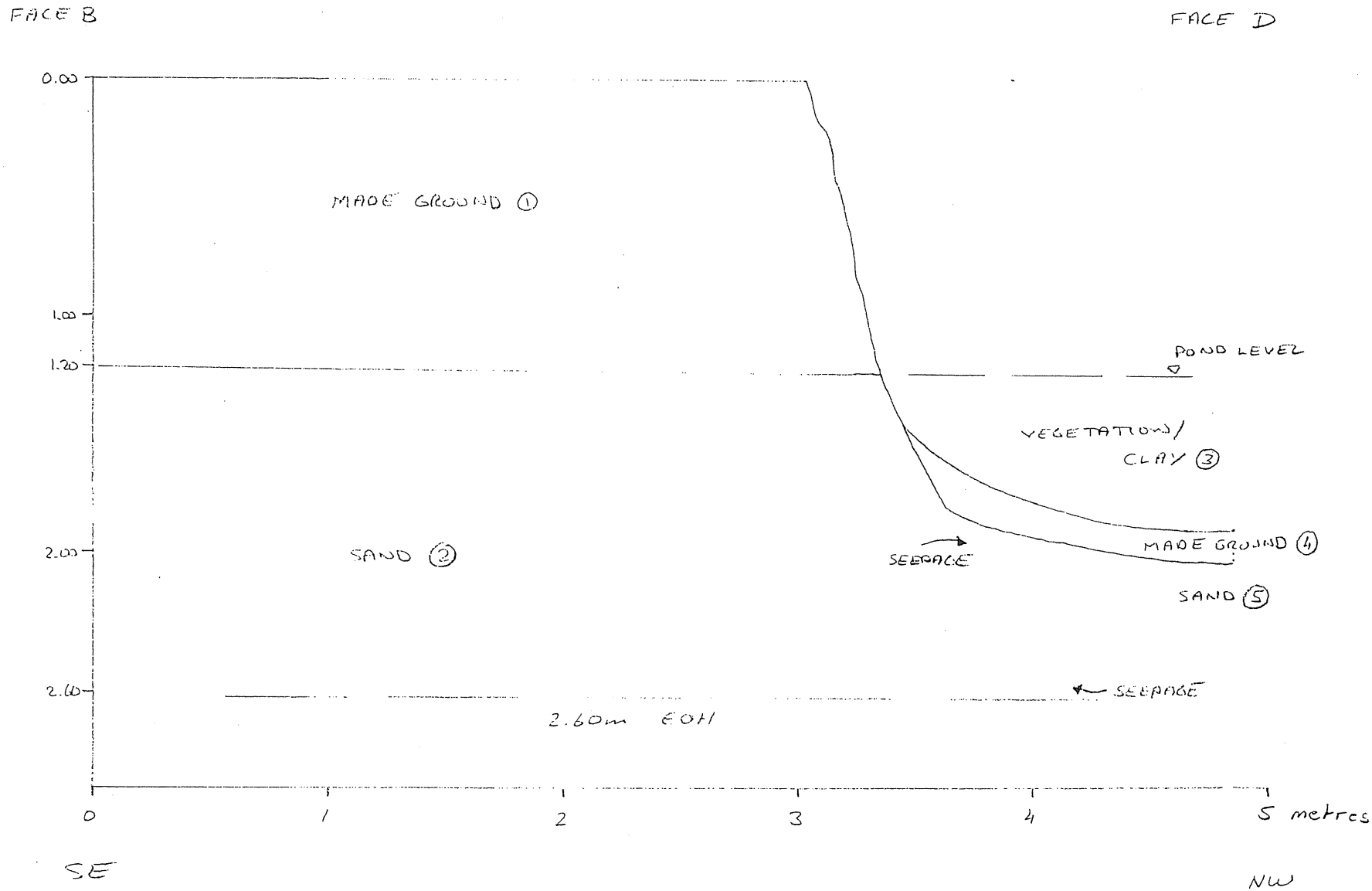
Forge Lane Former Steelworks, Thornhill, Dewsbury Kirklees M.B.C.

Contract

129148

Figure

TP10A



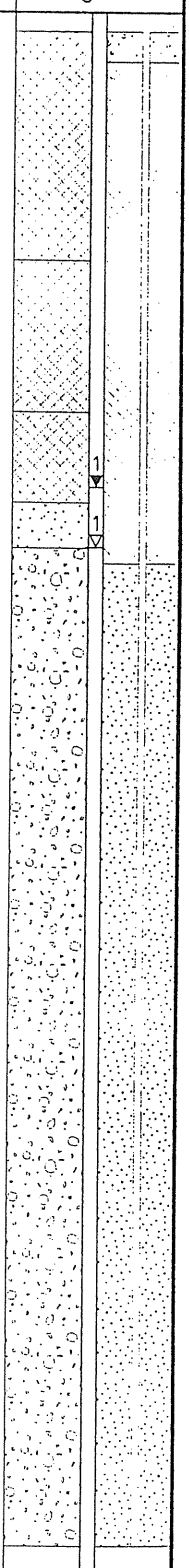
Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
0.50-1.00	B		25/06 1999 DRY	
1.50-2.00	B			
2.50-3.00	B			
3.50-4.00	B			
4.50-5.00	B			
5.50-6.00	B			
6.50-7.00	B			
7.50-8.00	B			
8.50-9.00	B			
9.50-10.00	B			

Strata

Description	Depth (Thickness)	Level
MADE GROUND:Grey brown clayey sub angular fine to coarse gravel and cobbles including red brick,occasional rootlets	G.L.	38.81
MADE GROUND:Black,mottled brown sandy clayey silt with a little fine and medium gravel including coal and clinker,locally peaty	1.50	37.31
MADE GROUND:Soft brown,mottled black sandy silty clay with a little fine and medium gravel including clinker	2.50	36.31
Brown SAND**	3.10	35.71
Brown sandy subrounded fine to coarse GRAVEL and cobbles	3.40	35.41
At 9.50m:very sandy		

Legend



Equipment: Cable percussive boring rig

Borehole Dia (mm) 150 to 11.00m

Casing Dia (mm) 150 to 10.50m

Groundwater

No.	Struck	Behaviour	Sealed
1	3.40	Rose to 3.00m in 20 mins	No

Ground Level 38.81 m OD
Coordinates 1158.61 mE
1004.97 mN

Drilled by DH
Logged by DJLS
Checked by

Remarks

Water added to assist boring throughout
Hard strata from 9.30m to 9.50m(½hour) and 10.80m to 11.00m(½hour)
Piezometer installed,tip at 10.50m,sand reponse zone from 3.50m to 11.00m

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Borehole 1A(1 of 2)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			25/06	
10.50-11.00 3.00	B W			
11.00		10.50	4.50	

Strata

Description	Depth (Thickness)	Level
(See previous sheet:GRAVEL)		
	10.50	28.31
Weathered grey,orange brown SILTSTONE		
	11.00	27.81
End of Borehole.		

Legend

Equipment: Cable percussive boring rig

Borehole Dia (mm) 150 to 11.00m

Casing Dia (mm) 150 to 10.50m

Groundwater

No. Struck Behaviour Sealed

Ground Level 38.81 m OD

Coordinates 1158.61 mE
1004.97 mN

Drilled by DH

Logged by DJLS

Checked by

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Borehole 1A(2 of 2)

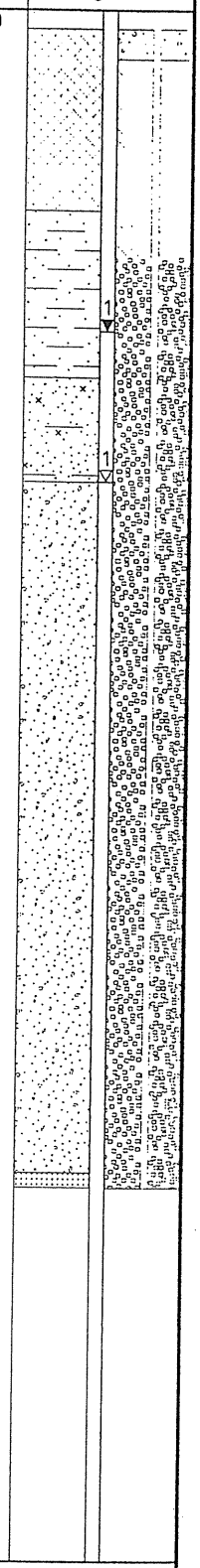
Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			24/06 1999 DRY	
0.50-1.00	B			
1.50-2.00	B			
2.50-3.00	B			
3.50-4.00	B			
4.50-5.00	B			
5.50-6.00	B			
6.50-7.00	B			
7.60-7.70	B			
2.00	W			
7.70		7.60	2.00	

Strata

Description	Depth (Thickness)	Level
MADE GROUND:Scrub onto black clayey fine to coarse sand with some subangular fine to coarse gravel including brick,coal and occasional pockets of grey silty clay	G.L.	37.70
Soft brown,mottled light grey,black very sandy CLAY with occasional rootlets(Possible made ground)	1.20	36.50
Grey brown silty clayey fine and medium SAND	2.30	35.40
Brown fine to coarse SAND with some subrounded fine to coarse gravel	3.00	34.70
Below 4.50m:grading to sand and gravel and cobbles		
Weathered grey SANDSTONE	7.60	30.10
End of Borehole.	7.70	30.00

Legend



Equipment: Cable percussive boring rig

Borehole Dia (mm): 150 to 7.70m

Casing Dia (mm): 150 to 7.60m

Groundwater

No.	Struck	Behaviour	Sealed
1	3.00	Rose to 2.00m in 20 mins	No

Ground Level: 37.70 m OD

Coordinates: 1051.02 mE, 979.98 mN

Drilled by: DH

Logged by: DJLS

Checked by:

Remarks

Water added to assit boring throughout
Hard strata form 7.60m to 7.70m(½hour)
50mmφ slotted standpipe installed,slotted section and gravel filter from 1.50m to 7.70m

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Borehole 2A(1 of 1)

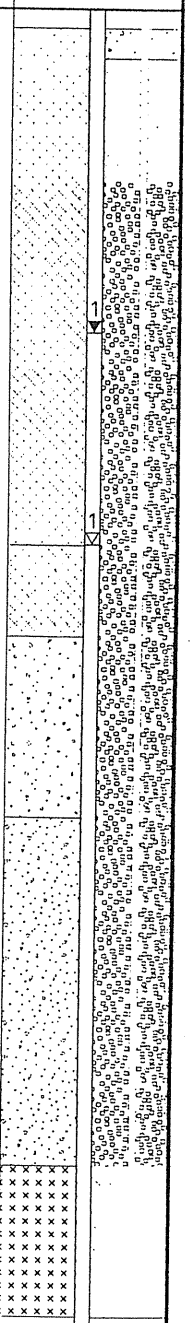
Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			23/06 1999 DRY	
0.50-1.00	B			
1.50-2.00	B			
2.50-3.00	B			
3.50-4.00	B			
4.50-5.00	B			
2.00	W			
		5.00	2.00	
5.00			24/06	
		5.00	2.00	
5.50-6.00	B			
6.50-7.00	B			
7.50-8.00	B			
8.50		8.50	8.00	

Strata

Description	Depth (Thickness)	Level
MADE GROUND:Black slightly clayey sandy fine to coarse gravel including ash,rare slag grading to clayey gravel	G.L.	37.72
At 1.50m:occasional vegetable matter		
MADE GROUND:Soft black very silty clay with some subangular fine to coarse gravel,locally peaty	3.40	34.32
Dark grey sandy subrounded fine to coarse GRAVEL	4.00	33.72
Brown fine to coarse SAND with some subrounded fine to coarse coarse gravel	5.20	32.52
Below 6.50m:clayey sandy gravel		
Weathered grey,mottled yellow brown SILTSTONE recovered as stiff silty clay	7.50	30.22
End of Borehole.	8.50	29.22

Legend



Equipment: Cable percussive boring rig

Borehole Dia (mm) 150 to 8.50m

Casing Dia (mm) 150 to 8.00m

Groundwater

No.	Struck	Behaviour	Sealed
1	3.40	Rose to 2.00m in 20 mins	No

Ground Level 37.72 m OD

Coordinates 1054.77 mE 1001.90 mN

Drilled by DH

Logged by DJLS

Checked by

Remarks 50mmφ standpipe installed,slotted section and gravel filter from 1.00m to 7.50m

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Borehole 3A(1 of 1)

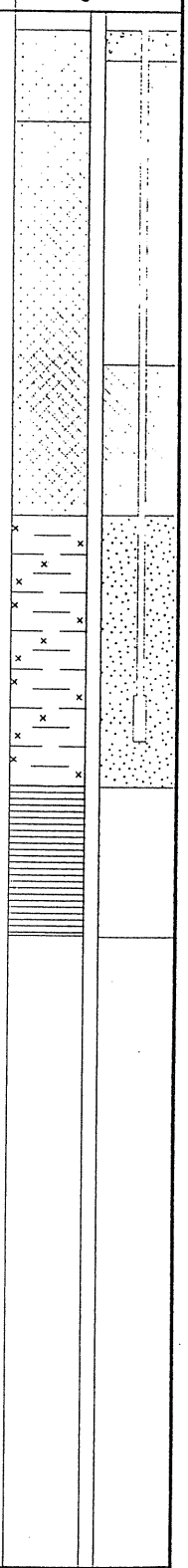
Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			23/06 1999 DRY	
0.50-1.00	B			
1.50-2.00	B			
2.50-3.00	B			
3.50-4.00	B			
4.50-5.00	B			
5.50-6.00	B			
6.00		5.00		

Strata

Description	Depth (Thickness)	Level
MADE GROUND:Scrub,compact ash and brick fill**	G.L.	38.63
MADE GROUND:Firm brown,orange brown sandy clay with a little fine to coarse gravel including sandstone and brick	0.60	38.03
Soft grey,mottled dark grey silty locally peaty CLAY	3.20	35.43
Weathered grey MUDSTONE/SILTSTONE	5.00	33.63
End of Borehole.	6.00	32.63

Legend



Equipment: Cable percussive boring rig

Borehole Dia (mm) 150 to 6.00m

Casing Dia (mm) 150 to 5.00m

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Ground Level 38.63 m OD

Coordinates 1050.11 mE 1108.43 mN

Drilled by DH

Logged by DJLS

Checked by

Remarks Water added to asist boring throughout
Piezometer installed,tip at 4.70m,sand response zone from 3.20m to 5.00m

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Borehole 4A(1 of 1)

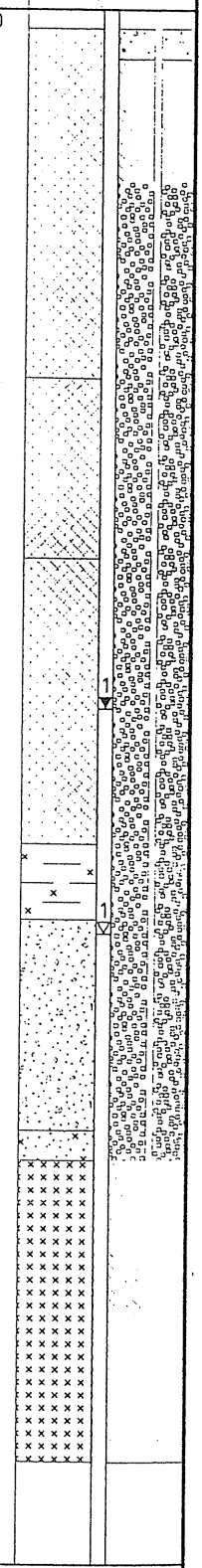
Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			23/06 1999 DRY	
0.50-1.00	B			
1.50-2.00	B			
2.50-3.00	B			
3.50-4.00	B			
4.50-5.00	B			
5.50-6.00	B			
4.50	W			
6.50-7.00	B			
7.50-8.00	B			
8.50-9.00	B			
9.50		9.30		

Strata

Description	Depth (Thickness)	Level
MADE GROUND:Scrub onto brown slightly clayey sandy subangular fine to coarse gravel and cobbles including sandstone,brick and mudstone	G.L.	40.40
Below 1.50m:sandstone cobbles		
MADE GROUND:Dark grey,black clayey sandy subangular fine to coarse gravel including sandstone,mudstone and coal grading to gravelly clay	2.30	38.10
MADE GROUND:Firm orange brown,mottled grey, black silty clay with some subangular fine to coarse gravel including sandstone,brick and rare coal	3.50	36.90
Below 4.50m:occasional cobbles of grey and yellow brown sandstone		
Soft to firm grey,grey brown,light grey silty CLAY with occasional cobbles of sandstone	5.40	35.00
Brown fine to coarse SAND and subrounded fine to coarse GRAVEL	5.90	34.50
Grey silty SAND**	7.30	33.10
Weathered grey SILTSTONE recovered as gravelly clay	7.50	32.90
End of Borehole.	9.50	30.90

Legend



Equipment: Cable percussive boring rig

Borehole Dia (mm): 150 to 9.50m

Casing Dia (mm): 150 to 9.30m

Groundwater

No.	Struck	Behaviour	Sealed
1	6.00	Rose to 4.50m in 20 mins	No

Ground Level: 40.40 m OD

Coordinates: 931.25 mE, 1109.17 mN

Drilled by: DH

Logged by: DJLS

Checked by:

Remarks

Water added to assist boring throughout
Hard strata from 9.30m to 9.50m(1hour)
50mmφ standpipe installed,slotted section from 1.50m to 7.50m,gravel filter from 1.00m to 7.50m

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

Forge Lane Former Steelworks,Thornhill, Dewsbury
Kirklees M.B.C.

Contract 129148

Borehole 5A(1 of 1)

ENCLOSURE B

Laboratory Test Results

	Sheet
Results of Chemical Analyses	TES Report No. CL992494
	TES Report No. W/EXR/993625
Results of Swelling Potential Tests	
ICRCL Tables 3 and 4	
Guidelines for Contaminated Soils	
"Netherlands" Classification	
Drinking Water Standards	

TEST REPORT
SOIL SAMPLE ANALYSIS

TESTING
No.1252
No.1411

TES Report No. CL/992494

Site: Forge Lane 129148

Exploration Associates
Unit 18
Deeside Industrial Estate
Welsh Road
Deeside
CH5 2LR

The 16 samples described in this report were scheduled for analysis by TES Bretby on Wednesday, 14 July 1999. The analysis was completed by Friday, 30 July 1999.

Tests marked as 'not UKAS accredited' and any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by TES Bretby laboratories.

The following tables are contained in this report:

Table 1 Sample Descriptions
Table 2 Main Analysis Results

On behalf of
TES Bretby :
J Elstub Project Co-ordinator

Date of Issue: 30/07/99

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby accepts no responsibility for the sampling related to the above results

TEST REPORT
SOIL SAMPLE ANALYSIS

TESTING
No.1252
No.1411

Exploration Associates
Unit 18
Deeside Industrial Estate
Welsh Road
Deeside
CH5 2LR

TES Report No. 992494

Site: Forge Lane 129148

Page No	Assessed Area	ID No. EFS/CL	Sample	Depth (m) from	to	Description
1	129148	9917860	B/H / 1/A	1.50	2.00	BH1A 1.5-2.0
1	129148	9917856	B/H / 1/A	2.50	3.00	BH1A 2.5-3.0
1	129148	9917863	B/H / 2/A	0.50	1.00	BH2A 0.5-1.0
1	129148	9917868	B/H / 2/A	1.50	2.00	BH2A 1.5-2.0
2	129148	9917857	B/H / 2/A	2.50	3.00	BH2A 2.5-3.0
2	129148	9917867	B/H / 3/A	1.50	2.00	BH3A 1.5-2.0
2	129148	9917858	B/H / 3/A	3.50	4.00	BH3A 3.5-4.0
2	129148	9917862	B/H / 4/A	3.50	4.00	BH4A 3.5-4.0
3	129148	9917864	B/H / 5/A	2.50	3.00	BH5A 2.5-3.0
3	129148	9917859	B/H / 5/A	5.50	6.00	BH5A 5.5-6.0
3	129148	9917861	B/H / 5/A	6.50	7.00	BH5A 6.5-7.0
3	129148	9917865	T/P / 4/A	1.20		TP4A 1.2
4	129148	9917853	T/P / 6/A	2.00		TP6A 2.0
4	129148	9917854	T/P / 8/A	1.50		TP8A 1.5
4	129148	9917855	T/P / 9/A	0.50		TP9A 0.5
4	129148	9917866	T/P / 10/A	0.75		TP10A 0.75

Date of Issue: 30/07/99

Tests not marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby accepts no responsibility for the sampling related to the above results

TES Bretby
Report 992494
Table 1
Sheet 1/ 1

TES Bretby, P.O. Box 100, Burton-on-Trent, DE15 0XD Telephone: 01283 554400 Fax: 01283 554422
TES Bretby is a division of Environmental Services Group Limited Registered in England Number 2880501

TEST REPORT
SOIL SAMPLE ANALYSIS

TESTING
No.1252
No.1411
No.1253

Exploration Associates
Unit 18
Deeside Industrial Estate
Welsh Road
Deeside
CH5 2LR

TES Report No. 992494

Site: Forge Lane 129148

Customer reference	B/H 1 A	B/H 1 A	B/H 2 A	B/H 2 A
Depth (m)	1.50 to 2	2.50 to 3	0.50 to 1	1.50 to 2
Date logged	14/07/99	14/07/99	14/07/99	14/07/99
TES Bretby ID Number	CL/9917860	CL/9917856	CL/9917863	CL/9917868

UKAS accredited	Test No.	CL/9917860	CL/9917856	CL/9917863	CL/9917868
Arsenic	ICPSSS11	62	36		
Cadmium	ICPSSS11	<1	<1		
Chloride	WSLM1	17	13		
Chromium (total)	ICPSSS11	20	15		
Chromium (VI)	WSLM6	<0.1	<0.1		
Copper	ICPSSS11	35	25		
Lead	ICPSSS11	55	42		
Loss on Ignition %	CA3			13.7	
Mercury	ICPSSS11	<0.5	<0.5		
Nickel	ICPSSS11	23	19		
pH units	WSLM3	5.7	7.6		
Phenol Index	WSLM4	<0.5	<0.5		
SO4-- (H2O sol) mg/l	ICPWAS46	1600	700		
Sulphide	ICTSCN28	<1	<1		
Zinc	ICPSSS11	102	58		

not UKAS accredited		CL/9917860	CL/9917856	CL/9917863	CL/9917868
Boron.		<0.5	<0.5		
Elemental Sulphur		33	34		
Organic Matter %					1.8
Selenium (MS)		0.60	<0.50		

Results expressed as mg/kg Air Dried unless stated otherwise
SO4 Analysis not conducted in accordance with BS1377
Water Soluble Sulphate on 2:1 water:soil extract

Date of Issue: 30/07/99

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby

TEST REPORT
SOIL SAMPLE ANALYSIS

UKAS TESTING

TESTING
No.1252
No.1411
No.1253

Exploration Associates
Unit 18
Deeside Industrial Estate
Welsh Road
Deeside
CH5 2LR

TES Report No. 992494

Site: Forge Lane 129148

Customer reference	B/H	B/H	B/H	B/H
Depth (m)	2 A 2.50 to 3	3 A 1.50 to 2	3 A 3.50 to 4	4 A 3.50 to 4
Date logged	14/07/99	14/07/99	14/07/99	14/07/99
TES Bretby ID Number	CL/9917857	CL/9917867	CL/9917858	CL/9917862

UKAS accredited	Test No.	CL/9917857	CL/9917867	CL/9917858	CL/9917862
Arsenic	ICPSSS11	6		27	4
Cadmium	ICPSSS11	<1		<1	<1
Chloride	WSLM1	<12		<12	37
Chromium (total)	ICPSSS11	15		12	33
Chromium (VI)	WSLM6	<0.1		<0.1	<0.1
Copper	ICPSSS11	16		13	25
Lead	ICPSSS11	25		29	42
Mercury	ICPSSS11	<0.5		<0.5	<0.5
Nickel	ICPSSS11	18		23	35
PAH (screening)	PAHSCUV		41		
pH units	WSLM3	7.3		6.8	5.9
Phenol Index	WSLM4	<0.5		<0.5	<0.5
SO4-- (H2O sol) mg/l	ICPWAS46	87.8		327	139
Sulphide	ICTSCN28	<1		<1	<1
Zinc	ICPSSS11	43		53	91

not UKAS accredited		CL/9917857	CL/9917867	CL/9917858	CL/9917862
Boron.		<0.5		<0.5	<0.5
Elemental Sulphur		<20		240	140
Organic Matter %			13.6		
Selenium (MS)		<0.50		<0.50	<0.50

Results expressed as mg/kg Air Dried unless stated otherwise
SO4 Analysis not conducted in accordance with BS1377
Water Soluble Sulphate on 2:1 water:soil extract

Date of Issue: 30/07/99

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby accepts no responsibility for the sampling related to the above results

TEST REPORT
SOIL SAMPLE ANALYSIS

TESTING
No.1252
No.1411
No.1253

Exploration Associates
Unit 18
Deeside Industrial Estate
Welsh Road
Deeside
CH5 2LR

TES Report No. 992494

Site: Forge Lane 129148

Customer reference	B/H 5 A	B/H 5 A	B/H 5 A	T/P 4 A
Depth (m)	2.50 to 3	5.50 to 6	6.50 to 7	1.20
Date logged	14/07/99	14/07/99	14/07/99	14/07/99
TES Bretby ID Number	CL/9917864	CL/9917859	CL/9917861	CL/9917865

UKAS accredited	Test No.	CL/9917864	CL/9917859	CL/9917861	CL/9917865
Arsenic	ICPSSS11		<3	3	
Cadmium	ICPSSS11		<1	<1	
Chloride	WSLM1		28	31	
Chromium (total)	ICPSSS11		28	15	
Chromium (VI)	WSLM6		<0.1	<0.1	
Copper	ICPSSS11		21	9	
Lead	ICPSSS11		33	20	
Loss on Ignition %	CA3	47			22.8
Mercury	ICPSSS11		<0.5	<0.5	
Nickel	ICPSSS11		30	25	
PAH (screening)	PAHSCUV				86
pH units	WSLM3		6.5	7.1	
Phenol Index	WSLM4		<0.5	<0.5	
SO4-- (H2O sol) mg/l	ICPWAS46		256	46.2	
Sulphide	ICTSCN28		<1	<1	
Zinc	ICPSSS11		71	57	

not UKAS accredited		CL/9917864	CL/9917859	CL/9917861	CL/9917865
Boron.			<0.5	<0.5	
Elemental Sulphur			48	<20	
Selenium (MS)			<0.50	<0.50	

Results expressed as mg/kg Air Dried unless stated otherwise
SO4 Analysis not conducted in accordance with BS1377
Water Soluble Sulphate on 2:1 water:soil extract

Date of Issue: 30/07/99

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TEST REPORT
SOIL SAMPLE ANALYSIS

TESTING
No.1252
No.1411
No.1253

Exploration Associates
Unit 18
Deeside Industrial Estate
Welsh Road
Deeside
CH5 2LR

TES Report No. 992494

Site: Forge Lane 129148

Customer reference	T/P 6 A	T/P 8 A	T/P 9 A	T/P 10 A
Depth (m)	2.00	1.50	0.50	0.75
Date logged	14/07/99	14/07/99	14/07/99	14/07/99
TES Bretby ID Number	CL/9917853	CL/9917854	CL/9917855	CL/9917866

UKAS accredited	Test No.	CL/9917853	CL/9917854	CL/9917855	CL/9917866
Arsenic	ICPSSS11	71	111	78	
Cadmium	ICPSSS11	<1	<1	<1	
Chloride	WSLM1	47	97	21	
Chromium (total)	ICPSSS11	24	29	25	
Chromium (VI)	WSLM6	<0.1	<0.1	<0.1	
Copper	ICPSSS11	65	48	42	
Lead	ICPSSS11	98	78	72	
Mercury	ICPSSS11	<0.5	1.0	<0.5	
Nickel	ICPSSS11	27	28	23	
PAH (screening)	PAHSCUV				415
pH units	WSLM3	6.6	8.1	4.8	
Phenol Index	WSLM4	0.7	2.0	0.7	
SO4-- (H2O sol) mg/l	ICPWAS46	1840	464	1610	
Sulphide	ICTSCN28	7	6	<1	
Zinc	ICPSSS11	195	93	100	

not UKAS accredited		CL/9917853	CL/9917854	CL/9917855	CL/9917866
Boron.		<0.5	<0.5	<0.5	
Elemental Sulphur		480	1500	<20	
Organic Matter %					46.4
Selenium (MS)		0.68	0.97	0.80	

Results expressed as mg/kg Air Dried unless stated otherwise
SO4 Analysis not conducted in accordance with BS1377
Water Soluble Sulphate on 2:1 water:soil extract

Date of Issue: 30/07/99

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby accepts no responsibility for the sampling related to the above results

TEST REPORT
WATER SAMPLE ANALYSIS

TESTING
No.1252

Amended Report
TES Report No. W/EXR/993625

Site: FORGE LANE

Exploration Associates
Geotechnical House
Unit 18
Deeside Industrial Estate
Deeside
Flintshire
CH5 2LR

The 7 Samples described in this report were scheduled for analysis by TES Bretby on Tuesday, 13 July 1999. The analysis was completed by Tuesday, 27 July 1999.

Tests marked as 'not UKAS accredited' and any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by TES Bretby laboratories.

The following tables are contained in this report:

Table 1 Sample Descriptions
Table 2 Main Analysis Results
Tables of Volatile Organic Compounds (7 Pages)

On behalf of
TES Bretby :
J Elstub Project Co-ordinator

Date of Issue: 27/07/99

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.
TES Bretby accepts no responsibility for the sampling related to the above results.

TEST REPORT
WATER SAMPLE ANALYSIS

TESTING
No.1252

Exploration Associates
Geotechnical House
Unit 18
Deeside Industrial Estate
Deeside
Flintshire
CH5 2LR

Amended Report
TES Report No. W/EXR/993625

Client: EXPLORATION ASS.
Site: FORGE LANE

Page No	ID No. W/EX/		Sample Date
1	9915867	TP 6A @ 2.80m	
1	9915868	TP 8A @ 2.70m	
1	9915869	TP 9A @ 0.00m	
1	9915870	BH 1A @ 3.00m	25/06/99
2	9915871	BH 2A @ 2.00m	24/06/99
2	9915872	BH 3A @ 2.00m	23/06/99
2	9915873	BH 5A @ 4.50m	23/06/99

Date of Issue: 27/07/99

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby accepts no responsibility for the sampling related to the above results.

TES Bretby, P.O. Box 100, Burton-on-Trent, DE15 0XD Telephone: 01283 554400 Fax: 01283 554422
TES Bretby is a division of Environmental Services Group Limited Registered in England Number 2880501

TES Bretby
Report Number
W/EXR/993625
Table 1
Sheet 1/ 1

TEST REPORT
WATER SAMPLE ANALYSIS

TESTING
No.1252

Exploration Associates
Geotechnical House
Unit 18
Deeside Industrial Estate
Deeside
Flintshire
CH5 2LR

Amended Report
TES Report No. W/EXR/993625

Client: EXPLORATION ASS.
Site: FORGE LANE

Sample reference		Sample 01	Sample 02	Sample 03	Sample 04
Sample Date					25/06/99
TES Bretby ID Number	W/EX/..	9915867	9915868	9915869	9915870
UKAS accredited	Test No.				
pH units	WSLM3	7.2	7.2	7.1	7.0
Nickel as Ni (Dissolved)	ICPPWW13	<0.02	<0.02	<0.02	<0.02
Chromium as Cr (Dissolved)	ICPPWW13	<0.02	<0.02	<0.02	<0.02
Chromium (Hexavalent)	WSLM6	<0.01	<0.01	<0.01	<0.01
Cadmium as Cd (Dissolved)	ICPPWW13	<0.01	<0.01	<0.01	<0.01
Copper as Cu (Dissolved)	ICPPWW13	<0.01	0.01	<0.01	<0.01
Lead as Pb (Dissolved)	ICPPWW13	<0.03	<0.03	<0.03	<0.03
Zinc as Zn (Dissolved)	ICPPWW13	<0.01	<0.01	<0.01	0.02
Arsenic as As (Dissolved)	ICPPWW13	<0.03	<0.03	<0.03	<0.03
Ammoniacal Nitrogen as N	AMMKA40	<0.2	<0.2	3.8	<0.2
Phenol Index as C6H5OH	WSLM4	<0.05	<0.05	<0.05	<0.05
not UKAS accredited		9915867	9915868	9915869	9915870
Boron as B (Dissolved)		0.09	0.15	0.10	0.10
Mercury as Hg (Dissolved)		0.0001	0.0001	<0.0001	<0.0001
Selenium as Se (Dissolved)		<0.001	0.001	<0.001	<0.001

Results expressed as mg/l unless stated, for the sample as received
Sample 01: TP 6A @ 2.80m
Sample 02: TP 8A @ 2.70m
Sample 03: TP 9A @ 0.00m
Sample 04: BH 1A @ 3.00m

Date of Issue: 27/07/99

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby accepts no responsibility for the sampling related to the above results.

TES Bretby, P.O. Box 100, Burton-on-Trent, DE15 0XD Telephone: 01283 554400 Fax: 01283 554422
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TEST REPORT
WATER SAMPLE ANALYSIS

TESTING
No.1252

Exploration Associates
Geotechnical House
Unit 18
Deeside Industrial Estate
Deeside
Flintshire
CH5 2LR

Amended Report
TES Report No. W/EXR/993625

Client: EXPLORATION ASS.
Site: FORGE LANE

Sample reference		Sample 05	Sample 06	Sample 07	
Sample Date		24/06/99	23/06/99	23/06/99	
TES Bretby ID Number	W/EX/..	9915871	9915872	9915873	
UKAS accredited	Test No.	9915871	9915872	9915873	
pH units	WSLM3	7.0	7.1	6.8	
Nickel as Ni (Dissolved)	ICPPWW13	<0.02	<0.02	<0.02	
Chromium as Cr (Dissolved)	ICPPWW13	<0.02	<0.02	<0.02	
Chromium (Hexavalent)	WSLM6	<0.01	<0.01	<0.01	
Cadmium as Cd (Dissolved)	ICPPWW13	<0.01	<0.01	<0.01	
Copper as Cu (Dissolved)	ICPPWW13	0.01	<0.01	<0.01	
Lead as Pb (Dissolved)	ICPPWW13	<0.03	<0.03	<0.03	
Zinc as Zn (Dissolved)	ICPPWW13	<0.01	<0.01	0.06	
Arsenic as As (Dissolved)	ICPPWW13	<0.03	<0.03	<0.03	
Ammoniacal Nitrogen as N	AMMKA40	<0.2	<0.2	1.2	
Phenol Index as C6H5OH	WSLM4	<0.05	<0.05	<0.05	
not UKAS accredited		9915871	9915872	9915873	
Boron as B (Dissolved)		0.07	0.07	0.16	
Mercury as Hg (Dissolved)		<0.0001	<0.0001	<0.0001	
Selenium as Se (Dissolved)		<0.001	<0.001	0.001	

Results expressed as mg/l unless stated, for the sample as received
Sample 05: BH 2A @ 2.00m
Sample 06: BH 3A @ 2.00m
Sample 07: BH 5A @ 4.50m

Date of Issue: 27/07/99

Tests marked 'not UKAS accredited' in this report are not included in the UKAS Accreditation Schedule for our laboratory.

TES Bretby accepts no responsibility for the sampling related to the above results.

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TES Bretby

Volatile Organic Compounds by PTGCMS

NAMAS TESTING No. 1252

Customer and Site Details:	Exploration Associates: Forge Lane	Directory:	0720VOC.MS3\	Matrix:	Water
Sample Details:	BH 1A @ 3.00m	Date Booked in:	13-Jul-99	Method:	Purge and Trap
LIMS ID Number:	EX15870	Date Analysed:	21-Jul-99	Dilution:	1
Report Number:	993625	Operator:	AT	Position:	16

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Dichlorodifluoromethane	75-71-8	-	< 1	-
Chloromethane	74-87-3	-	< 1	-
Vinyl Chloride	75-01-4	-	< 1	-
Bromomethane	74-83-9	-	< 1	-
Chloroethane	75-00-3	-	< 1	-
Trichlorofluoromethane	75-69-4	-	< 1	-
1,1-Dichloroethene	75-35-4	-	< 1	-
trans 1,2-Dichloroethene	156-60-5	-	< 1	-
1,1-Dichloroethane	75-34-3	-	< 1	-
2,2-Dichloropropane	594-20-7	-	< 1	-
cis 1,2-Dichloroethene	156-59-2	-	< 1	-
Bromochloromethane	74-97-5	-	< 1	-
Chloroform	67-66-3	-	< 1	-
1,1,1-Trichloroethane	71-55-6	-	< 1	-
Carbon Tetrachloride	56-23-5	-	< 1	-
1,1-Dichloropropene	563-58-6	-	< 1	-
Benzene	71-43-2	-	< 1	-
1,2-Dichloroethane	107-06-2	-	< 1	-
Trichloroethene	79-01-6	-	< 1	-
1,2-Dichloropropane	78-87-5	-	< 1	-
Dibromomethane	74-95-3	-	< 1	-
Bromodichloromethane	75-27-4	-	< 1	-
cis 1,3-Dichloropropene	10061-01-5	-	< 1	-
Toluene	108-88-3	-	< 1	-
trans 1,3-Dichloropropene	10061-02-6	-	< 1	-
1,1,2-Trichloroethane	79-00-5	-	< 1	-
Tetrachloroethene	127-18-4	-	< 1	-
1,3-Dichloropropane	142-28-29	-	< 1	-
Dibromochloromethane	124-48-1	-	< 1	-
1,2-Dibromoethane	106-93-4	-	< 1	-
Chlorobenzene	108-90-7	17.54	4	70
Ethylbenzene	100-41-4	-	< 1	-
1,1,1,2-Tetrachloroethane	630-20-6	-	< 1	-
m and p-Xylene	108-38-3/106-42-3	-	< 1	-
o-Xylene	95-47-6	-	< 1	-

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Styrene	100-42-5	-	< 1	-
Bromoform	75-25-2	-	< 1	-
iso-Propylbenzene	98-82-8	-	< 1	-
1,1,2,2-Tetrachloroethane	79-34-5	-	< 1	-
Propylbenzene	103-65-1	-	< 1	-
Bromobenzene	108-86-1	-	< 1	-
1,2,3-Trichloropropane	96-18-4	-	< 1	-
2-Chlorotoluene	95-49-8	-	< 1	-
1,3,5-Trimethylbenzene	108-67-8	-	< 1	-
4-Chlorotoluene	106-43-4	-	< 1	-
tert-Butylbenzene	108-67-8	-	< 1	-
1,2,4-Trimethylbenzene	95-63-6	-	< 1	-
sec-Butylbenzene	135-98-8	-	< 1	-
p-Isopropyltoluene	99-87-6	-	< 1	-
1,3-Dichlorobenzene	541-73-1	-	< 1	-
1,4-Dichlorobenzene	106-46-7	-	< 1	-
n-Butylbenzene	104-51-8	-	< 1	-
1,2-Dichlorobenzene	95-50-1	-	< 1	-
1,2-Dibromo-3-chloropropane	96-12-8	-	< 5	-
1,2,4-Trichlorobenzene	120-82-1	-	< 5	-
Hexachlorobutadiene	87-68-3	-	< 5	-
Naphthalene	91-20-3	-	< 5	-
1,2,3-Trichlorobenzene	87-61-6	-	< 5	-

Internal standards	R.T.	Area %	Surrogates	% Rec
Pentafluorobenzene	12.00	88	Dibromofluoromethane	105
1,4-Difluorobenzene	13.16	90	Toluene-d8	100
Chlorobenzene-d5	17.50	90	Bromofluorobenzene	106
1,4-Dichlorobenzene-d4	20.99	95		

TES Bretby

NAMAS TESTING No. 1252

Volatile Organic Compounds by PTGCMS

Customer and Site Details:	Exploration Associates: Forge Lane	Directory:	0720VOC.MS3\	Matrix:	Water
Sample Details:	BH 2A @ 2.00m	Date Booked in:	13-Jul-99	Method:	Purge and Trap
LIMS ID Number:	EX15871	Date Analysed:	21-Jul-99	Dilution:	1
Report Number:	993625	Operator:	AT	Position:	1

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Dichlorodifluoromethane	75-71-8	-	< 1	-
Chloromethane	74-87-3	-	< 1	-
Vinyl Chloride	75-01-4	-	< 1	-
Bromomethane	74-83-9	-	< 1	-
Chloroethane	75-00-3	-	< 1	-
Trichlorofluoromethane	75-69-4	-	< 1	-
1,1-Dichloroethene	75-35-4	-	< 1	-
trans 1,2-Dichloroethene	156-60-5	-	< 1	-
1,1-Dichloroethane	75-34-3	-	< 1	-
2,2-Dichloropropane	594-20-7	-	< 1	-
cis 1,2-Dichloroethene	156-59-2	-	< 1	-
Bromochloromethane	74-97-5	-	< 1	-
Chloroform	67-66-3	-	< 1	-
1,1,1-Trichloroethane	71-55-6	-	< 1	-
Carbon Tetrachloride	56-23-5	-	< 1	-
1,1-Dichloropropene	563-58-6	-	< 1	-
Benzene	71-43-2	-	< 1	-
1,2-Dichloroethane	107-06-2	-	< 1	-
Trichloroethene	79-01-6	-	< 1	-
1,2-Dichloropropane	78-87-5	-	< 1	-
Dibromomethane	74-95-3	-	< 1	-
Bromodichloromethane	75-27-4	-	< 1	-
cis 1,3-Dichloropropene	10061-01-5	-	< 1	-
Toluene	108-88-3	-	< 1	-
trans 1,3-Dichloropropene	10061-02-6	-	< 1	-
1,1,2-Trichloroethane	79-00-5	-	< 1	-
Tetrachloroethene	127-18-4	-	< 1	-
1,3-Dichloropropane	142-28-29	-	< 1	-
Dibromochloromethane	124-48-1	-	< 1	-
1,2-Dibromoethane	106-93-4	-	< 1	-
Chlorobenzene	108-90-7	-	< 1	-
Ethylbenzene	100-41-4	-	< 1	-
1,1,1,2-Tetrachloroethane	630-20-6	-	< 1	-
m and p-Xylene	108-38-3/106-42-3	-	< 1	-
o-Xylene	95-47-6	-	< 1	-

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Styrene	100-42-5	-	< 1	-
Bromoform	75-25-2	-	< 1	-
iso-Propylbenzene	98-82-8	-	< 1	-
1,1,2,2-Tetrachloroethane	79-34-5	-	< 1	-
Propylbenzene	103-65-1	-	< 1	-
Bromobenzene	108-86-1	-	< 1	-
1,2,3-Trichloropropane	96-18-4	-	< 1	-
2-Chlorotoluene	95-49-8	-	< 1	-
1,3,5-Trimethylbenzene	108-67-8	-	< 1	-
4-Chlorotoluene	106-43-4	-	< 1	-
tert-Butylbenzene	108-67-8	-	< 1	-
1,2,4-Trimethylbenzene	95-63-6	-	< 1	-
sec-Butylbenzene	135-98-8	-	< 1	-
p-Isopropyltoluene	99-87-6	-	< 1	-
1,3-Dichlorobenzene	541-73-1	-	< 1	-
1,4-Dichlorobenzene	106-46-7	-	< 1	-
n-Butylbenzene	104-51-8	-	< 1	-
1,2-Dichlorobenzene	95-50-1	-	< 1	-
1,2-Dibromo-3-chloropropane	96-12-8	-	< 5	-
1,2,4-Trichlorobenzene	120-82-1	-	< 5	-
Hexachlorobutadiene	87-68-3	-	< 5	-
Naphthalene	91-20-3	-	< 5	-
1,2,3-Trichlorobenzene	87-61-6	-	< 5	-

Internal standards	R.T.	Area %	Surrogates	% Rec
Pentafluorobenzene	12.00	75	Dibromofluoromethane	103
1,4-Difluorobenzene	13.16	76	Toluene-d8	98
Chlorobenzene-d5	17.50	76	Bromofluorobenzene	106
1,4-Dichlorobenzene-d4	20.99	82		

TES Bretby

NAMAS TESTING No. 1252

Volatile Organic Compounds by PTGCMS

Customer and Site Details:	Exploration Associates: Forge Lane	Directory:	0720VOC.MS3\	Matrix:	Water
Sample Details:	BH 3A @ 2.00m	Date Booked in:	13-Jul-99	Method:	Purge and Trap
LIMS ID Number:	EX15872	Date Analysed:	21-Jul-99	Dilution:	1
Report Number:	993625	Operator:	AT	Position:	2

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Dichlorodifluoromethane	75-71-8	-	< 1	-
Chloromethane	74-87-3	-	< 1	-
Vinyl Chloride	75-01-4	-	< 1	-
Bromomethane	74-83-9	-	< 1	-
Chloroethane	75-00-3	-	< 1	-
Trichlorofluoromethane	75-69-4	-	< 1	-
1,1-Dichloroethene	75-35-4	-	< 1	-
trans 1,2-Dichloroethene	156-60-5	-	< 1	-
1,1-Dichloroethane	75-34-3	-	< 1	-
2,2-Dichloropropane	594-20-7	-	< 1	-
cis 1,2-Dichloroethene	156-59-2	-	< 1	-
Bromochloromethane	74-97-5	-	< 1	-
Chloroform	67-66-3	-	< 1	-
1,1,1-Trichloroethane	71-55-6	-	< 1	-
Carbon Tetrachloride	56-23-5	-	< 1	-
1,1-Dichloropropene	563-58-6	-	< 1	-
Benzene	71-43-2	-	< 1	-
1,2-Dichloroethane	107-06-2	-	< 1	-
Trichloroethene	79-01-6	-	< 1	-
1,2-Dichloropropane	78-87-5	-	< 1	-
Dibromomethane	74-95-3	-	< 1	-
Bromodichloromethane	75-27-4	-	< 1	-
cis 1,3-Dichloropropene	10061-01-5	-	< 1	-
Toluene	108-88-3	-	< 1	-
trans 1,3-Dichloropropene	10061-02-6	-	< 1	-
1,1,2-Trichloroethane	79-00-5	-	< 1	-
Tetrachloroethene	127-18-4	-	< 1	-
1,3-Dichloropropane	142-28-29	-	< 1	-
Dibromochloromethane	124-48-1	-	< 1	-
1,2-Dibromoethane	106-93-4	-	< 1	-
Chlorobenzene	108-90-7	-	< 1	-
Ethylbenzene	100-41-4	-	< 1	-
1,1,1,2-Tetrachloroethane	630-20-6	-	< 1	-
m and p-Xylene	108-38-3/106-42-3	-	< 1	-
o-Xylene	95-47-6	-	< 1	-

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Styrene	100-42-5	-	< 1	-
Bromoform	75-25-2	-	< 1	-
iso-Propylbenzene	98-82-8	-	< 1	-
1,1,2,2-Tetrachloroethane	79-34-5	-	< 1	-
Propylbenzene	103-65-1	-	< 1	-
Bromobenzene	108-86-1	-	< 1	-
1,2,3-Trichloropropane	96-18-4	-	< 1	-
2-Chlorotoluene	95-49-8	-	< 1	-
1,3,5-Trimethylbenzene	108-67-8	-	< 1	-
4-Chlorotoluene	106-43-4	-	< 1	-
tert-Butylbenzene	108-67-8	-	< 1	-
1,2,4-Trimethylbenzene	95-63-6	-	< 1	-
sec-Butylbenzene	135-98-8	-	< 1	-
p-Isopropyltoluene	99-87-6	-	< 1	-
1,3-Dichlorobenzene	541-73-1	-	< 1	-
1,4-Dichlorobenzene	106-46-7	-	< 1	-
n-Butylbenzene	104-51-8	-	< 1	-
1,2-Dichlorobenzene	95-50-1	-	< 1	-
1,2-Dibromo-3-chloropropane	96-12-8	-	< 5	-
1,2,4-Trichlorobenzene	120-82-1	-	< 5	-
Hexachlorobutadiene	87-68-3	-	< 5	-
Naphthalene	91-20-3	-	< 5	-
1,2,3-Trichlorobenzene	87-61-6	-	< 5	-

Internal standards	R.T.	Area %	Surrogates	% Rec
Pentafluorobenzene	12.00	86	Dibromofluoromethane	104
1,4-Difluorobenzene	13.16	88	Toluene-d8	88
Chlorobenzene-d5	17.49	86	Bromofluorobenzene	109
1,4-Dichlorobenzene-d4	20.99	96		

TES Bretby

NAMAS TESTING No. 1252

Volatile Organic Compounds by PTGCMS

Customer and Site Details:	Exploration Associates: Forge Lane
Sample Details:	BH 5A @ 4.50m
LIMS ID Number:	EX15873
Report Number:	993625

Directory:	0720VOC.MS3\
Date Booked in:	13-Jul-99
Date Analysed:	21-Jul-99
Operator:	AT

Matrix:	Water
Method:	Purge and Trap
Dilution:	1
Position:	3

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Dichlorodifluoromethane	75-71-8	-	< 1	-
Chloromethane	74-87-3	-	< 1	-
Vinyl Chloride	75-01-4	-	< 1	-
Bromomethane	74-83-9	-	< 1	-
Chloroethane	75-00-3	-	< 1	-
Trichlorofluoromethane	75-69-4	-	< 1	-
1,1-Dichloroethene	75-35-4	-	< 1	-
trans 1,2-Dichloroethene	156-60-5	-	< 1	-
1,1-Dichloroethane	75-34-3	-	< 1	-
2,2-Dichloropropane	594-20-7	-	< 1	-
cis 1,2-Dichloroethene	156-59-2	-	< 1	-
Bromochloromethane	74-97-5	-	< 1	-
Chloroform	67-66-3	-	< 1	-
1,1,1-Trichloroethane	71-55-6	-	< 1	-
Carbon Tetrachloride	56-23-5	-	< 1	-
1,1-Dichloropropene	563-58-6	-	< 1	-
Benzene	71-43-2	-	< 1	-
1,2-Dichloroethane	107-06-2	-	< 1	-
Trichloroethene	79-01-6	-	< 1	-
1,2-Dichloropropane	78-87-5	-	< 1	-
Dibromomethane	74-95-3	-	< 1	-
Bromodichloromethane	75-27-4	-	< 1	-
cis 1,3-Dichloropropene	10061-01-5	-	< 1	-
Toluene	108-88-3	-	< 1	-
trans 1,3-Dichloropropene	10061-02-6	-	< 1	-
1,1,2-Trichloroethane	79-00-5	-	< 1	-
Tetrachloroethene	127-18-4	-	< 1	-
1,3-Dichloropropane	142-28-29	-	< 1	-
Dibromochloromethane	124-48-1	-	< 1	-
1,2-Dibromoethane	106-93-4	-	< 1	-
Chlorobenzene	108-90-7	-	< 1	-
Ethylbenzene	100-41-4	-	< 1	-
1,1,1,2-Tetrachloroethane	630-20-6	-	< 1	-
m and p-Xylene	108-38-3/106-42-3	-	< 1	-
o-Xylene	95-47-6	-	< 1	-

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Styrene	100-42-5	-	< 1	-
Bromoform	75-25-2	-	< 1	-
iso-Propylbenzene	98-82-8	-	< 1	-
1,1,2,2-Tetrachloroethane	79-34-5	-	< 1	-
Propylbenzene	103-65-1	-	< 1	-
Bromobenzene	108-86-1	-	< 1	-
1,2,3-Trichloropropane	96-18-4	-	< 1	-
2-Chlorotoluene	95-49-8	-	< 1	-
1,3,5-Trimethylbenzene	108-67-8	-	< 1	-
4-Chlorotoluene	106-43-4	-	< 1	-
tert-Butylbenzene	108-67-8	-	< 1	-
1,2,4-Trimethylbenzene	95-63-6	-	< 1	-
sec-Butylbenzene	135-98-8	-	< 1	-
p-Isopropyltoluene	99-87-6	-	< 1	-
1,3-Dichlorobenzene	541-73-1	-	< 1	-
1,4-Dichlorobenzene	106-46-7	-	< 1	-
n-Butylbenzene	104-51-8	-	< 1	-
1,2-Dichlorobenzene	95-50-1	-	< 1	-
1,2-Dibromo-3-chloropropane	96-12-8	-	< 5	-
1,2,4-Trichlorobenzene	120-82-1	-	< 5	-
Hexachlorobutadiene	87-68-3	-	< 5	-
Naphthalene	91-20-3	-	< 5	-
1,2,3-Trichlorobenzene	87-61-6	-	< 5	-

Internal standards	R.T.	Area %	Surrogates	% Rec
Pentafluorobenzene	12.00	90	Dibromofluoromethane	105
1,4-Difluorobenzene	13.16	92	Toluene-d8	97
Chlorobenzene-d5	17.50	90	Bromofluorobenzene	106
1,4-Dichlorobenzene-d4	20.99	97		

TES Bretby

NAMAS TESTING No. 1252

Volatile Organic Compounds by PTGCMS

Customer and Site Details:	Exploration Associates: Forge Lane
Sample Details:	TP 6A @ 2.80m
LIMS ID Number:	EX15867
Report Number:	993625

Directory:	0720VOC.MS3\
Date Booked in:	13-Jul-99
Date Analysed:	20-Jul-99
Operator:	AT

Matrix:	Water
Method:	Purge and Trap
Dilution:	1
Position:	12

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Dichlorodifluoromethane	75-71-8	-	< 1	-
Chloromethane	74-87-3	-	< 1	-
Vinyl Chloride	75-01-4	-	< 1	-
Bromomethane	74-83-9	-	< 1	-
Chloroethane	75-00-3	-	< 1	-
Trichlorofluoromethane	75-69-4	-	< 1	-
1,1-Dichloroethene	75-35-4	-	< 1	-
trans 1,2-Dichloroethene	156-60-5	-	< 1	-
1,1-Dichloroethane	75-34-3	-	< 1	-
2,2-Dichloropropane	594-20-7	-	< 1	-
cis 1,2-Dichloroethene	156-59-2	-	< 1	-
Bromochloromethane	74-97-5	-	< 1	-
Chloroform	67-66-3	-	< 1	-
1,1,1-Trichloroethane	71-55-6	-	< 1	-
Carbon Tetrachloride	56-23-5	-	< 1	-
1,1-Dichloropropene	563-58-6	-	< 1	-
Benzene	71-43-2	-	< 1	-
1,2-Dichloroethane	107-06-2	-	< 1	-
Trichloroethene	79-01-6	-	< 1	-
1,2-Dichloropropane	78-87-5	-	< 1	-
Dibromomethane	74-95-3	-	< 1	-
Bromodichloromethane	75-27-4	-	< 1	-
cis 1,3-Dichloropropene	10061-01-5	-	< 1	-
Toluene	108-88-3	-	< 1	-
trans 1,3-Dichloropropene	10061-02-6	-	< 1	-
1,1,2-Trichloroethane	79-00-5	-	< 1	-
Tetrachloroethene	127-18-4	-	< 1	-
1,3-Dichloropropane	142-28-29	-	< 1	-
Dibromochloromethane	124-48-1	-	< 1	-
1,2-Dibromoethane	106-93-4	-	< 1	-
Chlorobenzene	108-90-7	-	< 1	-
Ethylbenzene	100-41-4	-	< 1	-
1,1,1,2-Tetrachloroethane	630-20-6	-	< 1	-
m and p-Xylene	108-38-3/106-42-3	-	< 1	-
o-Xylene	95-47-6	-	< 1	-

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Styrene	100-42-5	-	< 1	-
Bromoform	75-25-2	-	< 1	-
iso-Propylbenzene	98-82-8	-	< 1	-
1,1,2,2-Tetrachloroethane	79-34-5	-	< 1	-
Propylbenzene	103-65-1	-	< 1	-
Bromobenzene	108-86-1	-	< 1	-
1,2,3-Trichloropropane	96-18-4	-	< 1	-
2-Chlorotoluene	95-49-8	-	< 1	-
1,3,5-Trimethylbenzene	108-67-8	-	< 1	-
4-Chlorotoluene	106-43-4	-	< 1	-
tert-Butylbenzene	108-67-8	-	< 1	-
1,2,4-Trimethylbenzene	95-63-6	-	< 1	-
sec-Butylbenzene	135-98-8	-	< 1	-
p-Isopropyltoluene	99-87-6	-	< 1	-
1,3-Dichlorobenzene	541-73-1	-	< 1	-
1,4-Dichlorobenzene	106-46-7	-	< 1	-
n-Butylbenzene	104-51-8	-	< 1	-
1,2-Dichlorobenzene	95-50-1	-	< 1	-
1,2-Dibromo-3-chloropropane	96-12-8	-	< 5	-
1,2,4-Trichlorobenzene	120-82-1	-	< 5	-
Hexachlorobutadiene	87-68-3	-	< 5	-
Naphthalene	91-20-3	-	< 5	-
1,2,3-Trichlorobenzene	87-61-6	-	< 5	-

Internal standards	R.T.	Area %
Pentafluorobenzene	12.00	94
1,4-Difluorobenzene	13.16	96
Chlorobenzene-d5	17.50	96
1,4-Dichlorobenzene-d4	20.99	102

Surrogates	% Rec
Dibromofluoromethane	103
Toluene-d8	99
Bromofluorobenzene	104

TES Bretby

Volatile Organic Compounds by PTGCMS

NAMAS TESTING No. 1252

Customer and Site Details:	Exploration Associates: Forge Lane	Directory:	0720VOC.MS3\	Matrix:	Water
Sample Details:	TP 8A @ 2.70m	Date Booked in:	13-Jul-99	Method:	Purge and Trap
LIMS ID Number:	EX15868	Date Analysed:	20-Jul-99	Dilution:	1
Report Number:	993625	Operator:	AT	Position:	13

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Dichlorodifluoromethane	75-71-8	-	< 1	-
Chloromethane	74-87-3	-	< 1	-
Vinyl Chloride	75-01-4	-	< 1	-
Bromomethane	74-83-9	-	< 1	-
Chloroethane	75-00-3	-	< 1	-
Trichlorofluoromethane	75-69-4	-	< 1	-
1,1-Dichloroethene	75-35-4	-	< 1	-
trans 1,2-Dichloroethene	156-60-5	-	< 1	-
1,1-Dichloroethane	75-34-3	-	< 1	-
2,2-Dichloropropane	594-20-7	-	< 1	-
cis 1,2-Dichloroethene	156-59-2	-	< 1	-
Bromochloromethane	74-97-5	-	< 1	-
Chloroform	67-66-3	-	< 1	-
1,1,1-Trichloroethane	71-55-6	-	< 1	-
Carbon Tetrachloride	56-23-5	-	< 1	-
1,1-Dichloropropene	563-58-6	-	< 1	-
Benzene	71-43-2	-	< 1	-
1,2-Dichloroethane	107-06-2	-	< 1	-
Trichloroethene	79-01-6	-	< 1	-
1,2-Dichloropropane	78-87-5	-	< 1	-
Dibromomethane	74-95-3	-	< 1	-
Bromodichloromethane	75-27-4	-	< 1	-
cis 1,3-Dichloropropene	10061-01-5	-	< 1	-
Toluene	108-88-3	-	< 1	-
trans 1,3-Dichloropropene	10061-02-6	-	< 1	-
1,1,2-Trichloroethane	79-00-5	-	< 1	-
Tetrachloroethene	127-18-4	-	< 1	-
1,3-Dichloropropane	142-28-29	-	< 1	-
Dibromochloromethane	124-48-1	-	< 1	-
1,2-Dibromoethane	106-93-4	-	< 1	-
Chlorobenzene	108-90-7	-	< 1	-
Ethylbenzene	100-41-4	-	< 1	-
1,1,1,2-Tetrachloroethane	630-20-6	-	< 1	-
m and p-Xylene	108-38-3/106-42-3	-	< 1	-
o-Xylene	95-47-6	-	< 1	-

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Styrene	100-42-5	-	< 1	-
Bromoform	75-25-2	-	< 1	-
iso-Propylbenzene	98-82-8	-	< 1	-
1,1,2,2-Tetrachloroethane	79-34-5	-	< 1	-
Propylbenzene	103-65-1	-	< 1	-
Bromobenzene	108-86-1	-	< 1	-
1,2,3-Trichloropropane	96-18-4	-	< 1	-
2-Chlorotoluene	95-49-8	-	< 1	-
1,3,5-Trimethylbenzene	108-67-8	-	< 1	-
4-Chlorotoluene	106-43-4	-	< 1	-
tert-Butylbenzene	108-67-8	-	< 1	-
1,2,4-Trimethylbenzene	95-63-6	-	< 1	-
sec-Butylbenzene	135-98-8	-	< 1	-
p-Isopropyltoluene	99-87-6	-	< 1	-
1,3-Dichlorobenzene	541-73-1	-	< 1	-
1,4-Dichlorobenzene	106-46-7	-	< 1	-
n-Butylbenzene	104-51-8	-	< 1	-
1,2-Dichlorobenzene	95-50-1	-	< 1	-
1,2-Dibromo-3-chloropropane	96-12-8	-	< 5	-
1,2,4-Trichlorobenzene	120-82-1	-	< 5	-
Hexachlorobutadiene	87-68-3	-	< 5	-
Naphthalene	91-20-3	-	< 5	-
1,2,3-Trichlorobenzene	87-61-6	-	< 5	-

Internal standards	R.T.	Area %	Surrogates	% Rec
Pentafluorobenzene	12.01	89	Dibromofluoromethane	101
1,4-Difluorobenzene	13.16	91	Toluene-d8	98
Chlorobenzene-d5	17.50	89	Bromofluorobenzene	107
1,4-Dichlorobenzene-d4	20.99	97		

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NAMAS TESTING No. 1252

Volatile Organic Compounds by PTGCMS

Customer and Site Details:	Exploration Associates: Forge Lane	Directory:	0720VOC.MS3\	Matrix:	Water
Sample Details:	TP 9A @ 0.00m	Date Booked in:	13-Jul-99	Method:	Purge and Trap
LIMS ID Number:	EX15869	Date Analysed:	21-Jul-99	Dilution:	1
Report Number:	993625	Operator:	AT	Position:	15

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Dichlorodifluoromethane	75-71-8	-	< 1	-
Chloromethane	74-87-3	-	< 1	-
Vinyl Chloride	75-01-4	-	< 1	-
Bromomethane	74-83-9	-	< 1	-
Chloroethane	75-00-3	-	< 1	-
Trichlorofluoromethane	75-69-4	-	< 1	-
1,1-Dichloroethene	75-35-4	-	< 1	-
trans 1,2-Dichloroethene	156-60-5	-	< 1	-
1,1-Dichloroethane	75-34-3	-	< 1	-
2,2-Dichloropropane	594-20-7	-	< 1	-
cis 1,2-Dichloroethene	156-59-2	-	< 1	-
Bromochloromethane	74-97-5	-	< 1	-
Chloroform	67-66-3	-	< 1	-
1,1,1-Trichloroethane	71-55-6	-	< 1	-
Carbon Tetrachloride	56-23-5	-	< 1	-
1,1-Dichloropropene	563-58-6	-	< 1	-
Benzene	71-43-2	-	< 1	-
1,2-Dichloroethane	107-06-2	-	< 1	-
Trichloroethene	79-01-6	-	< 1	-
1,2-Dichloropropane	78-87-5	-	< 1	-
Dibromomethane	74-95-3	-	< 1	-
Bromodichloromethane	75-27-4	-	< 1	-
cis 1,3-Dichloropropene	10061-01-5	-	< 1	-
Toluene	108-88-3	-	< 1	-
trans 1,3-Dichloropropene	10061-02-6	-	< 1	-
1,1,2-Trichloroethane	79-00-5	-	< 1	-
Tetrachloroethene	127-18-4	-	< 1	-
1,3-Dichloropropane	142-28-29	-	< 1	-
Dibromochloromethane	124-48-1	-	< 1	-
1,2-Dibromoethane	106-93-4	-	< 1	-
Chlorobenzene	108-90-7	-	< 1	-
Ethylbenzene	100-41-4	-	< 1	-
1,1,1,2-Tetrachloroethane	630-20-6	-	< 1	-
m and p-Xylene	108-38-3/106-42-3	-	< 1	-
o-Xylene	95-47-6	-	< 1	-

Target Compounds	CAS #	R.T. (min.)	Concentration µg/l	% Fit
Styrene	100-42-5	-	< 1	-
Bromoform	75-25-2	-	< 1	-
iso-Propylbenzene	98-82-8	-	< 1	-
1,1,2,2-Tetrachloroethane	79-34-5	-	< 1	-
Propylbenzene	103-65-1	-	< 1	-
Bromobenzene	108-86-1	-	< 1	-
1,2,3-Trichloropropane	96-18-4	-	< 1	-
2-Chlorotoluene	95-49-8	-	< 1	-
1,3,5-Trimethylbenzene	108-67-8	-	< 1	-
4-Chlorotoluene	106-43-4	-	< 1	-
tert-Butylbenzene	108-67-8	-	< 1	-
1,2,4-Trimethylbenzene	95-63-6	-	< 1	-
sec-Butylbenzene	135-98-8	-	< 1	-
p-Isopropyltoluene	99-87-6	-	< 1	-
1,3-Dichlorobenzene	541-73-1	-	< 1	-
1,4-Dichlorobenzene	106-46-7	-	< 1	-
n-Butylbenzene	104-51-8	-	< 1	-
1,2-Dichlorobenzene	95-50-1	-	< 1	-
1,2-Dibromo-3-chloropropane	96-12-8	-	< 5	-
1,2,4-Trichlorobenzene	120-82-1	-	< 5	-
Hexachlorobutadiene	87-68-3	-	< 5	-
Naphthalene	91-20-3	-	< 5	-
1,2,3-Trichlorobenzene	87-61-6	-	< 5	-

Internal standards	R.T.	Area %	Surrogates	% Rec
Pentafluorobenzene	12.00	81	Dibromofluoromethane	106
1,4-Difluorobenzene	13.16	83	Toluene-d8	98
Chlorobenzene-d5	17.50	82	Bromofluorobenzene	106
1,4-Dichlorobenzene-d4	20.99	87		

EXPLORATION ASSOCIATES
Gregsons Building, Northumberland Yard. East Howdon,
Wallsend, Tyne & Wear NE28 0QD.
Telephone: Tyneside (0191) 263 3303.
Fax: (0191) 262 3690.

TEST CERTIFICATE

DETERMINATION OF SWELLING POTENTIAL OF FILL MATERIAL.

Tested in accordance with the in-house method 12

Job Number : 539206

Client : Exploration Associates

Address : Unit 18
Deeside Industrial Estate
Deeside, Clwyd

Site : Forge Lane

Requested By : M Nuttal

Sample Description : Building Rubble

Report Number : 12309/1/sp

Sample Number : 12309/1

Date Required : 10/08/99

Date Received : 26/07/99

Date Tested : 02/08/99

Sampled At : Site

Sampled By : Unknown

TP3A@0.30m

Bulk Density (Mg/m^3)	1.73
Moisture Content (%)	23%
Dry Density (Mg/m^3)	1.41
Elpased Time of Test (hour)	73
Percentage of Swell (%)	-0.05

Comments :

Checked By : _____ Date : 12.8.99
(signature)

_____
(print)

Approved Signatory On behalf of the Materials Laboratory Supervisor.

EXPLORATION ASSOCIATES
Gregsons Building, Northumberland Yard, East Howdon,
Wallsend, Tyne & Wear NE28 0QD.
Telephone: Tyneside (0191) 263 3303.
Fax: (0191) 263 3690.

TEST CERTIFICATE

DETERMINATION OF SWELLING POTENTIAL OF FILL MATERIAL.

Tested in accordance with the in-house method 12

Job Number : 539206

Client : Exploration Associates

Address : Unit 18
Deeside Industrial Estate
Deeside, Clwyd

Site : Forge Lane

Requested By : M Nuttal

Report Number : 12309/2/sp

Sample Number : 12309/2

Date Required : 10/08/99

Date Received : 26/07/99

Date Tested : 02/08/99

Sampled At : Site

Sampled By : Unknown

Sample Description : Building Rubble

TP7A@1.20m

Bulk Density (Mg/m^3)	2.00
Moisture Content (%)	21%
Dry Density (Mg/m^3)	1.65
Elpased Time of Test (hour)	73
Percentage of Swell (%)	1.46

Comments :

Checked By : ___ Date : 12.8.99
(signature)

(print)

Approved Signatory On behalf of the Materials Laboratory Supervisor.

I.C.R.C.L. 59/83 (Second Edition): TABLE 3 TENTATIVE "TRIGGER CONCENTRATIONS" FOR SELECTED INORGANIC CONTAMINANTS

CONDITIONS

1. This table is invalid if reproduced without the conditions and footnotes.

2. All values are for concentrations determined on "spot" samples based on an adequate site investigation carried out prior to development. They do not apply to analysis of averaged, bulked or composted samples, nor to sites which have already been developed. All proposed values are tentative.

3. The lower values in Group A are similar to the limits for metal content of sewage sludge applied to agricultural land. 3(b). The values in Group B are those above which phytotoxicity is possible.

4. If all sample values are below the threshold concentrations then the site may be regarded as uncontaminated as far as the hazards from these contaminants are concerned and development may proceed. Above these concentrations, remedial action may be needed, especially if the contamination is still continuing. Above the action concentrations, remedial action will be required or the form of development changed.

Contaminants	Planned Uses	Trigger Concentrations (mg/kg) air dried soil)	
		Threshold	Action
Group A: Contaminants which may pose hazards to health			
Arsenic	Domestic Gardens, Allotments	10	*
	Parks, Playing Fields, Open Space	40	*
Cadmium	Domestic Gardens, Allotments	3	*
	Parks, Playing Fields, Open Space	15	*
Chromium (hexavalent)(1)	Domestic Gardens, Allotments Parks, Playing Fields, Open Space	25	*
Chromium (total)	Domestic Gardens, Allotments	600	*
	Parks, Playing Fields, Open Space	1000	*
Lead	Domestic Gardens, Allotments	500	*
	Parks, Playing Fields, Open Space	2000	*
Mercury	Domestic Gardens, Allotments	1	*
	Parks, Playing Fields, Open Space	20	*
Selenium	Domestic Gardens, Allotments	3	*
	Parks, Playing Fields, Open Space	6	*
Group B: Contaminants which are phytotoxic but not normally hazards to health			
Boron (water-soluble) (3)	Any uses where plants are to be grown (2, 6)	3	*
Copper (4, 5)	Any uses where plants are to be grown (2, 6)	130	*
Nickel (4, 5)	Any uses where plants are to be grown (2, 6)	70	*
Zinc (4, 5)	Any uses where plants are to be grown (2, 6)	300	*

NOTES:

* Action concentrations will be specified in the next edition of I.C.R.C.L. 59/83.

1. Soluble hexavalent chromium extracted by 0.1m HCl at 37°C; solution adjusted to pH 1.0 if alkaline substances present.

2. The soil pH value is assumed to be about 6.5 and should be maintained at this value. If the pH falls, the toxic effects and the uptake of these elements will be increased.

3. Determined by standard ADAS method (soluble in hot water).

4. Total concentrations (extractable by $HNO_3/HClO_4$).

5. The phytotoxic effect of copper, nickel and zinc may be additive. The trigger values given here are those applicable to the 'worst-case'; phytotoxic may occur at these concentrations in acid, sandy soils. In neutral or alkaline soils phytotoxic effects are unlikely at these concentrations.

6. Grass is more resistant to phytotoxic effects than most other plants and its growth may not be adversely affected at these concentrations.

Extract from "Guidance on Assessment and Redevelopment of Contaminated Land". Inter-Departmental Committee on the Redevelopment of Contaminated Land. I.C.R.C.L. 59/83. Second Edition, July 1987.

Contamination Standards	Project	Contract
Exploration Associates		Figure

I.C.R.C.L. 59/83 (Second Edition): TABLE 4 TENTATIVE "TRIGGER CONCENTRATIONS" FOR CONTAMINANTS ASSOCIATED WITH FORMER COAL CARBONIZATION SITES

CONDITIONS

1. This table is invalid if reproduced without the conditions and footnotes.

2. All values are for concentrations determined on "spot" samples based on an adequate site investigation carried out prior to development. They do not apply to analysis of averaged, bulked or composited samples, nor to sites which have already been developed.

3. Many of these values are preliminary and will require updating. They should not be applied without reference to the current edition of the report "Problems Arising from the Development of Gas Works and Similar Sites".

4. If all sample values are below the threshold concentrations then the site may be regarded as uncontaminated as far as the hazards from these contaminants are concerned, and development may proceed. Above these concentrations, remedial action may be needed, especially if the contamination is still continuing. Above the action concentrations, remedial action will be required or the form of development changed.

Contaminants	Planned Uses	Trigger Concentrations (mg/kg) air dried soil) Threshold	Action
Polyaromatic hydrocarbons (1, 2)	Domestic gardens, allotments, play areas.	50	500
	Landscaped areas, buildings, hard cover.	1000	10000
Phenols	Domestic gardens, allotments.	5	200
	Landscaped areas, buildings hard cover.	5	1000
Free cyanide	Domestic gardens, allotments landscaped areas.	25	500
	Buildings, hard cover.	100	500
Complex cyanides	Domestic gardens allotments.	250	1000
	Landscaped areas.	250	5000
	Buildings, hard cover.	250	NL
Thiocyanate (2)	All proposed uses.	50	NL
Sulphate	Domestic Gardens, allotments, landscaped areas.	2000	10000
	Buildings (3).	2000(3)	50000(3)
	Hard cover.	2000	NL
Sulphide	All proposed uses.	250	1000
Sulphur	All proposed uses.	5000	20000
Acidity (pH less than)	Domestic gardens, allotments, landscaped areas.	pH5	pH3
	Buildings, hard cover.	NL	NL

NOTES

NL: No limits set as the contaminant does not pose a particular hazard for this use.

(1) Used here as a marker for coal tar, for analytical reasons. See "Problems Arising from the Redevelopment of Gasworks and Similar Sites" Annex A1.

(2) See "Problems Arising from the Redevelopment of Gasworks and Similar Sites" for details of analytical methods.

(3) See also BRE Digest 250: Concrete in sulphate-bearing soils and groundwater.

Extract from "Guidance on Assessment and Redevelopment of Contaminated Land". Inter-Departmental Committee on the Redevelopment of Contaminated Land. I.C.R.C.L. 59/83, Second Edition, July 1987.

Guidelines for Contaminated Soils - Suggested Range of Values (mg kg^{-1} on air dried soils, except for pH)

Parameter	A Typical Values for Uncontaminated Soils	B Slight Contamination	C Contaminated	D Heavy Contamination	E Unusually Heavy Contamination
pH (acid)	6-7	5-6	4-5	2-4	>2
pH (alkali)	7-8	8-9	9-10	10-12	>12
Antimony	0-30	30-50	50-100	100-500	>500
Arsenic	0-30	30-50	50-100	100-500	>500
Cadmium	0-1	1-3	3-10	10-50	>50
Chromium	0-100	100-200	200-500	500-2500	>2500
Copper (available)	0-100	100-200	200-500	500-2500	>2500
Lead	0-500	500-1000	1000-2000	2000-1.0%	>1.0%
Lead (available)	0-200	200-500	500-1000	1000-5000	>5000
Mercury	0-1	1-3	3-10	10-50	>50
Nickel (available)	0-20	20-50	50-200	200-1000	>1000
Zinc (available)	0-250	250-500	500-1000	1000-5000	>5000
Zinc equivalent	0-250	250-500	500-2000	2000-1.0%	>1.0%
Boron (available)	0-2	2-5	5-50	50-250	>250
Selenium	0-1	1-3	3-10	10-50	>50
Barium	0-500	500-1000	1000-2000	2000-1.0%	>1.0%
Beryllium	0-5	5-10	10-20	20-50	>50
Manganese	0-500	500-1000	1000-2000	2000-1.0%	>1.0%
Vanadium	0-100	100-200	200-500	500-2500	>2500
Magnesium	0-500	500-1000	1000-2000	2000-1.0%	>1.0%
Sulphate	0-2000	2000-5000	5000-1.0%	1.0-5.0%	>5.0%
Sulphur (free)	0-100	100-500	500-1000	1000-5000	>5000
Sulphide	0-10	10-20	20-100	100-500	>500
Cyanide (free)	0-1	1-5	5-50	50-100	>100
Cyanide total	0-5	5-25	25-250	250-500	>500
Ferricyanide	0-100	100-500	500-1000	1000-5000	>5000
Thiocyanate	0-10	10-50	50-100	100-500	>2500
Coal Tar	0-500	500-1000	1000-2000	2000-1.0%	>1.0%
Phenol	0-2	2-5	5-50	50-250	>250
Toluene extract	0-5000	5000-1.0%	1.0-5.0%	5.0-25.0%	>25.0%
Cyclohexane extract	0-2000	2000-5000	5000-2.0%	2.0-10.0%	>10.0%

Extract from "Site Investigations and Materials Problems" Proceedings of Conference on Reclamation of Contaminated Land Society of Chemical Industry R T Kelly, 1980

Contamination Standards	Project	Contract
Exploration Associates		Figure

Standards adopted in the Netherlands for soil contaminants: A, reference value below which soils are probably uncontaminated; B, value above which there is need for further investigation; C, value above which a clean-up is indicated (from Moen et al. (ref. 5.31))

Substance		Concentration in soil: mg/kilogram dry weight			Concentration in groundwater: µg/l		
		A	B	C	A	B	C
Metals	Cr	100	250	800	20	50	200
	Co	20	50	300	20	50	200
	Ni	50	100	500	20	50	200
	Cu	50	100	500	20	50	200
	Zn	200	500	3000	50	200	800
	As	20	30	50	10	30	100
	Mo	10	40	200	5	20	100
	Cd	1	5	20	1	2·5	10
	Sn	20	50	300	10	30	150
	Ba	200	400	2000	50	100	500
	Hg	0·5	2	10	0·2	0·5	2
	Pb	50	150	600	20	50	200
Inorganic pollutants	NH (as N)	–	–	–	200	1000	3000
	F (total)	200	400	2000	300	1200	4000
	CN (total free)	1	10	100	5	30	100
	CN (total complex)	5	50	500	10	50	200
	S (total)	2	20	200	10	100	300
	Br (total)	20	50	300	100	500	2000
	PO (as P)	–	–	–	50	200	700
Aromatic compounds	Benzene	0·01	0·5	5	0·2	1	5
	Ethyl benzene	0·05	5	50	0·5	20	60
	Toluene	0·05	3	30	0·5	15	50
	Xylene	0·05	5	50	0·5	20	60
	Phenols	0·02	1	10	0·5	15	50
	Aromatics (total)	0·1	7	70	1	30	100
Polycyclic aromatic compounds (PCAs)	Naphthalene	0·1	5	50	0·2	7	30
	Anthracene	0·1	10	100	0·1	2	10
	Phenanthrene	0·1	10	100	0·1	2	10
	Fluoranthene	0·1	10	100	0·02	1	5
	Pyrene	0·1	10	100	0·02	1	5
	Benzo(a)pyrene	0·05	1	10	0·01	0·2	1
	Total PCAs	1	20	200	0·2	10	40
Chlorinated organic compounds	Aliphatic chlorinated compounds (individual)	0·1	5	50	1	10	50
	Aliphatic chlorinated compounds (total)	0·1	7	70	1	15	70
	Chlorobenzenes (individual)	0·05	1	10	0·02	0·5	2
	Chlorobenzenes (total)	0·05	2	20	0·02	1	5
	Chlorophenols (individual)	0·01	0·5	5	0·01	0·3	1·5
	Chlorophenols (total)	0·01	1	10	0·01	0·5	2
	Chlorinated PCA (total)	0·05	1	10	0·01	0·2	1
	PCB (total)	0·05	1	10	0·01	0·2	1
	EOCl (total)	0·1	8	80	1	15	70
Pesticides	Organic chlorinated (individual)	0·1	0·5	5	0·05	0·2	1
	Organic chlorinated (total)	0·1	1	10	0·1	0·5	2
	Pesticides (total)	0·1	2	20	0·1	1	5
Other pollutants	Tetrahydrofuran	0·1	4	40	0·5	20	60
	Pyridine	0·1	2	20	0·5	10	30
	Tetrahydrothiophene	0·1	5	50	0·5	20	60
	Cyclohexanone	0·1	6	60	0·5	15	50
	Styrene	0·1	5	50	0·5	20	60
	Fuel	20	100	300	10	40	150
	Mineral oil	100	1000	5000	20	200	600

The Water Supply (Water Quality) Regulations 1989 list a total of 56 parameters. For each parameter a prescribed concentration or value is given. This relates to the maximum or minimum concentration which must not be exceeded. The table below should be used in conjunction with the Water Supply (Water Quality) Regulations 1989.

Parameters	Expression of results	Concentration or value (Maximum unless otherwise stated)
Colour	mg/l Pt/Co scale	: 20
Turbidity (including suspended solids)	Formazin turbidity units	4
Odour (including hydrogen sulphide)	Dilution number	3 at 25°C
Taste	Dilution number	3 at 25°C
Temperature	°C	25
Hydrogen ion	pH value	9.5 (5.5 minimum)
Conductivity	µS/cm	1500 at 20°C
Chloride	Cl mg/l	400
Calcium	Ca mg/l	250
Total hardness	Ca mg/l	50 (minimum)
Alkalinity	HCO_3 mg/l	30 (minimum)
Sulphate	SO_4 mg/l	250
Magnesium	Mg mg/l	50
Sodium	Na mg/l	150
Potassium	K mg/l	12
Dry residues	mg/l	1500 (after drying at 180°C)
Nitrate	NO_3 mg/l	50
Nitrite	NO_2 mg/l	0.1
Ammonium (ammonia and ammonium ions)	NH_4 mg/l	0.5
Kjeldahl nitrogen	N mg/l	1
Oxidizability (permanganate value)	O_2 mg/l	5
Total organic carbon	C mg/l	No significant increase over that normally observed
Dissolved or emulsified hydro-carbons (after extraction with petroleum ether): mineral oils	µg/l	10
Phenols	C_6H_5OH µg/l	0.5
Surfactants	µg/l (as lauryl sulphate)	200
Aluminium	Al µg/l	200
Iron	Fe µg/l	200
Manganese	Mn µg/l	50
Copper	Cu µg/l	3000
Zinc	Zn µg/l	5000
Phosphorus	P µg/l	2200
Fluoride	F µg/l	1500
Silver	Ag µg/l	10
Arsenic	As µg/l	50
Cadmium	Cd µg/l	5
Cyanide	CN µg/l	50
Chromium	Cr µg/l	50
Mercury	Hg µg/l	1
Nickel	Ni µg/l	50
Lead	Pb µg/l	50
Antimony	Sb µg/l	10
Selenium	Se µg/l	10
Boron	B µg/l	2000
Barium	Ba µg/l	1000
Pesticides and related products: a) individual substances b) total substances (i)	 µg/l µg/l	 0.1 0.5
Polycyclic aromatic hydrocarbons (ii)	µg/l	0.2
Benzo 3,4 pyrene	ng/l	10
Tetrachloromethane	µg/l	3
Trichloroethene	µg/l	30
Tetrachloroethene	µg/l	10
Substances extractable in chloroform	mg/l dry residue	1
Total coliforms	number/100 ml	0
Faecal coliforms	number/100 ml	0
Faecal streptococci	number/100 ml	0
Sulphite-reducing clostridia	number/20 ml	<1
Colony counts	number/1 ml at 22°C or 37°C	No significant increase over that normally observed

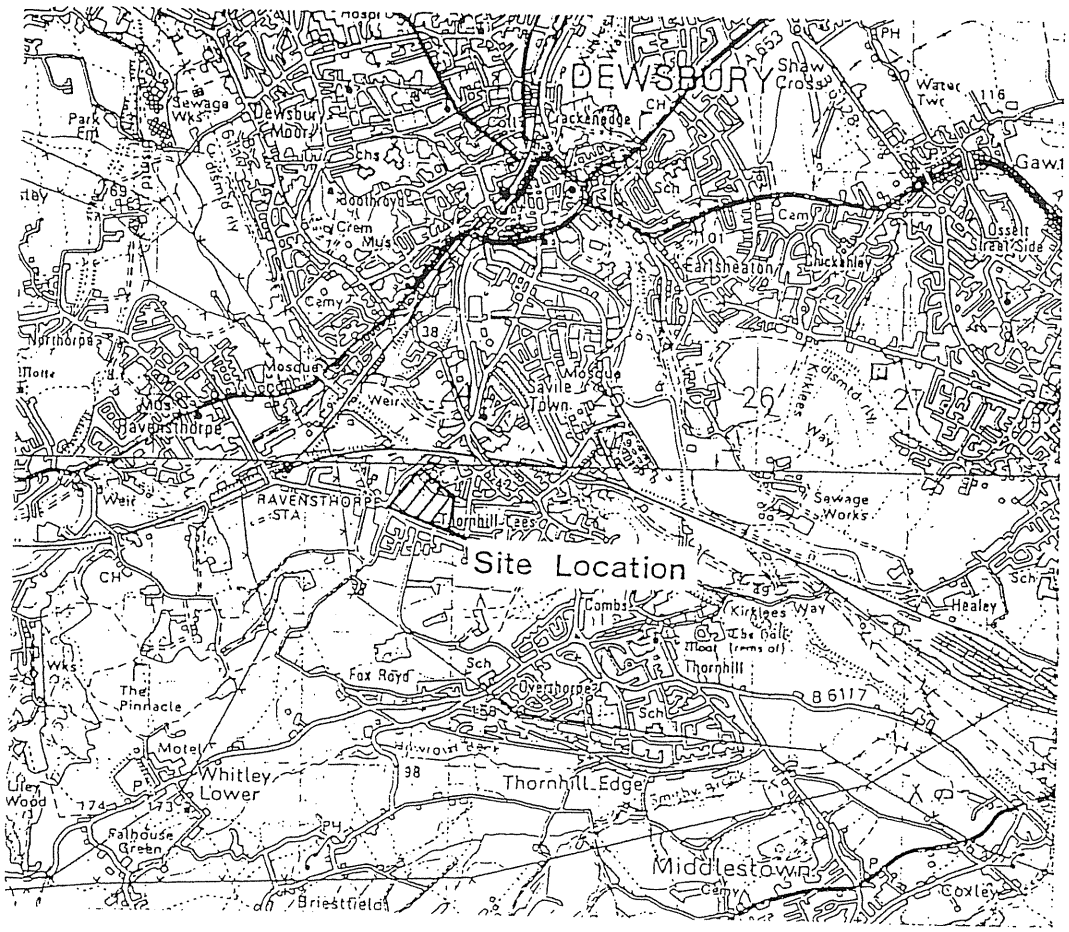
(i) The sum of the detected concentrations of individual substances
(ii) The sum of the detected concentrations of fluoranthene, benzo 3,4 fluoranthene, benzo 11,12 fluoranthene, benzo 3,4 pyrene, benzo 1,12 perylene and indeno (1,2,3-cd) pyrene

Standards for drinking water quality

ENCLOSURE C

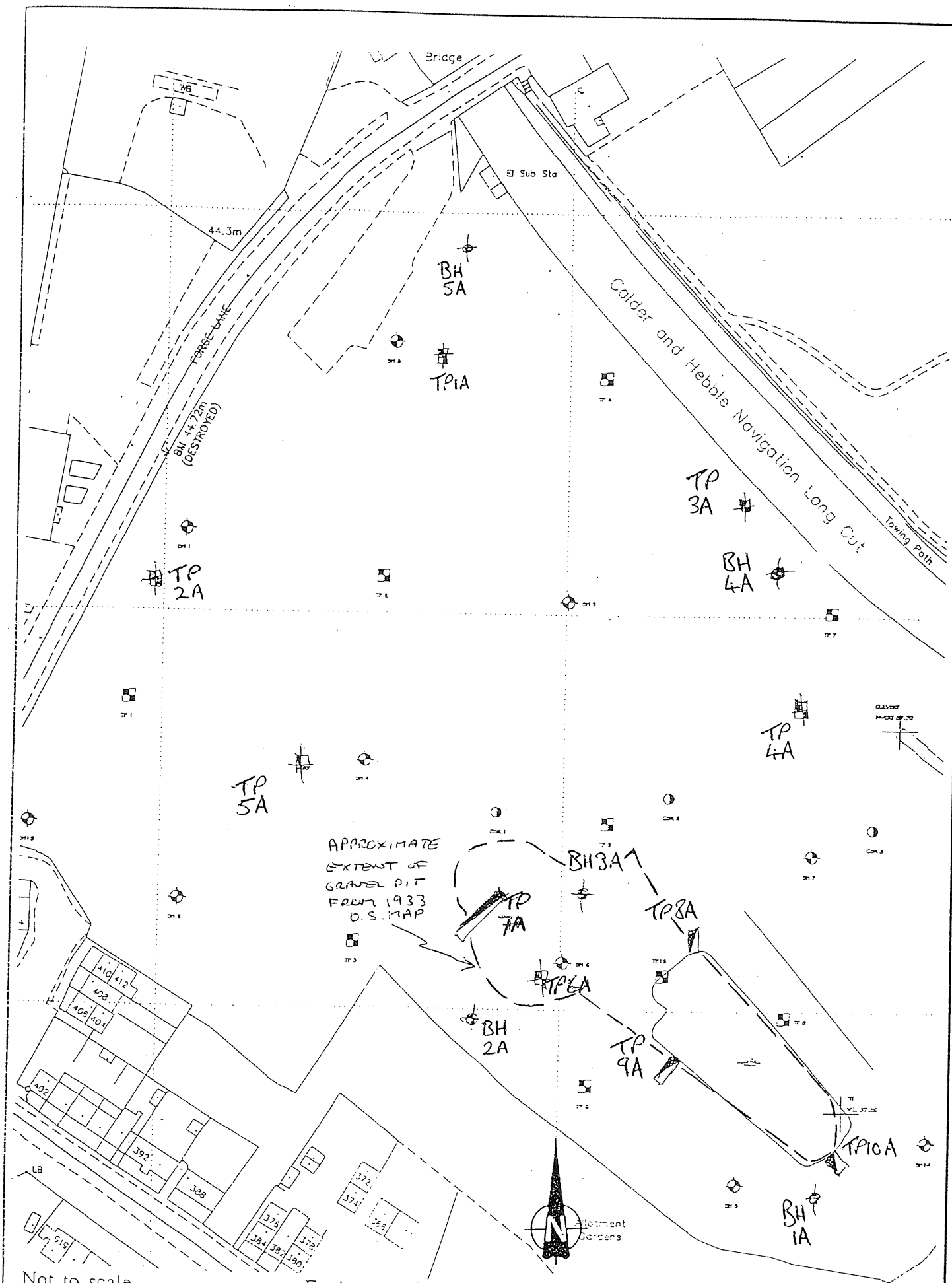
Drawings

	Drawings
Site Location Plan	1
Exploratory Hole Location Plan (Not to scale) showing approximate extent of gravel pit 1933	2
Exploratory Hole Location Plan	3



Reproduced from the 1991 Ordnance Survey
1:50000 scale Landranger map with the
permission of The Controller of Her Majesty's
Stationery Office, ©Crown Copyright
Environmental Services Group Limited
Glossop House, Hogwood Lane,
Finchampstead, Wokingham, Berkshire, RG40 4QW
Licence No: 543691

Site Location Plan	Project Forge Lane Former Steelworks, Thornhill, Dewsbury Kirklees Metropolitan Council	Contract 129148
Exploration Associates		Drawing 1



Not to scale

Exploratory hole locations approximate.

Exploratory Hole Location Plan	Project Forge Lane Former Steelworks, Thornhill, Dewsbury Kirklees M.B.C.	Contract 129148
Exploration Associates		Figure Drawing 2

ENCLOSURE D

General Notes

These notes, which accompany the ground investigation report, are intended to assist the user of the factual information contained in the report. They point out some inevitable shortcomings for any ground investigation and do not constitute a disclaimer responsibility for the results obtained by the ground investigation specialist.

1. The information in this report is based on the ground conditions encountered during the ground investigation work and the results of any field and laboratory testing. Borehole and/or trial pit logs describe the ground excavated at their specific locations and should not be regarded as representative of the ground as a whole.

2. Site investigations are performed by this Company in general accordance with the recommendations in BS 5930(1981) "Code of Practice for Site Investigations". The testing of soils, rocks and aggregates generally follow the recommendations of BS 1377 (1990) "Methods of test for soils for civil engineering purposes", the International Society of Rock Mechanics (Brown, 1981) "Rock characterisation, testing and monitoring, ISRM suggested methods", and BS 812 (1975) "Methods of sampling and testing of mineral aggregates, sands and fillers", respectively.

3. The primary purpose of ground investigation boreholes and trial pits is to probe the stratified sequence of rock and/or soil. From the results of these probings no conclusions should be drawn concerning the presence, size, lithological nature and numbers per unit volume of ground of cobbles and boulders in soil types such as glacial till (boulder clay).

4. When cable percussion boring techniques are used in superficial and drift deposits some mixing of thin-layed soils inevitably occurs. If strong randomly-occurring pieces of rock are encountered in soil material then the rock may either be pushed aside or be penetrated and broken up in which case the arisings that are recovered may not be indicative of the nature of the material in situ.

5. Rotary drilling techniques may sometimes be used for drilling through superficial deposits and rocks in order to provide a very general indication of the nature of the ground. When open-hole methods have been used for the ground investigation the description of the ground is based on the cuttings recovered from the flushing medium and the rate of progress in advancing the hole. Descriptions of strata and the depths of changes in strata may not be accurate under these conditions.

6. Groundwater conditions noted during boring may be subject to change through seasonal and/or other effects such as, for example, boring and constructional excavation. When a groundwater inflow is encountered during boring, work on the hole is suspended, typically for 20 minutes, and any change in level is recorded. The groundwater level recorded on resumption of boring may not be natural, pre-boring standing water level. When piezometers are installed in boreholes the reported groundwater levels may also be subject to variation due to seasonal and/or other effects.

7. The factual ground investigation information contained within the ground investigation report should be used only in its entirety and not for any development project other than the one for which it was prepared unless a check has been carried out on its applicability and permission for its use has been obtained from the investigator and the person or body which commissioned the investigation.

8. Where the ground investigation report contains an interpretation of the factual information this information must be considered in the context of the stated development proposals and should not be used in any other context. This interpretation is provided for the use of the person or body that commissioned the work and no responsibility will be accepted by the ground investigation specialist if it is used by any other person or body.

APPENDIX

Monitoring Records

6th February 1997 to 28th November 1997

Date	6/2/97
Time	
Operator	SL

Meteorological and Site Conditions

State of ground:		Dry	X	Moist		Wet		
Wind:		Calm		Light	X	Moderate		Strong
Wind Direction:	SE-SW							
Cloud Cover:		None		Slight		Cloudy	X	Overcast
Precipitation:		None	X	Slight		Moderate		Heavy

Barometric Pressure (mbars): 1012 Air Temp °C: 8°C

Instrumentation Details	50mm diameter standpipes in gravel filter

Equipment Used	GI Infra Red Gas Analyser X	GMI Landsurveyor	GMI CO_2 Portable
	Others (specify):		

Borehole / Instrument	Depth of Installation (m)	Explosive Gases / CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Depth to Groundwater (m)	Others / Comments
1	8.80	0	0.7	16.2	3.13	
5	7.20	0	2.5	14.8	1.90	
6	6.30	0	0.0	20.1	1.21	
11	9.70	0	0.0	19.9	0.98	
12	8.70	0	0.0	20.0	0.72	
13	9.00	0	0.0	20.1	0.96	
15	11.00	0	0.0	20.1	4.88	

Remarks

The concentrations of gases recorded above are subject to the accuracy, as specified by the manufacturer, of the instrumentation adopted. If concentration accuracies of less than +/- 2% are required, it is recommended that gas samples are recovered and laboratory analyses are undertaken.

Form 11/1

Gas Monitoring Record	**Project** Forge Lane Former Steelworks, Thornhill, Dewsbury, Kirklees M.B.C.	**Contract** 127001
Exploration Associates		**Figure** G1

Date	9/4/97
Time	A.M.
Operator	TJD

Meteorological and Site Conditions

State of ground:	X	Dry		Moist		Wet			
Wind:		Calm	X	Light		Moderate		Strong	
Wind Direction:	W								
Cloud Cover:		None	X	Slight		Cloudy		Overcast	
Precipitation:	X	None		Slight		Moderate		Heavy	

Barometric Pressure (mbars): 1029 Air Temp °C: 17

Instrumentation Details	50mm diameter pipe in gravel filter

Equipment Used	GI Infra Red Gas Analyser	X	GMI Landsurveyor		GMI CO_2 Portable
	Others (specify):				

Borehole / Instrument	Depth of Installation (m)	Explosive Gases / CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Depth to Groundwater (m)	Others / Comments
1		0	1.00	19.3	3.38	
5		0	2.2	19.4	2.25	
6		0	0	20.9	1.18	
11		0	1.2	17.7	1.08	
13		0	0.0	20.7	1.08	

Remarks

The concentrations of gases recorded above are subject to the accuracy, as specified by the manufacturer, of the instrumentation adopted. If concentration accuracies of less than +/- 2% are required, it is recommended that gas samples are recovered and laboratory analyses are undertaken.

Form 11/1

Gas Monitoring Record	**Project**	**Contract** 127001
Exploration Associates	Forge Lane Former Steelworks Thornhill, Dewsbury Kirklees M.B.C.	**Figure** G2

Date	23/5/97
Time	1.00pm
Operator	SL

Meteorological and Site Conditions

State of ground:	X	Dry		Moist		Wet		
Wind:		Calm	X	Light		Moderate		Strong
Wind Direction:								
Cloud Cover:		None		Slight	X	Cloudy		Overcast
Precipitation:	X	None		Slight		Moderate		Heavy

Barometric Pressure (mbars): 1019 Air Temp °C: 16

Instrumentation Details

50mm diameter pipe in gravel filter

Equipment Used

GI Infra Red Gas Analyser [X] GMI Landsurveyor [ ] GMI CO_2 Portable [ ]

Others (specify):

Borehole / Instrument	Depth of Installation (m)	Explosive Gases / CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Depth to Groundwater (m)	Others / Comments
1		0	0	20.5	3.08	(Cover vandalised)
5		0	00.2	18.7	1.93	
6		0	0	20.4	1.21	
11		0	0	20.5	1.02	
12		0	0	20.4	0.84	(Valve removed)
13		0	0	20.4	1.00	
15		0	0	20.3	4.84	

Remarks

The concentrations of gases recorded above are subject to the accuracy, as specified by the manufacturer, of the instrumentation adopted. If concentration accuracies of less than +/- 2% are required, it is recommended that gas samples are recovered and laboratory analyses are undertaken.

Form 11/1

Gas Monitoring Record	**Project** Forge Lane Former Steelworks, Thornhill, Dewsbury, Kirklees M.B.C.	**Contract** 127001
Exploration Associates		**Figure** G3

Date	10/7/97
Time	1.30pm
Operator	SL

Meteorological and Site Conditions

State of ground: [X] Dry [ ] Moist [ ] Wet

Wind: [X] Calm [ ] Light [ ] Moderate [ ] Strong

Wind Direction: [ ]

Cloud Cover: [ ] None [ ] Slight [ ] Cloudy [X] Overcast

Precipitation: [X] None [ ] Slight [ ] Moderate [ ] Heavy

Barometric Pressure (mbars): 1008 Air Temp °C: [ ]

Instrumentation Details

50mm diameter standpipes in gravel filter

Equipment Used

GI Infra Red Gas Analyser [X] GMI Landsurveyor [ ] GMI CO_2 Portable [ ]

Others (specify):

Borehole / Instrument	Depth of Installation (m)	Explosive Gases / CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Depth to Groundwater (m)	Others / Comments
1	8.80	0	0	21.0	2.90	
5	7.20	0	1.0	20.0	1.91	
6	6.30	0	0	21.4	1.19	
11	9.70	0	0	21.4	0.98	
12	8.70	0	0	21.3	0.79	
13	9.00	0	0	21.0	0.95	
15	11.00	0	0	21.1	4.63	

Remarks

The concentrations of gases recorded above are subject to the accuracy, as specified by the manufacturer, of the instrumentation adopted. If concentration accuracies of less than +/- 2% are required, it is recommended that gas samples are recovered and laboratory analyses are undertaken.

Form 11/1

Gas Monitoring Record	**Project**	**Contract**
	Forge Lane Former Steelworks Thornhill, Dewsbury Kirklees M.B.C.	127001
Exploration Associates		**Figure**

Date	20/8/97
Time	2.45pm
Operator	SL

Meteorological and Site Conditions

State of ground: [X] Dry [ ] Moist [ ] Wet

Wind: [ ] Calm [X] Light [ ] Moderate [ ] Strong

Wind Direction: [ ]

Cloud Cover: [ ] None [X] Slight [ ] Cloudy [ ] Overcast

Precipitation: [ ] None [ ] Slight [ ] Moderate [ ] Heavy

Barometric Pressure (mbars): 1018 Air Temp °C: [ ]

Instrumentation Details

50mm diameter standpipes in gravel filter

Equipment Used

GI Infra Red Gas Analyser [X] GMI Landsurveyor [ ] GMI CO_2 Portable [ ]

Others (specify):

Borehole / Instrument	Depth of Installation (m)	Explosive Gases / CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Depth to Groundwater (m)	Others / Comments
1	8.80	--	--	--	--	Vandalised unusable
5	7.20	0	0.7	18.6		
6	6.30	--	--	--	--	Vandalised unusable
11	9.70	0	0	21.1		
12	8.70	0	0	21.0		
13	9.00	0	0	20.8		
15	11.00	0	0	21.1		

Remarks

The concentrations of gases recorded above are subject to the accuracy, as specified by the manufacturer, of the instrumentation adopted. If concentration accuracies of less than +/- 2% are required, it is recommended that gas samples are recovered and laboratory analyses are undertaken.

Form 11/1

Gas Monitoring Record	**Project**	**Contract** 127001
Exploration Associates	Forge Lane Former Steelworks Thornhill, Dewsbury Kirklees M.B.C.	**Figure**

Date	29/10/97
Time	2.15pm
Operator	SL

Meteorological and Site Conditions

State of ground: [ ] Dry [X] Moist [ ] Wet

Wind: [ ] Calm [X] Light [ ] Moderate [ ] Strong

Wind Direction: [ ]

Cloud Cover: [X] None [ ] Slight [ ] Cloudy [ ] Overcast

Precipitation: [X] None [ ] Slight [ ] Moderate [ ] Heavy

Barometric Pressure (mbars): 1025 Air Temp °C: [ ]

Instrumentation Details

50mm diameter standpipes in gravel filter

Equipment Used

GI Infra Red Gas Analyser [X] GMI Landsurveyor [ ] GMI CO_2 Portable [ ]

Others (specify):

Borehole / Instrument	Depth of Installation (m)	Explosive Gases / CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Depth to Groundwater (m)	Others / Comments
1	8.80	--	--	--	--	Vandalised unusable
5	7.20	0	0.9	16.0	2.65	
6	6.30	--	--	--	--	Vandalised unusable
11	9.70	0	1.3	18.0	1.57	
12	8.70	0	0	20.0	1.28	
13	9.00	0	0	21.0	1.53	
15	11.00	0	0	20.1	5.73	

Remarks

The concentrations of gases recorded above are subject to the accuracy, as specified by the manufacturer, of the instrumentation adopted. If concentration accuracies of less than +/- 2% are required, it is recommended that gas samples are recovered and laboratory analyses are undertaken.

Form 11/1

Gas Monitoring Record	**Project**	**Contract** 127001
Exploration Associates	Forge Lane Former Steelworks Thornhill, Dewsbury Kirklees M.B.C.	**Figure**

Date	28/11/97
Time	1.45pm
Operator	SL

Meteorological and Site Conditions

State of ground: [ ] Dry [ ] Moist [X] Wet

Wind: [ ] Calm [X] Light [ ] Moderate [ ] Strong

Wind Direction: [ ]

Cloud Cover: [ ] None [ ] Slight [ ] Cloudy [X] Overcast

Precipitation: [ ] None [ ] Slight [X] Moderate [ ] Heavy

Barometric Pressure (mbars): 995 Air Temp °C: [ ]

Instrumentation Details

50mm diameter standpipes in gravel filter

Equipment Used

GI Infra Red Gas Analyser [X] GMI Landsurveyor [ ] GMI CO_2 Portable [ ]

Others (specify):

Borehole / Instrument	Depth of Installation (m)	Explosive Gases / CH_4 (% v/v)	CO_2 (% v/v)	O_2 (% v/v)	Depth to Groundwater (m)	Others / Comments
1	8.80	--	--	--	--	Vandalised unusable
5	7.20	0	2.9	13.6	2.17	
6	6.30	--	--	--	--	Vandalised unusable
11	9.70	0	0	20.7	0.66	
12	8.70	0	0	20.9	0.55	
13	9.00	0	0	20.9	0.88	
15	11.00	0	0	20.7	5.26	

Remarks

The concentrations of gases recorded above are subject to the accuracy, as specified by the manufacturer, of the instrumentation adopted If concentration accuracies of less than +/- 2% are required, it is recommended that gas samples are recovered and laboratory analyses are undertaken.

Form 11/1

Gas Monitoring Record

Exploration Associates

Project: Forge Lane Former Steelworks, Thornhill, Dewsbury, Kirklees M.B.C.

Contract: 127001

Figure:

CAS

22 April 1997

Exploration Associates Ltd
Unit 18
Deeside Industrial Estate
Welsh Road
Deeside
CH5 2LR

FAO Tim Downes

TEST REPORT EAD/18732

Dear Sir

Please find enclosed the results of the analyses carried out on the samples submitted from Forge Lane 12 April 1997.

I trust you will find these satisfactory but should you have any queries please do not hesitate to contact me.

Yours sincerely

C V Billings
QUALITY MANAGER

enc

3 FAIRFIELD COURT, WHELER ROAD, WHITLEY
COVENTRY, WEST MIDLANDS CV3 4LA
TEL: 01203 639012 FAX: 01203 639710

EAD/18732
FORGE LANE
EXPLORATION ASSOCIATES DEESIDE
WATERS RECEIVED 12/04/97
YOUR REFERENCE 127001
YOUR ORDER NO

CAS

CAS SAMPLE No				1	2	3	4	5	6	7	8
SAMPLE No				BH 1	BH 3	BH 4	BH 5	BH 6	BH 9	BH 10	BH 11
Method		as	units								
03-W*	Ammonia	N	mg/l	0.40	0.33	1.2	0.38	24	12	1.5	4.7
25C-W*	Arsenic (soluble)	As	µg/l	<10	<10	<10	<10	<10	<10	<10	<10
07-W*	Boron (soluble)	B	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
25-W*	Cadmium (soluble)	Cd	µg/l	<5	<5	<5	<5	<5	<5	<5	<5
25-W*	Chromium (soluble)	Cr	µg/l	<10	<10	<10	<10	<10	<10	<10	<10
25-W*	Copper (soluble)	Cu	µg/l	<10	<10	<10	<10	<10	10	70	<10
25-W*	Lead (soluble)	Pb	µg/l	<10	<10	<10	<10	<10	<10	<10	<10
25X-W*	Mercury (soluble)	Hg	µg/l	<1	<1	<1	<1	<1	<1	<1	<1
35A-W*	Mineral Oil		mg/l	3.2	3.6	<2	2.4	<2	<2	6.6	<2
25-W*	Nickel (soluble)	Ni	µg/l	<10	<10	<10	<10	<10	<10	<10	10
31-W	pH		pH units	6.5	6.8	7.0	7.0	7.6	7.0	10.2	7.5
25C-W*	Selenium (soluble)	Se	µg/l	<2	<2	<2	<2	<2	<2	<2	<2
37-W	Sulphate	SO_3	g/l	0.63	0.33	0.22	0.15	0.32	0.02	0.21	0.18
25-W*	Zinc (soluble)	Zn	µg/l	<10	<10	<10	<10	<10	<10	<10	<10

CHECKED AND ISSUED BY:

DATE: 22 Apr 97

EAD/18732
FORGE LANE
EXPLORATION ASSOCIATES DEESIDE
WATERS RECEIVED 12/04/97
YOUR REFERENCE 127001
YOUR ORDER NO

CAS

CAS SAMPLE No				9	10	11
SAMPLE No				BH 12	BH 13	BH 15
Method		as	units			
03-W*	Ammonia	N	mg/l	0.34	0.45	0.60
25C-W*	Arsenic (soluble)	As	µg/l	<10	<10	<10
07-W*	Boron (soluble)	B	mg/l	<0.05	<0.05	<0.05
25-W*	Cadmium (soluble)	Cd	µg/l	<5	<5	<5
25-W*	Chromium (soluble)	Cr	µg/l	<10	<10	<10
25-W*	Copper (soluble)	Cu	µg/l	<10	<10	10
25-W*	Lead (soluble)	Pb	µg/l	<10	<10	<10
25X-W*	Mercury (soluble)	Hg	µg/l	<1	<1	<1
35A-W*	Mineral Oil		mg/l	3.6	<2	<2
25-W*	Nickel (soluble)	Ni	µg/l	<10	<10	<10
31-W	pH		pH units	7.7	7.2	6.8
25C-W*	Selenium (soluble)	Se	µg/l	<2	<2	<2
37-W	Sulphate	SO_3	g/l	0.04	0.05	0.22
25-W*	Zinc (soluble)	Zn	µg/l	<10	<10	10

CHECKED AND ISSUED BY:

DATE: 22 Apr 97

Symbol Key

▒▒▒ - Test not scheduled

LAB/18732
FORGE LANE
EXPLORATION ASSOCIATES DEESIDE
YOUR REFERENCE 127001
YOUR ORDER NO

CAS

FINAL REPORT

TEST METHOD LIST.

Method Number	Method Name
03-W*	AMMONIA
07-W*	BORON (SOLUBLE)
25-W*	METALS (SOLUBLE)
25C-W*	HYDRIDES (SOLUBLE)
25X-W*	MERCURY (SOLUBLE)
31-W	pH
35A-W*	MINERAL OIL
37-W	SULPHATE (SOLUBLE)

CHECKED AND ISSUED BY:

DATE: 22 Apr 97