GEOENVIRONMENTAL APPRAISAL
of land at
Heckmondwike Grammar School, Heckmondwike
Client: Heckmondwike Grammar School.

REPORT NO. D2003/1
JUNE 2008

Written by	Checked by
KP	GD

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1 INTRODUCTION

Dunelm Geotechnical & Environmental (Dunelm) carried out a geoenvironmental appraisal of land at Heckmondwike Grammar School, Heckmondwike on behalf of Heckmondwike Grammar School.

It is proposed to develop the site with a two storey extension to the existing school.

Arc Environmental have previously produced a Preliminary Geoenvironmental Appraisal Report (Ref 08-086). Reference should be made to this report for details of the site's history and environmental setting.

The objectives of this exploratory phase of investigation were as follows:

- To determine whether past mining may have had an influence on the site
- To assess risks from ground contamination
- To provide recommendations for foundations

Conditions of offer and notes on limitations relevant to all Dunelm geoenvironmental investigations are described in Appendix F and should be read in conjunction with this report.

2 SITE RECONNAISSANCE

2.1 General

The centre of the site is located at OS Grid Ref 421970, 423540. The site is situated approximately 0.2km south of Heckmondwike town centre. The site location is shown in Drawing Number D2003/01 in Appendix A to this report.

The preliminary site inspection was undertaken during May 2008.

2.2 Topography and Site Features

The site is relatively flat and typically used as a car park. The western region is elevated slightly above the western region of the site by less than 1m and some steps connect the site between the two levels.

The western region of the site is tarmac covered and the eastern region of the site is covered with rough gravel. Portacabin classrooms are located directly east of the site and there is a small grassed bank located along the site's southern boundary with a small number of trees present.

The school building bounds the site to the north.

3 GEOLOGICAL SETTING

3.1 Information Sources

The environmental setting of the site was determined through reference to the following:

- British Geological Survey (BGS) 1: 50,000 scale sheet No 77 Huddersfield
- Coal Mining Report from David Bellis Associates (based on data obtained from the Coal Authority)

3.2 Geology

Drift deposits are not shown on the geological plan.

The solid geology underlying the site comprises Middle Coal Measures strata.

The geological plan shows the site to be underlain by the Coal seam which is shown to outcrop west of the site and dip to the east beneath the site.

The site is located within a heavily faulted area.

3.3 Mining & Quarrying

The mining report included in the desk study report indicates that the site may be underlain by workings in two coal seams, the shallowest being the Black Bed Seam at a depth of approximately 202m below ground level.

The mining report indicates that the site may be affected by unrecorded shallow workings.

There is no evidence from the mining report to indicate that the Middleton Main seam has been worked although the possibility of unrecorded shallow workings cannot be ruled out.

There are no recorded mine entries within 20m of the site.

No evidence has been found to suggest that the site has been affected by quarrying.

4 PREVIOUS INVESTIGATION

Dunelm have examined the following reports: Phase 1: Desk top Study Report produced by Arc Environmental. A summary of the works undertaken is shown in the Table below together with the main findings.

Item	Main findings
Review of desk study information	Former site uses: residential and existing school. Cawley Hill Quarry located 240m southeast of the site. No landfills within 250m of the site. Site is underlain by a minor aquifer. No surface water features within 250m of the site. Three discharge consents within 250m of the site, these do not directly affect the site. No pollution incidents within 250m of the site. No radon protection measures required.

5 SITE WORKS AND LABORATORY TESTING

5.1 Conceptual Site Model

A preliminary conceptual site model, including an assessment of potential pollutant linkages, has been determined based on the desk study information presented above.

The site has been occupied previously and it is possible that contamination is present however no specific contaminants have been identified.

The main receptors include future site users.

5.2 Summary of Investigation

The initial investigation strategy is outlined in the preceding Section.

The exploratory holes listed below were advanced during May 2008. Records for each of the exploratory holes noted are included in Appendix B and the locations are shown on Drawing Number D2003/02 in Appendix A.

- Hand dug trial pit HTP1
- Mini percussion boreholes MBH1-4
- Rotary probeholes R1-2.

5.3 Chemical Testing

Appropriate samples were delivered to a suitably accredited laboratory with a schedule of testing drawn up by Dunelm. The laboratory test results are presented in Appendix C to this report and discussed in Section

8.

5.4 Geotechnical Testing

Samples of natural soil were delivered to a geotechnical laboratory with a schedule of testing drawn up by Dunelm. The geotechnical laboratory test results are currently outstanding and will be included in the final report.

6 GROUND CONDITIONS & MATERIAL PROPERTIES

6.1 General

Strata encountered were generally similar beneath all parts of the site. Ground conditions are described in the following sections.

6.2 Topsoil

Topsoil 500mm thick was recorded within MBH4 with brick fragments.

6.3 Made Ground

Made ground was encountered across the site to depths between 0.6 and 1.0m within the mini boreholes and hand dug trial pit. The made ground generally consisted of granular material including brick, concrete, limestone, clinker, slag and coal.

6.4 Natural Soils

The natural soils at the site consisted of stiff and very stiff clays to depths in excess of 3.05m bgl. The clays were recorded as sandy gravelly clays with a significant gravel fraction comprising weathered rock deposits. SPT tests within the clay recorded 'N' values between 20 and 40 confirming the stiff and very stiff nature of the clay.

In view of the gravel fraction and high SPT 'N' values it is considered that these deposits represent the boundary between shallow drift deposits and rock.

Moisture content testing within the clay deposits recorded values between 13% and 18% with plasticity indices ranging from 9 to 13 indicating low plasticity with low shrinkage potential. The moisture contents were equal to or below the plastic limit confirming the generally stiff/very stiff nature of the clay.

6.5 Rock Head

Although not proved by coring sandstone rock was encountered at 3m within MBH1.

Mudstone rock was encountered in both probeholes at depths of 2.6m and 6.5m.

6.6 Groundwater

Groundwater was not encountered during site works; subsequent groundwater monitoring has been carried out following the completion of fieldwork and recorded standing water levels between 0.79 and 2.64m bgl, the groundwater levels recorded are shown in Appendix E.

6.7 Hydrocarbon Contamination

No visual or olfactory evidence of hydrocarbon contamination was noted during the investigation.

6.8 Concrete in Aggressive Ground

To enable buried concrete to be designed to resist sulfate attack, samples of made ground and natural strata from depths corresponding to the anticipated foundation depth have been tested for water-soluble sulfate and pH.

The maximum water-soluble sulfate concentration is 78mg/l and the lowest recorded pH value is 5.6.

Based on the above results, Design Sulfate Class DS-1 and ACEC Classification AC-2z would be appropriate for buried concrete at the site.

6.9 Existing Foundations

A hand dug pit was excavated alongside the existing school building to record the foundation details. The foundation recorded a depth of 670mm with a projection of 300mm. The base of the found was noted to lie within granular made ground deposits.

7 MINING

The geological plan shows the site to be underlain by the Middleton Main seam which is shown to outcrop west of the site and dip to the east beneath the site. There is no evidence from the mining report to indicate that the Middleton Main seam has been worked although the possibility of unrecorded shallow workings cannot be ruled out.

The results of the mining investigation are discussed below.

7.1 Results

Two rotary holes were drilled to depths of 25m, rockhead was recorded at depths between 2.6 and 6.5m bgl. No coal seams were recorded.

8 CHEMICAL TESTING RESULTS

8.1 Selection of Chemical Testing

This section represents the 'Hazard Identification' process required in accordance with CLR11.

The site's former usage is not considered likely to have given rise to significant ground contamination.

Appropriate chemical testing has been undertaken taking into account potential contaminants identified and evidence of contamination recorded during the ground investigation. Laboratory test certificates are presented in Appendix C to this report. The test results are presented in the following sections.

8.2 Generic Assessment Criteria for Inorganic Contamination

Generic Assessment Criteria (GAC) appropriate to current UK practice for the assessment of inorganic contamination are shown in the table below. These criteria are dependent on the nature of the proposed development; standard land uses as per the CLEA model are shown below. In addition, some contaminants depend on other soil parameters as shown.

Generic Assessment Criteria for Human Health

Contaminant	Generic Assessment Criteria			
	Residential with plant uptake	Allotments	Residential without plant uptake	Commercial / industrial
	DEFRA/EA Soil Guideline Value (mg/kg)			
Arsenic	20	20	20	500
Cadmium (soil pH 6)	1	1	30	1400
Cadmium (soil pH 7)	2	2	30	1400
Cadmium (soil pH 8)	8	8	30	1400
Chromium	130	130	200	5000
Lead	450	450	450	750
Mercury	8	8	15	480
Nickel	50	50	75	5000
Selenium	35	35	260	8000
	LQM CIEH Generic Assessment Criteria for Human Health Risk Assessment (mg/kg)			
Copper	111	-	2080	45700
Zinc	330	-	8250	188,000

Generic Assessment Criteria for Phytotoxic Effects on Plants

Contaminant	Maximum Permissible Concentration from MAFF *The Soil Code* (1998) (mg/kg)
Copper (soil pH 5.0-5.5)	80
Copper (soil pH 5.5-6.0)	100
Copper (soil pH 6.0-7.0)	135
Copper (soil pH >7.0 & $CaCO_3$ > 5%)	200
Zinc (soil pH 5.0-7.0)	200
Zinc (soil pH >7.0 & $CaCO_3$ > 5%)	300

8.3 Topsoil

A summary of the results of inorganic testing on one topsoil sample is shown in the table below.

Inorganic Test Results - Topsoil

Contaminant	Units	No. of topsoil samples tested	No. of samples exceeding GAC	Generic Assessment Criteria	Max concentration
pH	-	1	0	5	7.4
Arsenic	mg/kg	1	0	500	6
Cadmium	mg/kg	1	0	1400	0.3
Chromium (Total)	mg/kg	1	0	5000	18
Lead	mg/kg	1	0	750	38
Mercury	mg/kg	1	0	480	<0.5
Selenium	mg/kg	1	0	8000	<0.3
Copper	mg/kg	1	0	45,700	26
Nickel	mg/kg	1	0	5000	19
Zinc	mg/kg	1	0	188,000	47

No elevated determindand were recorded within the one topsoil sample tested.

8.4 Made Ground (Inorganic Contaminants)

A summary of the results of inorganic testing on made ground samples is shown in the table below.

Inorganic Test Results – Made Ground

Contaminant	Units	No. of made ground samples tested	No. of samples exceeding GAC	Generic Assessment Criteria	Max concentration
pH	-	4	0	5	7.4-10.0
Arsenic	mg/kg	4	0	500	50
Cadmium	mg/kg	4	0	1400	0.3
Chromium (Total)	mg/kg	4	0	5000	26
Lead	mg/kg	4	0	750	290
Mercury	mg/kg	4	0	480	1.0
Selenium	mg/kg	4	0	8000	<0.3
Copper	mg/kg	4	0	45,700	113
Nickel	mg/kg	4	0	5000	35
Zinc	mg/kg	4	0	188,000	120

No elevated values were recorded within the made ground samples tested when compared to commercial threshold guideline values.

9 ASSESSMENT OF CONTAMINATION RISKS

9.1 Summary of Contamination Sources

Topsoil

Topsoil 500mm thick was recorded within MBH4. Testing has indicated that this material does not contain elevated concentrations of the determinands tested.

Made Ground

The majority of the site is underlain by a layer of granular material up to 1.0m thick.

Testing has indicated that this made ground does not contain elevated concentrations of inorganic contaminants.

9.2 Hazard Assessment

No sources of contamination have been encountered during this investigation and consequently no unacceptable risks have been identified.

10 HAZARDOUS GAS

10.1 Hazard Identification

Desk study information has indicated that the site could be affected by potential sources of gas including backfilled ground within 250m and possible gas from abandoned mineworkings.

Given the above, gas monitoring wells were installed in three boreholes during the fieldwork. Details of the monitoring installations are shown on the exploratory hole records in Appendix B.

To date, one visit has been carried out to record methane and carbon dioxide concentrations and borehole flow rates in accordance with current guidance.

10.2 Results and Discussion

No methane was detected. Carbon dioxide concentrations of up to 2.9% v/v were recorded. No positive flows have been detected.

Once the monitoring period is complete, the complete set of monitoring results will be provided together with a gas risk assessment report with recommendations for gas protection measures for new structures. It is essential that the monitoring wells are protected from damage during re-development works such as site clearance or demolition.

11 FOUNDATIONS AND GEOTECHNICAL ISSUES

11.1 Introduction

The proposed development is understood to consist of a two storey extension to the existing school building.

Ground conditions encountered during this investigation comprised made ground up to 1.0m consisting of granular material. The underlying natural ground consisted of stiff and very stiff clays with a proportion of weathered rock fragments.

Sandstone rock was encountered at 3m within MBH1. Mudstone rock was recorded at 2.6m and 6.5m within R1 and R2 respectively.

11.2 Mining

No evidence has been found to indicate that the site is underlain by coal workings at shallow depth.

No evidence has been found to indicate that the site has been affected by quarrying.

11.3 Foundations

Due to the heterogeneous nature of the made ground, unacceptable total and differential settlements may occur if foundations are placed on made ground. Therefore, foundations should be taken through made ground onto underlying natural ground of adequate bearing capacity.

It is understood that the proposed development comprises a steel framed structure and it is therefore considered that strip or pad foundations should be suitable for the proposed structures.

Based on visual descriptions and the laboratory testing, a safe bearing capacity of at least 150kN/m² has been determined for strip or pad foundations up to 1m wide founding on the natural stiff and very stiff clay at depths of around 1.0m bgl. At this width of foundation and bearing pressure settlements should be less than 25mm.

Based on plasticity index results, all cohesive soils at the site should be regarded as being of low volume change potential. Foundations should therefore be placed at a minimum depth of 0.75m below original or finished ground level, whichever is the lower.

Should rock be encountered at foundation level, consideration should be given to placing the whole of the foundation on rock in order to avoid the possibility of differential settlement; this may necessitate overdeepening of foundations.

Foundations should be taken below a line drawn up at 45° from the base of existing or proposed services or foundations.

It should be recognised that clay rich soils can deteriorate fairly rapidly on exposure, particularly in periods of wet weather and frost. It would be prudent to protect all exposed soils in foundation excavations with a concrete blinding layer, particularly if they are likely to remain open for extended period of time.

Prior to placing foundation concrete, obvious soft or loose spots should be removed and replaced with suitably recompacted hardcore or lean mix concrete. In addition, all excavations should be inspected to ensure that they fully penetrate areas of disturbed ground.

Sub-surface concrete should be Design Sulphate Class DS-1, with the site allocated an ACEC Classification of AC-2z.

Further advice should be sought from Dunelm if unexpected ground conditions are encountered during redevelopment.

11.4 Floor Slabs

In view of the depths of made ground recorded suspended floor slabs should be adopted for the proposed development.

Alternatively, in order to utilise ground bearing slabs, made ground could be removed from beneath the footprint of the buildings and a blanket of compacted granular fill placed in accordance with an engineering specification.

11.5 Excavations

Observations made during the fieldwork indicate that significant groundwater flows would not be anticipated in shallow excavations. However, the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities. Therefore, water levels significantly higher than those found during this investigation may be encountered.

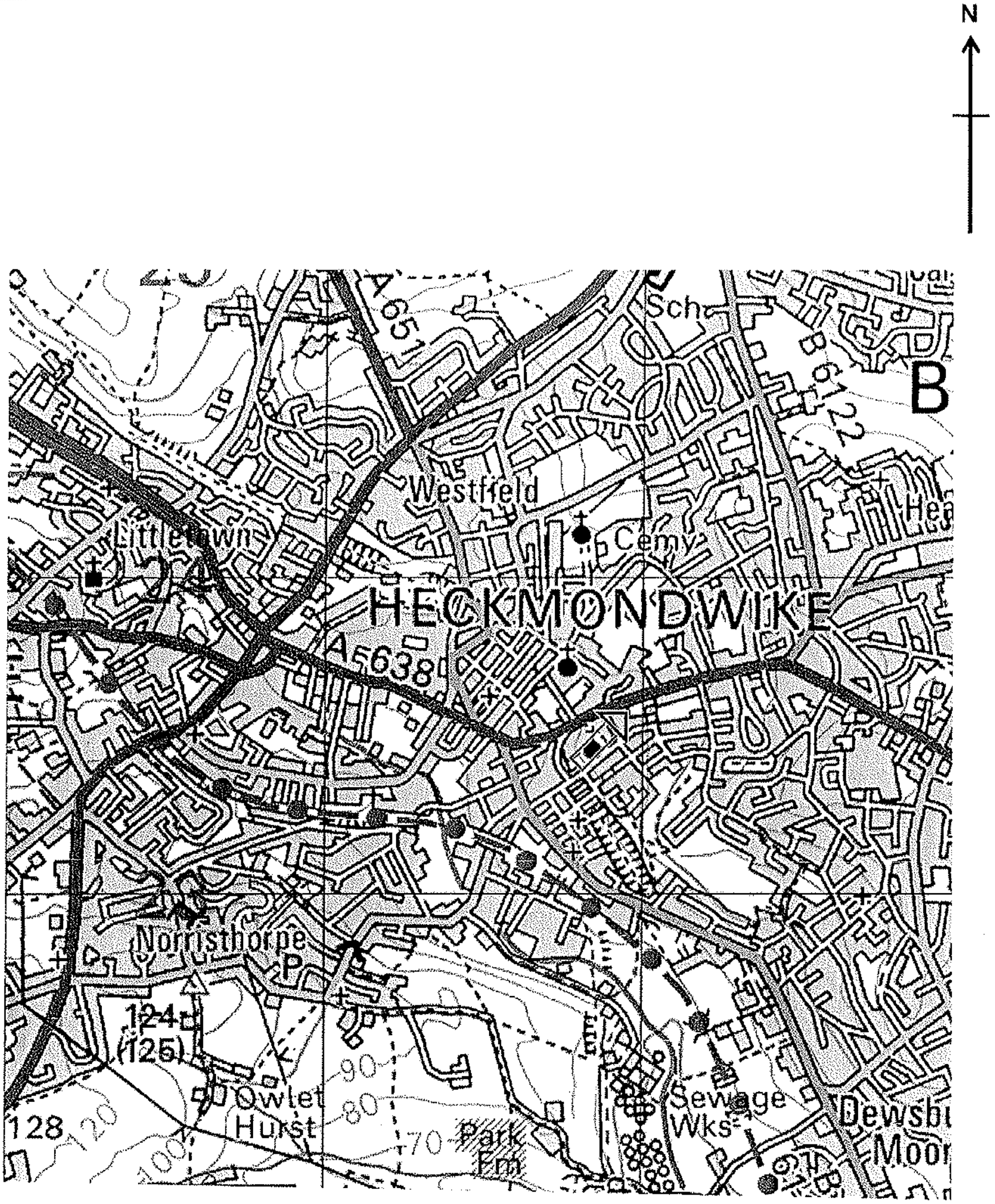
Based on the nature of the ground conditions encountered, excavations may be difficult to depths in excess of 1m in view of the very stiff nature of the clay.

11.6 Road Pavement Design

Where the granular made ground is re-engineered it is considered that a CBR value of 5% should be achievable, however, this should be verified by insitu CBR testing on site and confirmed with the adopting authority.

Appendix A

Drawings



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TEL: 0191 378 3151
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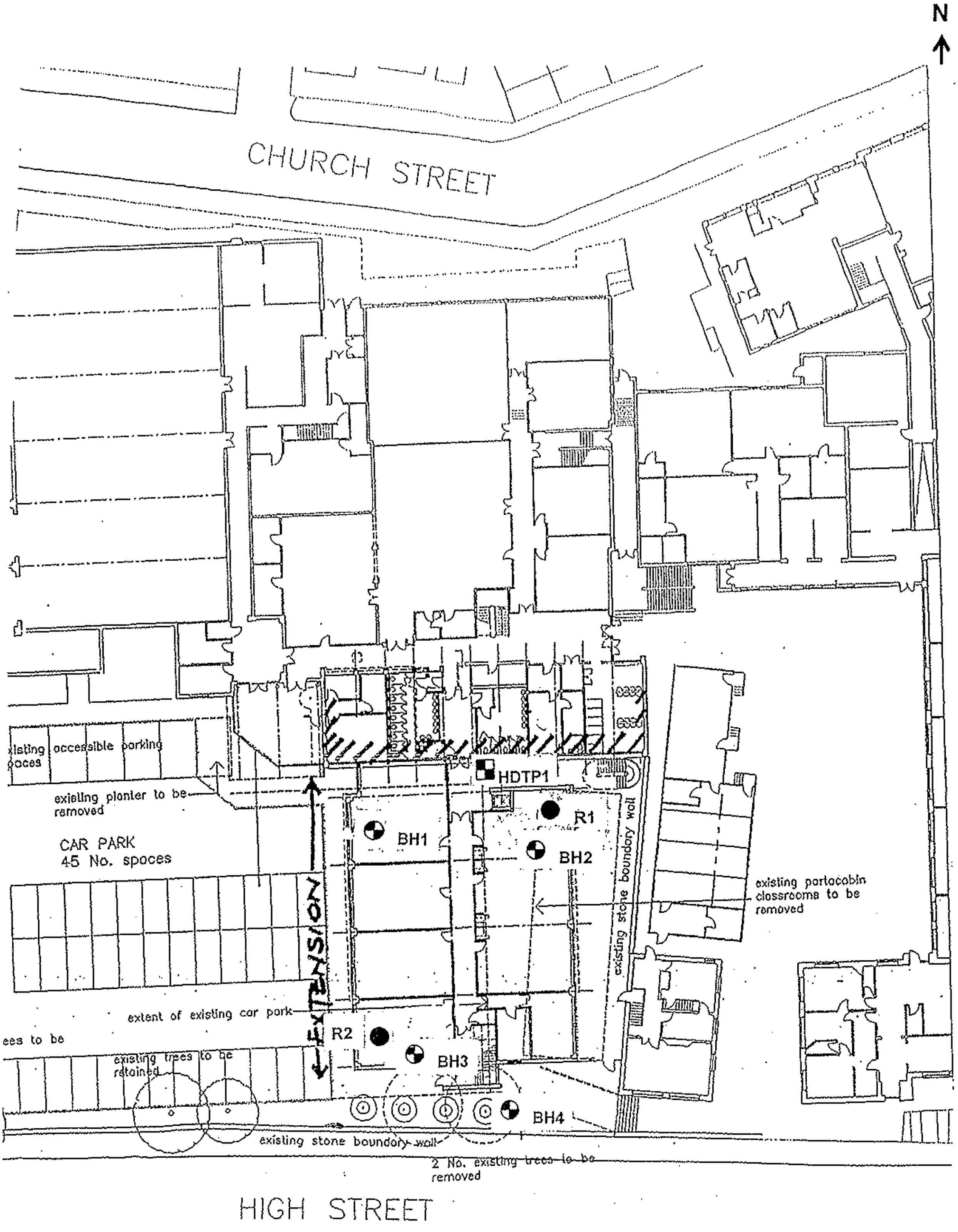
Contract:
Heckmondwike Grammar School, Heckmondwike

Contract No:
D2003

Client:
Heckmondwike Grammar School

Drawing Title:
Site Location Plan

Drawing No:	Date:	Scale:	Status:	Drawn by:
D2003/01	June 2008	NTS	Final	KP



DUNELM GEOTECHNICAL & ENVIRONMENTAL

Contract:
Heckmondwike Grammar School, Heckmondwike

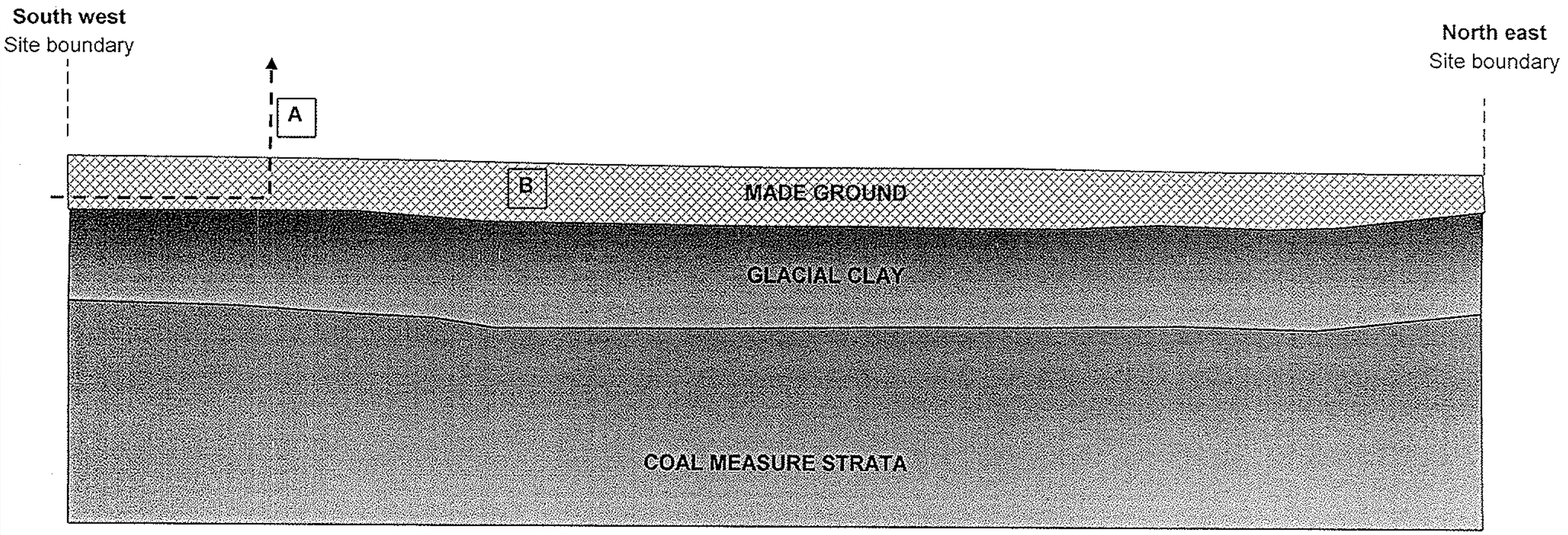
Contract No:
D2003

Client:
Heckmondwike Grammar School

TEL: 0191 378 3151
FAX: 0191 378 3157

Drawing Title:
Exploratory Hole Location Plan

Drawing No:	Date:	Scale:	Status:	Drawn by:
D2003/02	June 2008	NTS	Final	SC



Potential Contamination Linkages:

A – Gas emissions migrating from off site sources affecting residents or site users.

B – Aggressive ground conditions affecting buried concrete, services, and plants.

DUNELM GEOTECHNICAL & ENVIRONMENTAL	**Contract:** **Heckmondwike Grammar School, Heckmondwike**			
	Drawing Title: **Conceptual Site Model**			
Drawing No: **D2003/03**	**Date:** **June 2008**	**Scale:** **NTS**	**Status:** **Final**	**Drawn by:** **KP**

Appendix B

Exploratory Hole Records

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TRIAL PIT RECORD

Site : Heckmondwike Grammar School

Client : Heckmondwike Grammar School

Method : Hand excavated

TP No. **HDTP1**
Sheet 1 of 1

Contract No: D2003

Dates: -

Scale 1:25

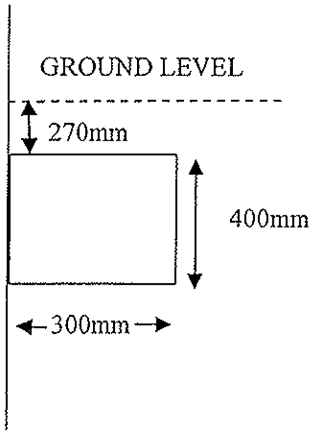
Logged By: SC

SAMPLE DETAILS

Type	Depth From - To(m)	Vane Results kN/m²	Groundwater

STRATA RECORD

Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	Well
MADE GROUND. CONCRETE.	0.05		▨	
MADE GROUND. Black very gravelly fine to coarse SAND with ash. Gravel is angular to subangular fine to coarse of brick slag and clinker. Many angular brick cobbles.	0.40		▨	
MADE GROUND. Brown very clayey gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of brick and sandstone. Some angular brick cobbles.	1.00		▨	
End of Trial Pit at 1.00 m				



Remarks and Water Observations

1. No groundwater encountered.
2. Trial pit stable.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.

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BOREHOLE RECORD

BH No. **MBH1**
Sheet 1 of 1

Site: Heckmondwike Grammar School

Client: Heckmondwike Grammar School

Method: Mini rig

Contract No: D2003

Dates: 10/05/2008

Scale 1:50

Driller: BT

Logged By: SC

SAMPLE DETAILS

Type	Depth From - To(m)	N (cu)	Groundwater (Casing)
	1.20 - 1.65	N=20 (4,4,5,4,5,6)	
D	2.00 - 2.45	N=27 (5,6,7,6,7,7)	
D	2.90 - 3.35	N=36 (10,9,8,8,8,12)	

STRATA RECORD

Description	Depth (m)	Level (m AOD)
MADE GROUND. TARMAC.	0.10	
MADE GROUND. Grey yellow slightly sandy GRAVEL. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of dolomite and concrete.	0.40	
MADE GROUND. Black very gravelly SAND with ash. Gravel is angular to subangular fine to coarse of clinker slag and coal.	0.60	
Very stiff dark brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone and mudstone. Many fragments of weathered sandstone noted.	3.00	
Weak yellow brown fine grained SANDSTONE.	3.35	

End of Borehole at 3.35 m

Remarks and Water Observations

1. No groundwater encountered.
2. Pipe installed.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.

DUNELM GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE RECORD

BH No.	**MBH2** Sheet 1 of 1
Site:	Heckmondwike Grammar School
Contract No:	D2003
Client:	Heckmondwike Grammar School
Dates:	10/05/2008
Method:	Mini rig
Scale	1:50
Driller:	BT
Logged By:	SC

SAMPLE DETAILS

Type	Depth From - To(m)	N (cu)
D	0.10	
	0.30	
	0.40	
D	0.70	
	0.90	
D	1.20 - 1.65	N=21 (2,3,4,4,6 ,7)
D	2.00 - 2.45	N=33 (6,7,7,8,9 ,9)
[illegible]	2.60 - 3.05	N=35 (6,8,8,9,9 ,9)

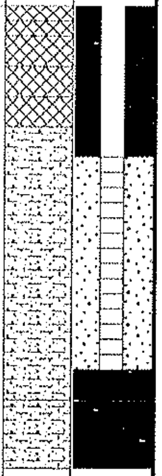
Groundwater (Casing)

STRATA RECORD

Description	Depth (m)	Level (m AOD)
MADE GROUND. TARMAC.	0.10	
MADE GROUND. Yellow sandy GRAVEL. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of dolomite.	0.20	
MADE GROUND. Red GRAVEL. Gravel is angular fine to coarse of brick.	0.40	
MADE GROUND. Black very gravelly fine to coarse SAND with ash. Gravel is angular to subangular fine to coarse of slag and clinker.	0.60	
MADE GROUND. Yellow sandy GRAVEL. Sand is fine to coarse. Gravel is angular fine to coarse of brick and sandstone.	0.80	
Stiff orange brown mottled grey sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of sandstone and mudstone. Many fragments of weathered sandstone noted.	2.60	
Very stiff brown sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subangular fine to coarse of sandstone and mudstone. Many fragments of weathered sandstone and mudstone noted.	3.05	

End of Borehole at 3.05 m

Legend Well



Remarks and Water Observations

1. No groundwater encountered.
2. Pipe installed.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.

DUNELM
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BOREHOLE RECORD

BH No. **MBH3**
Sheet 1 of 1

Site: Heckmondwike Grammar School

Contract No: D2003

Client: Heckmondwike Grammar School

Dates: 10/05/2008

Method: Mini rig

Scale 1:50

Driller: BT

Logged By: SC

SAMPLE DETAILS

Type	Depth From - To(m)	N (cu)	Groundwater (Casing)
[illegible]	0.20		
D	0.60		
[illegible]	1.20 - 1.65	N=21 (3,3,4,5,6 ,6)	
D	2.00 - 2.45	N=40 (5,5,10,10 ,10,10)	

STRATA RECORD

Description	Depth (m)	Level (m AOD)	Legend	Well
MADE GROUND. TARMAC.	0.10		▩	
MADE GROUND. Brown sandy GRAVEL. sand is fine to coarse. Gravel is angular to subangular fine to coarse of dolomite and concrete.	0.90		▩	
Very stiff red brown sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded fiine to coarse of sandstone mudstone and coal. Occasional fragments of weathered rock noted.	2.45		▒	

End of Borehole at 2.45 m

Remarks and Water Observations
1. No groundwater encountered.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.

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BOREHOLE RECORD

BH No. **MBH4**
Sheet 1 of 1

Site: Heckmondwike Grammar School

Contract No: D2003

Client: Heckmondwike Grammar School

Dates: 10/05/2008

Method: Mini rig

Scale 1:50

Driller: BT

Logged By: SC

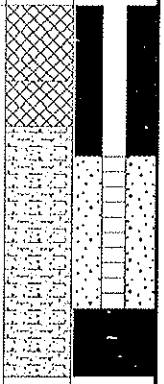
SAMPLE DETAILS

ype	Depth From - To(m)	N (cu)	Groundwater (Casing)
	0.10		
	0.30		
	0.40		
	0.90		
	1.20 - 1.65	N=17 (1,2,3,4,5 ,5)	
D	2.00 - 2.45	N=40 (14,13,10, 10,10,10)	

STRATA RECORD

Description	Depth (m)	Level (m AOD)	Legend	Well
MADE GROUND. Dark brown sandy gravelly clayey TOPSOIL with roots. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick.	0.50			
MADE GROUND. Red very gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of brick and sandstone.	0.80			
Stiff brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone mudstone and coal. Occasional fragments of weathered sandstone and mudstone noted.	2.45			

End of Borehole at 2.45 m



Remarks and Water Observations
1. No groundwater encountered.
2. Pipe installed.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.

DUNELM
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BOREHOLE RECORD

BH No.	**R1** Sheet 1 of 3
Site:	Heckmondwike Grammar School
Contract No:	D2003
Client:	Heckmondwike Grammar School
Dates:	10/05/2008
Method:	Rotary open hole
Scale	1:50
Driller:	CH
Logged By:	

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	FI	Groundwater (Casing)

STRATA RECORD

Description	SPT N Values	Depth (m)	Level (mAOD)	Legend	Well
MADE GROUND. TARMAC. (Drillers description).		0.10			
MADE GROUND. HARDCORE. (Drillers description).		0.30			
MADE GROUND. CLAY and rubble fill. (Drillers description).		1.30			
Brown CLAY. (Drillers description).		2.60			
Brown MUDSTONE. (Drillers description).		6.20			
Yellow SANDSTONE. (Drillers description).					

Continued next sheet

Remarks and Water Observations
1. No groundwater encountered.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.

DUNELM
GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE RECORD

BH No.	**R1** Sheet 2 of 3
Site:	Heckmondwike Grammar School
Contract No:	D2003
Client:	Heckmondwike Grammar School
Dates:	10/05/2008
Method:	Rotary open hole
Scale	1:50
Driller:	CH
Logged By:	

SAMPLE DETAILS							STRATA RECORD					
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	FI	Groundwater (Casing)	Description	SPT N Values	Depth (m)	Level (mAOD)	Legend	Well
							Yellow SANDSTONE. (Drillers description).				⁘	
							Grey SILTSTONE with mudstone bands. (Drillers description).		12.20		×	

Continued next sheet

Remarks and Water Observations 1. No groundwater encountered.	GL (m AOD) - Easting: - Northing: -	Fig. No.

DUNELM
GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE RECORD

BH No. **R1**
Sheet 3 of 3

Site: Heckmondwike Grammar School

Contract No: D2003

Client: Heckmondwike Grammar School

Dates: 10/05/2008

Method: Rotary open hole

Scale 1:50

Driller: CH

Logged By:

SAMPLE DETAILS													
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	FI	Groundwater (Casing)	STRATA RECORD Description	SPT N Values	Depth (m)	Level (mAOD)	Legend	Well
							Grey SILTSTONE with mudstone bands. (Drillers description).					
						25	End of Borehole at 25.00 m		25.00			

Remarks and Water Observations
1. No groundwater encountered.

GL (m AOD)
-

Easting:
-

Northing:
-

Fig. No.

DUNELM
GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE RECORD

BH No. **R2**
Sheet 1 of 3

Site: Heckmondwike Grammar School

Contract No: D2003

Client: Heckmondwike Grammar School

Dates: 10/05/2008

Method: Rotary open hole

Scale 1:50

Driller: CH

Logged By:

SAMPLE DETAILS							STRATA RECORD	SPT N Values				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	FI	Groundwater (Casing)	Description		Depth (m)	Level (mAOD)	Legend	Wall
							MADE GROUND. TARMAC. (Drillers description).		0.10			
							MADE GROUND. HARDCORE. (Drillers description).		0.40			
							MADE GROUND. CLAY and brick fill.		1.80			
							Grey brown CLAY. (Drillers description).		6.50			
							Brown MUDSTONE. (Drillers description).		8.00			
							Yellow SANDSTONE. (Drillers description).		9.50			
							Grey MUDSTONE. (Drillers description).					

Continued next sheet

Remarks and Water Observations
1. No groundwater encountered.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.

DUNELM
GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE RECORD

BH No. **R2**
Sheet 2 of 3

Site: Heckmondwike Grammar School

Contract No: D2003

Client: Heckmondwike Grammar School

Dates: 10/05/2008

Method: Rotary open hole

Scale 1:50

Driller: CH

Logged By:

SAMPLE DETAILS												
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	FI	Groundwater (Casing)	STRATA RECORD Description	SPT N Values	Depth (m)	Level (mAOD)	Legend	Well
							Grey MUDSTONE. (Drillers description).		11.30			
							Grey SILTSTONE / SANDSTONE. (Drillers description).		14.00			
							Grey MUDSTONE with siltstone bands. (Drillers description).					

Continued next sheet

Remarks and Water Observations
1. No groundwater encountered.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.

DUNELM
GEOTECHNICAL & ENVIRONMENTAL

BOREHOLE RECORD

BH No. **R2**
Sheet 3 of 3

Site: Heckmondwike Grammar School

Contract No: D2003

Client: Heckmondwike Grammar School

Dates: 10/05/2008

Method: Rotary open hole

Scale 1:50

Driller: CH

Logged By:

SAMPLE DETAILS							STRATA RECORD					
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	FI	Groundwater (Casing)	Description	SPT N Values	Depth (m)	Level (mAOD)	Legend	Well
							Grey MUDSTONE with siltstone bands. (Drillers description).					
						21			21			
						22			22			
						23			23			
						24			24			
						25	End of Borehole at 25.00 m		25 25.00			
						26			26			
						27			27			
						28			28			
						29			29			

Remarks and Water Observations
1. No groundwater encountered.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.

Appendix C

Chemical Testing Results

UKAS TESTING
2531

MCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

ANALYTICAL TEST REPORT

Contract no: DGE/37146

Contract name: Heckmondwyke Grammar School

Client reference: D2003

Clients name: Dunelm Geotechnical & Environmental

Clients address:
Kingfisher House
St Johns Road
Meadowfield
Durham
DH7 8TZ

Date received: 16 May 2008

Date started: 16 May 2008

Date of issue: 23 May 2008

Notes:
Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd were not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
All results are reported on a dry basis.
This report shall not be reproduced except in full, withour prior written approval.
Samples will be disposed of 8 weeks from initial receipt unless otherwise instructed.

Key:
U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
NAF Non asbestos fibres

Approved by:

Karan Campbell	John Campbell
Director	Director

Chemtech Environmental Limited

SAMPLE DESCRIPTIONS

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation.
They are not intended as full geological descriptions.
MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample.
Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Lab number	Sample id	Depth (m)	Description	Moisture (%)
37146-1	MBH 1	0.50	Sandy Clay	12.6
37146-2	MBH 1	1.20	Clay	8.4
37146-3	MBH 2	0.40	Gravelly Sandy Clay	11.2
37146-4	MBH 2	2.00	Clay	9.8
37146-5	MBH 3	0.20	Silty Sand	8.9
37146-6	MBH 3	0.60	Silty Sand	6.7
37146-7	MBH 3	1.20	Clay	12.0
37146-8	MBH 4	0.30	Gravelly Clay	6.0
37146-9	MBH 4	2.00	Gravelly Clay	7.5

SOILS

Lab number			37146-1	37146-2	37146-3	37146-4	37146-5	37146-6
Sample id			MBH 1	MBH 1	MBH 2	MBH 2	MBH 3	MBH 3
Depth (m)			0.50	1.20	0.40	2.00	0.20	0.60
Test	**Method**	**Units**						
Arsenic (total)	CE054 ^{M}	mg/kg	50	-	24	-	3	<1
Boron (water soluble)	CE063 ^{M}	mg/kg	0.4	-	0.4	-	0.5	<0.3
Cadmium (total)	CE054 ^{M}	mg/kg	<0.2	-	0.3	-	0.3	0.3
Chromium (total)	CE054 ^{M}	mg/kg	13	-	26	-	12	10
Copper (total)	CE054 ^{M}	mg/kg	113	-	67	-	12	6
Lead (total)	CE054 ^{M}	mg/kg	290	-	59	-	18	8
Mercury (total)	CE054 ^{M}	mg/kg	1.0	-	<0.5	-	<0.5	<0.5
Nickel (total)	CE054 ^{M}	mg/kg	15	-	35	-	14	11
Selenium (total)	CE054 ^{M}	mg/kg	<0.3	-	<0.3	-	<0.3	<0.3
Zinc (total)	CE054 ^{M}	mg/kg	120	-	56	-	35	24
pH	CE004 ^{M}	units	7.4	5.8	8.4	6.2	10	7.5
Sulphate (2:1 water soluble)	CE049 ^{U}	mg/l	78	37	43	55	53	13

SOILS

Lab number **Sample id** **Depth (m)**			37146-7 MBH 3 1.20	37146-8 MBH 4 0.30	37146-9 MBH 4 2.00
Test	**Method**	**Units**			
Arsenic (total)	CE054 ^{M}	mg/kg	-	6	-
Boron (water soluble)	CE063 ^{M}	mg/kg	-	<0.3	-
Cadmium (total)	CE054 ^{M}	mg/kg	-	0.3	-
Chromium (total)	CE054 ^{M}	mg/kg	-	18	-
Copper (total)	CE054 ^{M}	mg/kg	-	26	-
Lead (total)	CE054 ^{M}	mg/kg	-	38	-
Mercury (total)	CE054 ^{M}	mg/kg	-	<0.5	-
Nickel (total)	CE054 ^{M}	mg/kg	-	19	-
Selenium (total)	CE054 ^{M}	mg/kg	-	<0.3	-
Zinc (total)	CE054 ^{M}	mg/kg	-	47	-
pH	CE004 ^{M}	units	5.6	7.4	6.0
Sulphate (2:1 water soluble)	CE049 ^{U}	mg/l	37	16	25

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	STATUS	LOD	UNITS
CE054	Arsenic (total)	Aqua regia digest, ICP-OES	M	1	mg/kg
CE063	Boron (water soluble)	Hot water extract, ICP-OES	M	0.3	mg/kg
CE054	Cadmium (total)	Aqua regia digest, ICP-OES	M	0.2	mg/kg
CE054	Chromium (total)	Aqua regia digest, ICP-OES	M	1	mg/kg
CE054	Copper (total)	Aqua regia digest, ICP-OES	M	1	mg/kg
CE054	Lead (total)	Aqua regia digest, ICP-OES	M	1	mg/kg
CE054	Mercury (total)	Aqua regia digest, ICP-OES	M	0.5	mg/kg
CE054	Nickel (total)	Aqua regia digest, ICP-OES	M	1	mg/kg
CE054	Selenium (total)	Aqua regia digest, ICP-OES	M	0.3	mg/kg
CE054	Zinc (total)	Aqua regia digest, ICP-OES	M	3	mg/kg
CE004	pH	BS 1377, pH Meter	M	0.1	units
CE049	Sulphate (2:1 water soluble)	Aqueous extraction, IC-COND	U	10	mg/l

Appendix D

Geotechnical Testing Results

SUMMARY OF SOIL CLASSIFICATION TESTS

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

Identification	Sample Number	Depth m	Moisture Content %	pH	SO_4 Content mg/L	Particle Density Mg/m^3	Liquid Limit %	Plastic Limit %	Plasticity Index %	% Passing .425mm	Remarks
BH2		0.90	18				30	18	12		Low plasticity CL.
BH2		1.20	17				29	18	11		Low plasticity CL.
BH4		0.90	16				28	19	9		Low plasticity CL.
BH4		1.20	13				32	19	13		Low plasticity CL.

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.

Sheet 1 of 2.

DUNELM
GEOTECHNICAL & ENVIRONMENTAL

Compiled by	Date	Checked by	Date	Approved by	Date
A. Grieve	24/06/2008				

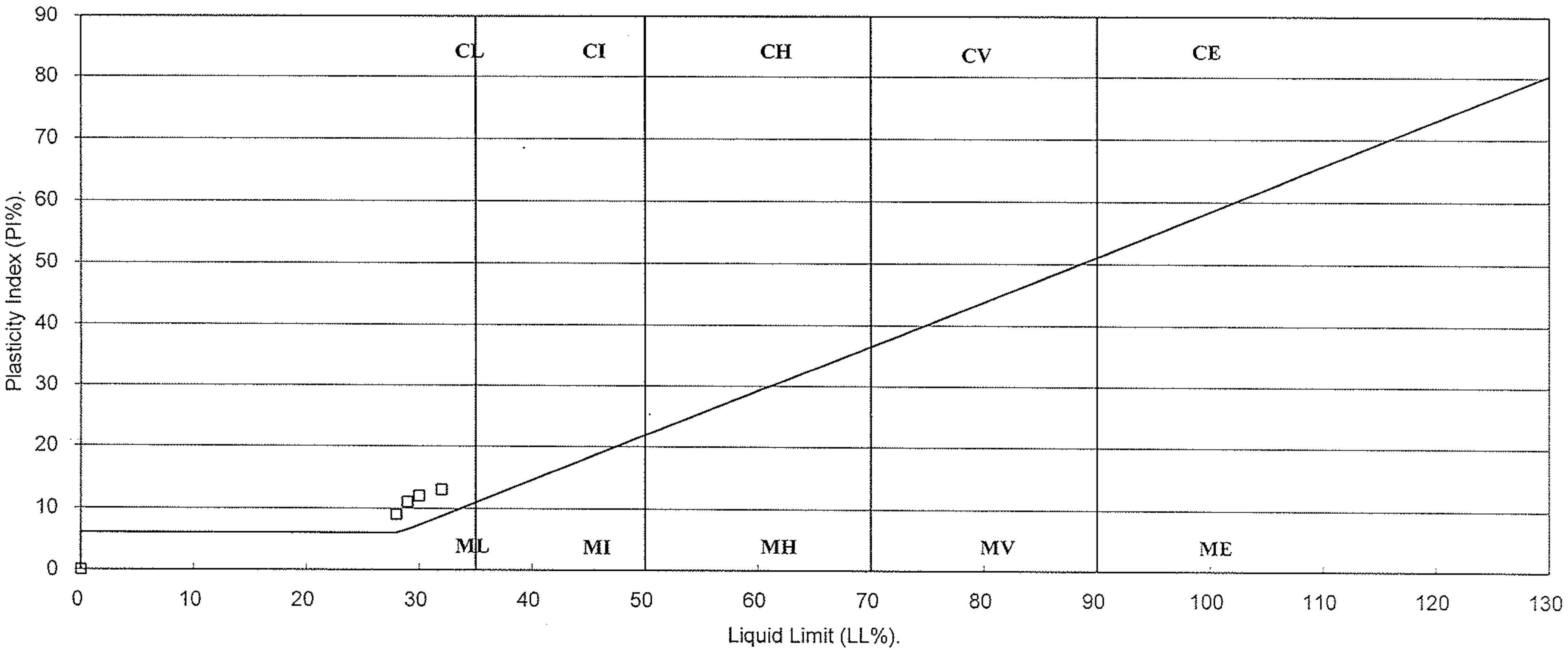
Heckmondwike School

Contract No: D2003

Client Ref:

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



Sheet 2 of 2.

Compiled by	Date	Checked by	Date	Approved by	Date
A. Grieve	24/06/2008				

Heckmondwike School

Contract No: D2003

Client Ref:

Appendix E

Gas Monitoring Results

GAS MONITORING SHEET

Dunelm Geotechnical & Environmental Ltd

Contract No: D2003
Contract Name: Heckmondwike
Date: 03 June 2008 **Visit No.** 1 **of** 6
Weather: Raining
Ground Conditions: Wet

Ambient Readings:	O_2 % v/v	20.5	CO_2 % v/v	ND	CH_4 % v/v	ND	PID (VOC) ppm	NR
Atmospheric Pressure:	Start:	998	Finish:	998	Regional Trend:	Rising		

Instrument Details: Geotech GA2000
Last Calibration: 09/10/2008
Operator: IL

Point No.	SWL (mbgl)	Lowest	Highest			Steady			Gas Emission Rate (litres/hr)	CO (ppm)	H_2S (ppm)	VOC (ppm)	Remarks
		O_2 (%v/v)	CO_2 (%v/v)	CH_4 (%v/v)	*CH_4 (%LEL)*	CO_2 (%v/v)	CH_4 (%v/v)	*CH_4 (%LEL)*					
BH1	1.55	18.2	2.7	ND		2.7	ND		ND				
BH2	0.88	19.8	0.6	ND		0.6	ND		ND				
BH4	0.83	19.9	0.5	ND		0.3	ND		ND				

Notes:

Key:		
	ND	None Detected
	NR	Not Recorded
	POS	Positive Flow
	NEG	Negative Flow
	SWL	Standing Water Level

GAS MONITORING SHEET

Dunelm Geotechnical & Environmental Ltd

Contract No: D2003
Contract Name: Heckmondwike
Date: 23 June 2008 **Visit No.** 2 **of** 6
Weather: Sunny
Ground Conditions: Dty

Ambient Readings:	O_2 % v/v	20.9	CO_2 % v/v	0.0	CH_4 % v/v	0.0	PID (VOC) ppm	NR
Atmospheric Pressure:	Start:	1019	Finish:	1019	Regional Trend:	Rising		

Instrument Details: Gas Data LMSz
Last Calibration: 11/06/2008
Operator: TS

Point No.	SWL (mbgl)	Lowest	Highest			Steady			Gas Emission Rate (litres/hr)	CO (ppm)	H_2S (ppm)	VOC (ppm)	Remarks
		O_2 (%v/v)	CO_2 (%v/v)	CH_4 (%v/v)	*CH_4 (%LEL)*	CO_2 (%v/v)	CH_4 (%v/v)	*CH_4 (%LEL)*					
BH1	2.64	18.2	2.9	0.5		2.9	0.5		ND				
BH2	0.79	20.1	0.5	0.3		0.5	0.3		ND				
BH4	1.24	19.4	1.6	0.5		1.6	0.5		ND				

Notes:

Key:		
	ND	None Detected
	NR	Not Recorded
	POS	Positive Flow
	NEG	Negative Flow
	SWL	Standing Water Level

Appendix F

Notes on Limitations

Dunelm Conditions of Offer, Notes on Limitations & Basis for Contract

These conditions accompany our tender and supercede any previous conditions issued. The firm will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3rd parties. The report, its content and format and associated data are copyright, and the property of the firm. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from the firm. A charge may be levied against such approval, the same to be made at the discretion of the firm.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, soil gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

The firm cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. The firm are not responsible for the action negligent or otherwise of subcontractors or third parties.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2001 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, the firm cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by the firm in the course of investigation is the property of the firm, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. The firm reserves the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning the firm, you understand and accept that you/your agent have a contractual relationship with the firm & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Dunelm are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete. Dunelm have not allowed for subsequent reinstatement as a result of settlement. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming the firm agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 7% to the base rate for unreasonably late payments. We will also apply the right to claim any associated legal costs incurred with recovery of late payments. The firm is exempt from the CIS Scheme. The firm offer to undertake work <u>only</u> in strict accordance with conditions covered by our current insurances, which are available for inspection. The company are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by the firm, and we give notice that consequential loss as a direct or indirect result of the firms activities or omission of the same are excluded.