

ENVIROARM LIMITED

CHADWICH LANE QUARRY LTD



**CONSTRUCTION QUALITY
ASSURANCE VALIDATION REPORT**

**EARTHWORKS CONSTRUCTION FOR BASAL GEOLOGICAL
BARRIER PHASE 3**

Section 3

REF:ARM/SCM/CLQ/CQA/1.00/2011

Revision 1.00

CHADWICH LANE QUARRY LANDFILL SITE

EARTHWORKS CONSTRUCTION FOR BASAL GEOLOGICAL BARRIER BASE PHASE 3 Section 3

CONSTRUCTION QUALITY ASSURANCE VALIDATION REPORT

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CHADWICH LANE QUARRY LANDFILL SITE

EARTHWORKS CONSTRUCTION

BASE PHASE 3 Section 3

CONSTRUCTION QUALITY ASSURANCE VALIDATION REPORT

1. INTRODUCTION

In March 2011, Enviroarm Limited were requested by Chadwich Lane Quarry Ltd to carry out supervision and quality control tests on earthworks construction of an engineered geological barrier on Phase 3 Section 3 at the Chadwich Lane Quarry landfill site.

Initial preparation works commenced during the later part of February and early March with final sand extraction in Phase 3 Section 3, completed in April 2011 down to the 176m AOD.

Mineral liner works on Section 3 commenced on 21st March 2011 and were completed on 6th May 2011.

During the period and most of May the final sand was extracted from Section 3 down to a depth of 176m AOD.

A final section of sand is now left to remove from the base to be completed during the summer of 2011.

The mineral liner works were carried out by Chadwich Lane Quarry Ltd.

During the works, Enviroarm Limited personnel were in attendance on site on a part time basis to assess and control the sub grade formation, mineral liner construction and to carry out all testing.

The following Construction Quality Plans were used during the construction of the cell:

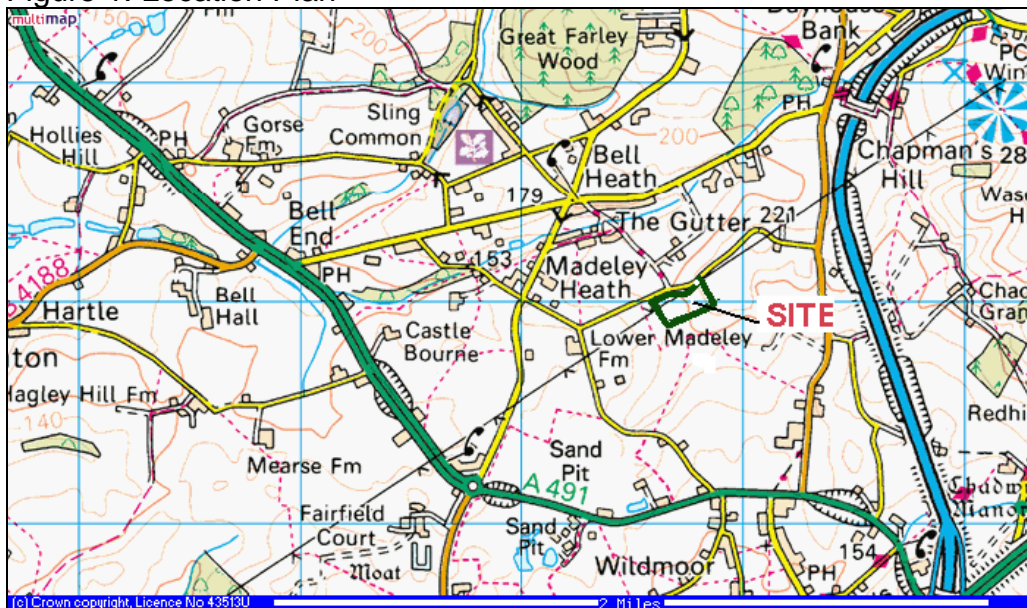
- Enviroarm Limited Chadwich Lane Quarry Construction Quality Assurance Plan

- Enviroarm Limited Source Evaluation of material for use in Geological Barrier at Chadwich Lane Quarry.

2. THE SITE

The Chadwich Lane Quarry landfill site is an operational landfill as defined under the Landfill Directive for the receipt of inert waste. Phase 3 Section 3 is the penultimate base section to be engineered in accordance with requirements of the Permit TP3431SG. The former quarry off Chadwich Lane is situated on the south-western fringe of Birmingham at National Grid Reference SO 958 771. It is approximately 3km east of Rubery and 3km north of Catshill.

Figure 1: Location Plan



3. FORMATION

3.1 General

The excavation was in clean virgin Sherwood Sandstone. The side walls remained stable with no tension cracks visible and the base was excavated flat. The overall configuration was in accordance with the Slope Stability Risk Assessment for the site. The sand is well cemented and requires a minimum 30 tonnes excavator to break and remove the sand.

3.2 Formation Compaction

Following the excavation of sand from the each section each section the exposed lower sub grade was subject to 8 passes with the excavator tracks all over the surface prior to the placement of the geological barrier.

4. GEOLOGICAL BARRIER MINERAL LINER

4.1 General

The geological barrier mineral liner of Phase 3, Section 3 were constructed using re-worked on-site clay bands excavated as part of the quarrying operations which had been selectively dug and stored separately from the sand. The accepted placement specification was a target permeability of $1 \times 10^{-7} \text{m/s}$ achieved between a moisture wet of optimum. The minimum clay fraction limit was set at 10% and minimum shear strength of 50kPa, and placed at 5% air voids. The mineral liner was to be placed to a thickness of 1000mm.

4.2 Compaction Testing

The initial Lift 1 was used as the compaction trial on the clay with the results faxed through from the soils laboratory prior to commencement of the next lift on the 21st March 2011, to ensure that the compaction had been achieved, and that the use of the hydraulic excavator tracking over the clay would achieve the necessary compaction of the liner.

The excavator was a 30 tonne Doosan DX300 and the lifts were placed at 300mm and compacted to 250mm using the tracks.

The same method of compaction was used for all of the Section 3 works detailed in this report.

4.3 Site Visits and Control Testing

Part time monitoring of the works was carried out during the construction of the engineered low permeability geological barrier mineral liner to check working procedures and to undertake quality control testing to ensure compliance with the approved Construction Quality Assurance Plan. The barrier was divided into two sections, each approximately 35 metres x 30 metres, giving each section a total surface area of 2100m^2 and a placed volume of $2,100 \text{m}^3$. Initial phases have previously been over tested against the CQA Plan to ensure that the compaction methodology was acceptable and to account for unknown variance in the clay.

The approximate test locations re presented on Drawing CLQSD2.

The clay was placed at natural moisture content as this demonstrated natural moulding parameters from basic on site puddling tests.

On site moisture compliance testing was carried out as a way of Construction Quality Control for the works, using an Ashworth Speedy Moisture Gauge and temperature control for placement was using an Environment Meter.

All testing was undertaken in accordance with BS 1377: 1990 and BS 5930:1999 at frequencies listed in Construction Quality Assurance Plan for Phase 3. In-situ tests using core cutters were undertaken to ensure that the material was placed with less than 5% air voids and at the correct moisture content.

Permeability tests were carried out using on site falling head core tests as per Environment Agency Guidance for inert landfill sites.

The total volume was calculated at 2,100m³.

The corroborative core cutters were taken in accordance with BS1377: 1999 and submitted to Ground Investigation and Piling Limited UKAS soils laboratory in Wolverhampton.

Ground Investigation and Piling Limited are UKAS accredited for Density, Moisture Content, Specific Gravity and Atterberg Limits. The UKAS Certificates are presented at Appendix 1 Ref 1897, Issue 010, August 2010.

All testing has been carried out in accordance with BS1377:1990, and reported in accordance with BS1377:1990 UKAS requirements, with the exception of the permeability tests which have been carried out as per Environment Agency Guidance.

Daily log sheets were completed for each working day by the site engineer and are presented in full at Appendix 6.

The excavator was observed traversing each lift with a minimum number of eight passes prior to any testing being carried out. In general the excavator did on average 10 passes on each lift.

4.4 Field Test Results

All field samples were taken by the Engineer during each day of works.

All testing carried out with the Speedy Moisture Gauge to control the moisture content of the conditioned material both at the processing area and placed in Section 3 are reported in the daily log sheets presented at Appendix 6.

Plate 1:17% moisture on Ashworth Speedy Moisture Tester



No clay was placed in a freezing condition or when temperatures were below 0°C. Temperature was monitored using an environment meter. The clay was clean and had been stored separately from the sand and had been previously selectively excavated. All of the material used was sourced from on site from the same band of clay used for all previous lining works on Phase 1, 2 and the side wall seal.

Core Cutter Assessment

Core Cutter tests were carried out on each of the four lifts on the base at a rate of one test per 525m³. The testing and pass-fail results are presented at Appendix 2.

The results of the cores on each sheet have been correlated against the upper specific gravity test value obtained on all of the sections. All of the results are presented at Appendix 2. The results from each section have been presented as the laboratory sheets, followed by graphical plots.

All of the plots were above the 5% air voids line.

The holes produced taking the Core Cutters were sealed using additional clay which was tamped into the hole using the core puner and then additional clay placed on top and subject to compaction with the compaction plant with a minimum 8 passes.

Specific Gravity Tests

The specific gravity or particle density value is presented at Appendix 3.

The test reported value was 2.70, this is similar to previous values of 2.69.

All of the holes produced taking the specific gravity bulk bag tests were sealed using additional clay which was tamped into the hole using the core puner and then additional clay placed on top and subject to compaction with the compaction plant with a minimum 8 passes.

Atterbrg Limits

One Atterberg test was taken at a frequency of one test in 1000m³.

The clay used for the mineral liner would be classified as CM-clays of medium plasticity.

Placement of the clay at and above 17% showed the clay to deform plastically during compaction.

The results are presented at Appendix 3.

The only specifications set for plastic limit and classification criteria was that the plastic limit should not be greater than 65% and a plasticity index less than 10%, and that the test frequency should be not greater than one test per 1000m³. Both of these criteria were complied with and exceeded.

No tests results were reported outside the British Standard. The plastic limit, liquid limit and therefore the plasticity index tests were reported correctly in accordance with the British Standard. The clay was placed at a moisture content of between a 16% and 17%. Corroborative bulk tests were taken for Natural Moisture Content with the Atterberg Limit determinations.

Control of moisture was carried out throughout the works using an Ashworth Speedy Moisture Tester.

The holes produced taking the Atterberg Limits and Natural Moisture Content bulk bag test were sealed using additional clay which was tamped into the hole using the core puner and then additional clay placed on top and subject to compaction with the compaction plant with a minimum 8 passes.

Permeability Tests

The permeability tests were carried out in accordance with the Environment Agency Guidance. Permeability test records are presented at Appendix 4.

All of the holes produced taking the Permeability cores were sealed using additional clay which was tamped into the hole using the core puner and then additional clay placed on top and subject to compaction with the compaction plant with a minimum 8 passes.

Plate 2: Core permeability falling head test on Phase 3



Shear Strength Tests

20 shear strength tests were undertaken at a rate of at least one test per 105m³ using an EDECO/Pilcon hand shear vane at random locations on the base and sides of each lift, within each section of geological barrier mineral liner placed, and are presented on summary sheets Appendix 5.

All of the results are well in excess of 50kPa.

The test locations together with the layer on which each test was taken are shown the daily log sheets at Appendix 6.

Plate 3: Hand shear vane result in excess of 100kPa



4.5 Assessment of Earthworks Construction

The Section 3 of Phase 3 are presented on Drawing CLQP3.1.

Section 1

Placement of the clay was carried out in four lifts between 21st March and 6th May in two phases. The plastic limit was reported at 17% and had a natural moisture content of 16% to 17%. The permeability falling head test carried out in 21st March still had lost no water on 23 March.

Section 2

Section 2 moisture values were at 17%. The cores did not lose any water from 29th April to 2nd May. The Phase 3 Section 2 basal lining works were completed on the 6th May 2011.

General

All moisture controls on site were by use of the Ashworth Speedy Moisture Gauge which had been calibrated on site against core cutters. The moisture gauge readings were found to be within 0.2% of laboratory tests. In addition the feel of the clay was easy to determine the plasticity.

4.6 Non-Conformance

No non-conformances were reported during the placement of the geological barrier.

5. CONCLUSIONS

The procedures carried out on site were in accordance with the Construction Quality Assurance Plan with appropriate layer thickness and the number of passes of the compaction plant. All materials incorporated within the earthworks were therefore placed satisfactorily.

The results of the permeability tests on falling head cores showed the geological barrier to achieve the standard of 1×10^{-7} m/s or less and the core cutters show less than 5% air voids in the barrier.

Plate 4:View of completed lining works for Phase 3



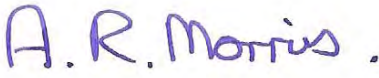
The mineral liner was over 1 metre in thickness as proved by physical measurements by the engineer on site.

The testing carried out on the geological barrier mineral liner both by independent laboratory testing at UKAS accredited soils laboratories and field tests exceeded the required test frequencies in the agreed CQA Plan and showed that the geological barrier had achieved and exceeded the required minimum standards on all testing.

Detailed and full comprehensive engineers daily logs have recorded the entire construction and testing carried out.

In conclusion all of the materials have been tested to and above the required frequency and all of the materials have exceeded the minimum standard requirements.

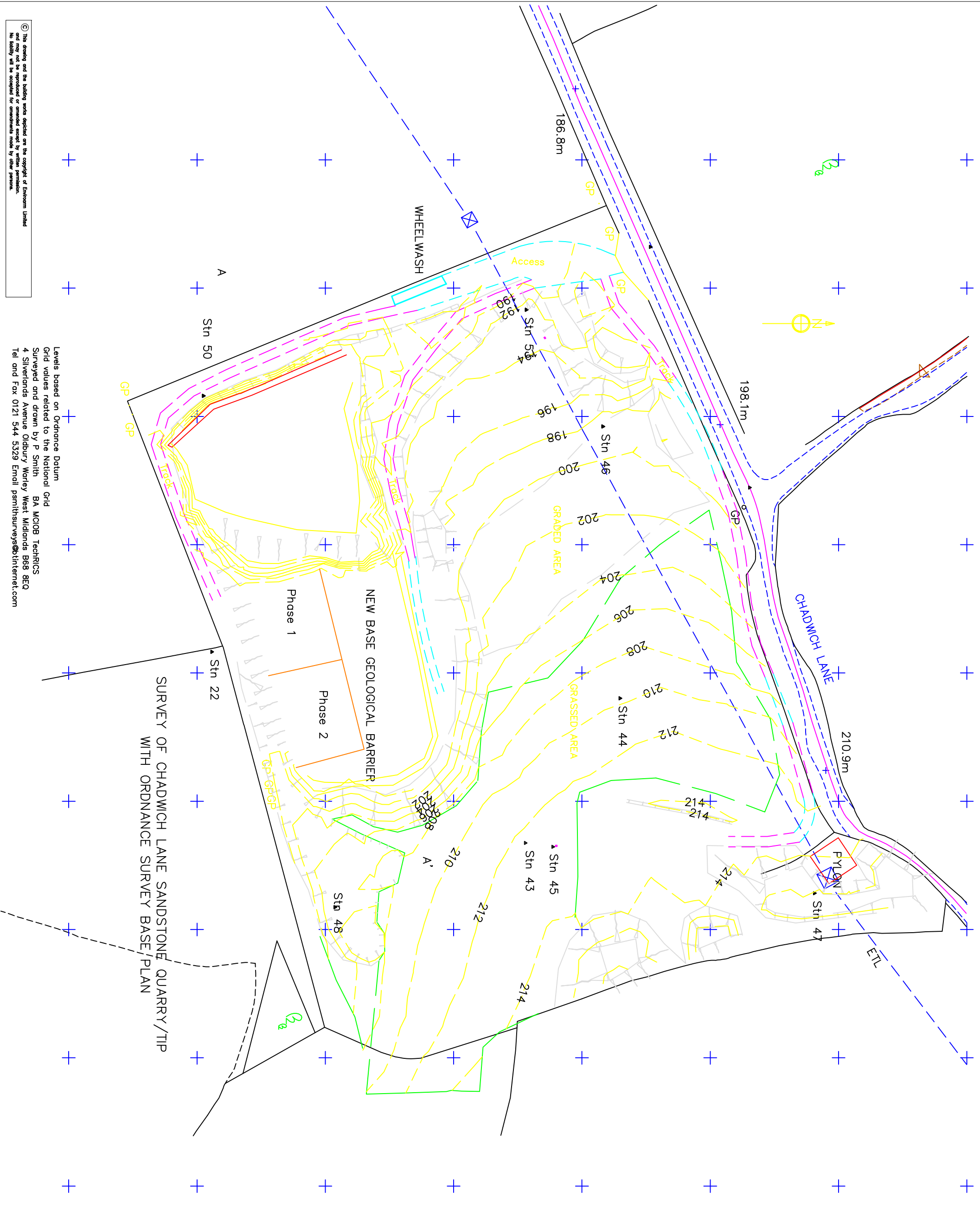
The Phase 3 Section 3 is therefore acceptable for the receipt of inert waste as it has been constructed in accordance with the approved Construction Quality Assurance Plan.

Report prepared by:  Date 29th May 2011
A.R.Morris

DRAWINGS

The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points prior to the commencement of construction. This drawing must be read with and checked against any structural or other specialist drawings provided by the client. The Contractor is to comply in all respects with the current Building Regulations and any regulations whether or not specifically stated on these drawings. This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each one of ground related upon which the Contractor is to construct, suitable methods of foundation to be investigated by the contractor, suitable methods of foundation to be provided and any special circumstances on or within the ground covered by the works be further investigated by a suitable expert.


Notes



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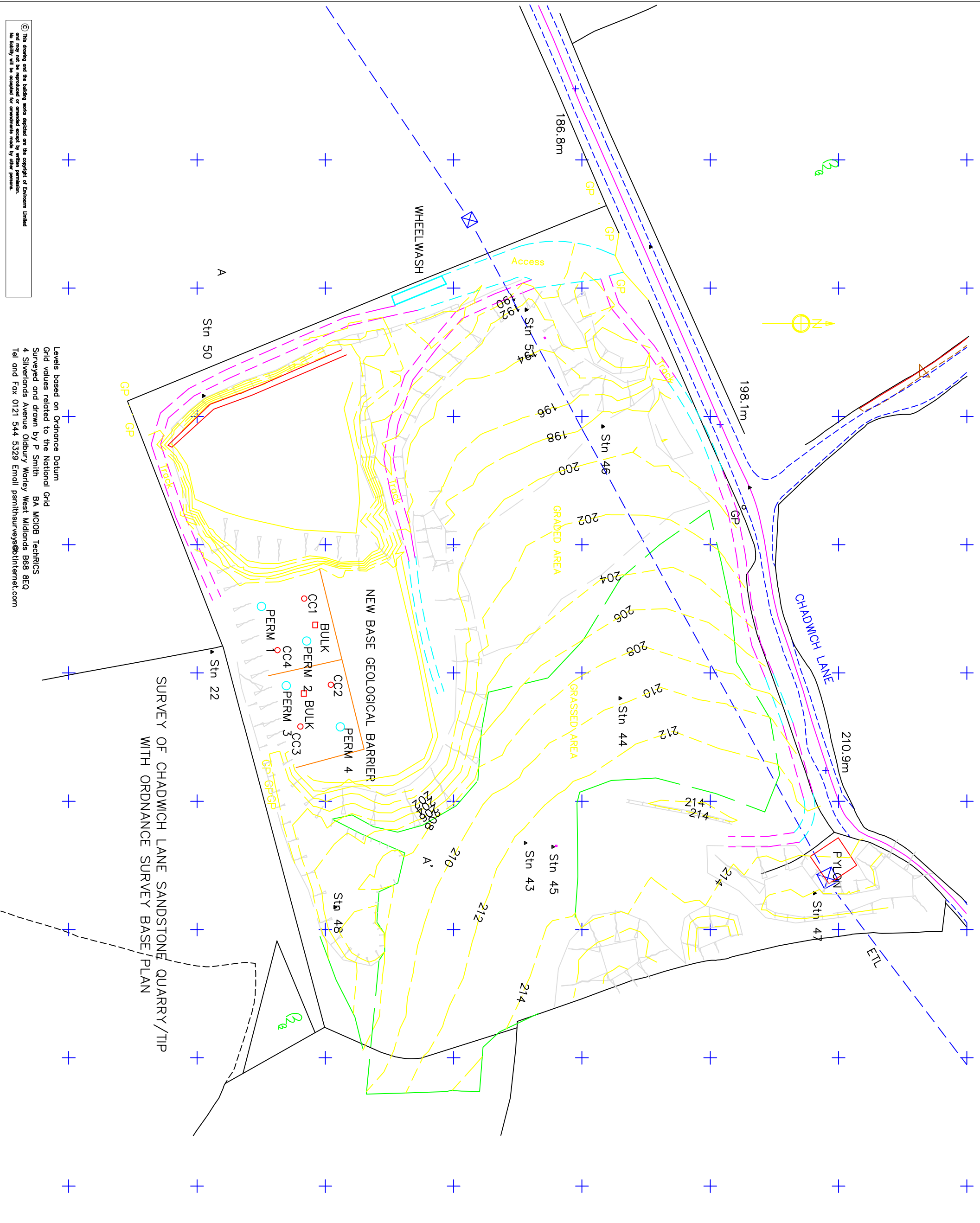
Levels based on Ordnance Datum
 Grid values related to the National Grid
 Surveyed and drawn by P Smith BA MCIQB TechnRICS
 4 Silverlands Avenue Oldbury Wroley West Midlands B68 8EQ
 Tel and Fax 0121 544 5329 Email psmithsurveys@btinternet.com

**SURVEY OF CHADWICH LANE SANDSTONE QUARRY/TIP
 WITH ORDNANCE SURVEY BASE/PLAN**

	
ENVIROARM LIMITED	
597, Walsall Road, Great Wyrley, Walsall, WS6 6AE Tel: 01922-412209 Mobile 07801980984 email: enviroarm@btconnect.com	
Client:	CHADWICH LANE QUARRY LTD
Project:	PHASE 3 BASE
Title:	CHADWICH LANE QUARRY PHASE 3 BASE LAYOUT PAUL SMITH SURVEYS
Date :	MAY 2011
Scale:	1:1250
Drawn:	PS
Project No.:	CLQSD
Checked:	ARH
Dwg No.:	1
Rev.:	

The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points prior to the commencement of construction.
 This drawing must be read with and checked against any structural or other specialist drawings provided by the client.
 The Contractor is to comply in all respects with the current Building Regulations and any regulations whether or not specifically stated on these drawings.
 This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each one of ground related upon which the Contractor is to rely shall be investigated by the Contractor and only subject to the contract conditions of foundation to be provided by the client. The Contractor shall investigate the ground provided by the client for further investigation by a suitable expert.


Notes



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Levels based on Ordnance Datum
 Grid values related to the National Grid
 Surveyed and drawn by P Smith BA MCIQB TechnRICS
 4 Silverlands Avenue Oldbury Worley West Midlands B68 8EQ
 Tel and Fax 0121 544 5329 Email psmithsurveys@btinternet.com

**SURVEY OF CHADWICH LANE SANDSTONE QUARRY/TIP
 WITH ORDNANCE SURVEY BASE/PLAN**

	
ENVIROARM LIMITED	
597, Walsall Road, Great Wyrley, Walsall, WS6 6AE Tel: 01922-412208 Mobile 07801980984 email: enviroarm@btinternet.com	
Client:	CHADWICH LANE QUARRY LTD
Project:	PHASE 3
Title:	CHADWICH LANE QUARRY TESTING LOCATIONS PAUL SMITH SURVEYS
Date:	MAY 2011
Scale:	1:1250
Drawn:	PS
Project No.:	CLQSD
Checked:	ARM
Dwg No.:	2
Rev.:	

APPENDIX 1:

**UKAS Certificate for
Soils Laboratory**

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

 <p>Accredited to ISO/IEC 17025:2005</p>	<h3>Ground Investigation and Piling Ltd</h3> <p>Issue No: 010 Issue date: 26 August 2010</p>	
	Devonshire House Ettingshall Road Wolverhampton West Midlands WV2 2JT	Contact: Mr. P. Smart Tel: +44 (0)1902-459558 Fax: +44 (0)1902-459085 E-Mail: info@gipuk.com Website: www.gipuk.com
Testing performed at the above address only		

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
SOILS for civil engineering purposes	Moisture content - oven drying method	BS 1377:Part 2:1990
	Liquid limit - cone penetrometer	BS 1377:Part 2:1990
	Liquid limit - cone penetrometer - one point	BS 1377:Part 2:1990
	Plastic limit	BS 1377:Part 2:1990
	Plasticity index and liquidity index	BS 1377:Part 2:1990
	Particle size distribution - dry sieving	BS 1377:Part 2:1990
	Particle size distribution - sedimentation - pipette method	BS 1377:Part 2:1990
	Particle density - gas jar	BS 1377:Part 2:1990
	Particle size distribution - wet sieving	BS 1377:Part 2:1990
	Sulphate content of soil and ground water - gravimetric method	BS 1377:Part 3:1990
pH value	BS 1377:Part 3:1990	
California Bearing Ratio (CBR) (loads from 0.2 to 20 kN)	BS 1377:Part 4:1990	



1897

Accredited to
ISO/IEC 17025:2005

Schedule of Accreditation
issued by
United Kingdom Accreditation Service
21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

Ground Investigation and Piling Ltd
Issue No: 010 Issue date: 26 August 2010

Testing performed at main address only

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
SOILS for civil engineering purposes	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377:Part 4:1990
	Dry density/moisture content relationship (4.5 kg rammer)	BS 1377:Part 4:1990
	Density of specimens sampled using the core cutter method	BS 1377:Part 9:1990
END		

APPENDIX 2:

Core Cutter test results and Graphs

LABORATORY REPORT FOR IN-SITU DENSITY TESTS

Contract: Chadwich Lane	Customer: Enviroarm Limited, 597 Walsall Road, Great Wyrley, Nr.Walsall Staffordshire. WS6 6AE.	GIP <small>Ground Investigation & Piling Limited</small> Devonshire House, Ettingshall Road, Wolverhampton. WV2 2JT Phone 01902 459558, Fax 01902 459085, email lab@gipuk.com
Job No:- L/7582	Page No:- 1 of 1	
Date Received:- 23.03.11	Date Issued:- 24.03.11	

SAMPLE DETAILS			TEST DATE	W	Bulk Density	Dry Density	Percentage Compaction	SAMPLE DESCRIPTION	REMARKS
SAMPLE No.	DEPTH m	TEST TYPE		%	Mg/m ³	Mg/m ³	%		
Base Lift 1	CC 1.1	CC	21.03.11	16	2.10	1.80		Firm red brown slightly sandy slightly gravelly CLAY. Gravel is weak mudstone.	
Base Lift 4	CC 4.1	CC	23.03.11	17	2.14	1.83			

Test abbreviations CC Core Cutter SR Sand Replacement	Test methods - Unless otherwise stated. CC BS1377:PART9:1990:2.4 SR *BS1377:PART9:1990:2.1 or 2.2	Approved signatory:- A.L.Pearce, Laboratory Director	1897 Tests marked * are not UKAS accredited. The reported results relate only to samples received. # = Sample mass smaller than BS1377 requirements.
Opinions and interpretations are outside the scope of UKAS accreditation This test report shall not be reproduced except in full without written approval by the laboratory.		NOTE: The in-situ sampling procedure is <u>not</u> UKAS accredited.	

LABORATORY REPORT FOR IN-SITU DENSITY TESTS

Contract: Chadwich Lane

Customer: Enviroarm Limited,
597 Walsall Road,
Great Wyrley,
Nr.Walsall
Staffordshire.



Devonshire House, Ettingshall Road,
Wolverhampton. WV2 2JT

Job No:- L/7603	Page No:- 1 of 1
Date Received:- 04.05.11	Date Issued:- 06.05.11

Phone 01902 459558, Fax 01902 459085, email lab@gipuk.com

SAMPLE DETAILS			TEST DATE	W %	Bulk Density Mg/m³	Dry Density Mg/m³	Percentage Compaction %	SAMPLE DESCRIPTION	REMARKS
SAMPLE No.	DEPTH m	TEST TYPE							
Base Lift 2	CC 2.1	CC	04.05.11	17	2.12	1.81		Firm red brown slightly sandy slightly gravelly CLAY. Gravel is weak mudstone.	
Base Lift 3	CC 3.1	CC	04.05.11	17	2.13	1.82	As above.		

Test abbreviations

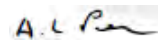
CC	Core Cutter
SR	Sand Replacement

Test methods - Unless otherwise stated.

CC	BS1377:PART9:1990:2.4
SR	*BS1377:PART9:1990:2.1 or 2.2

Approved signatory:-

A.L.Pearce, Laboratory Director



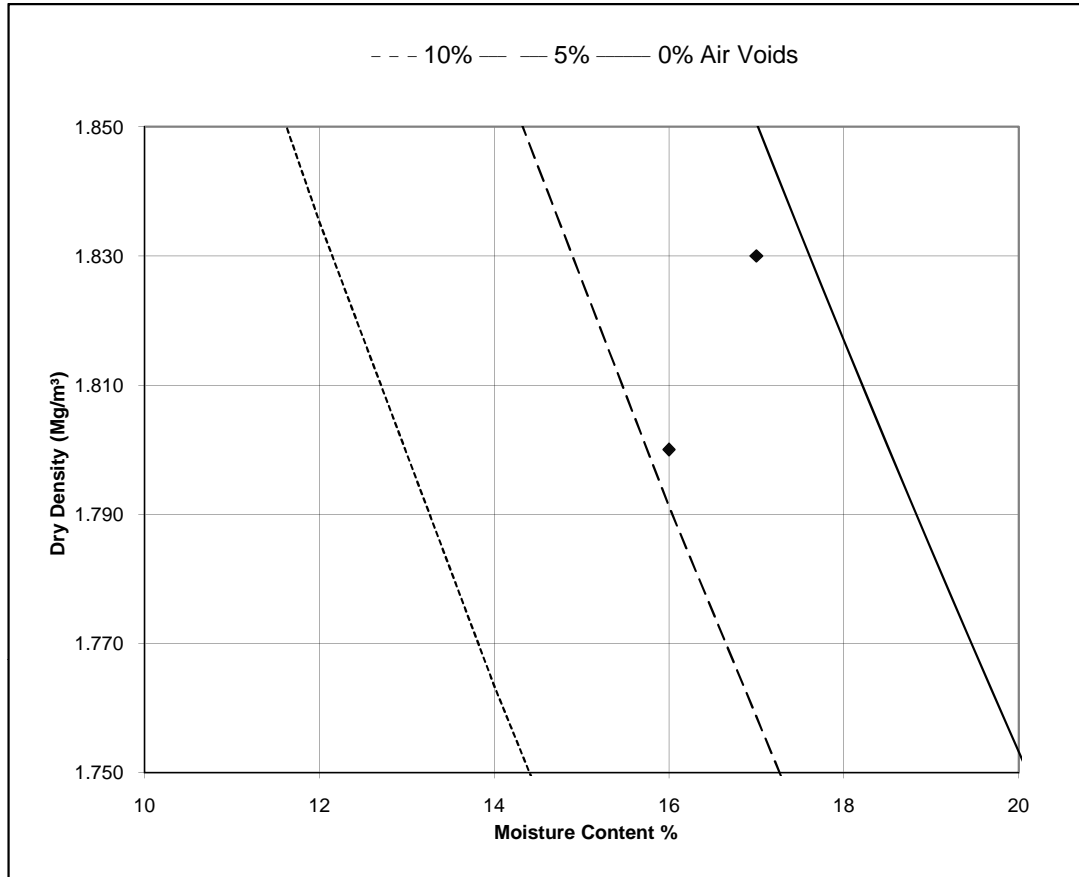

Tests marked * are not UKAS accredited.

Opinions and interpretations are outside the scope of UKAS accreditation
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NOTE: The in-situ sampling procedure is not UKAS accredited.

The reported results relate only to samples received.
= Sample mass smaller than BS1377 requirements.

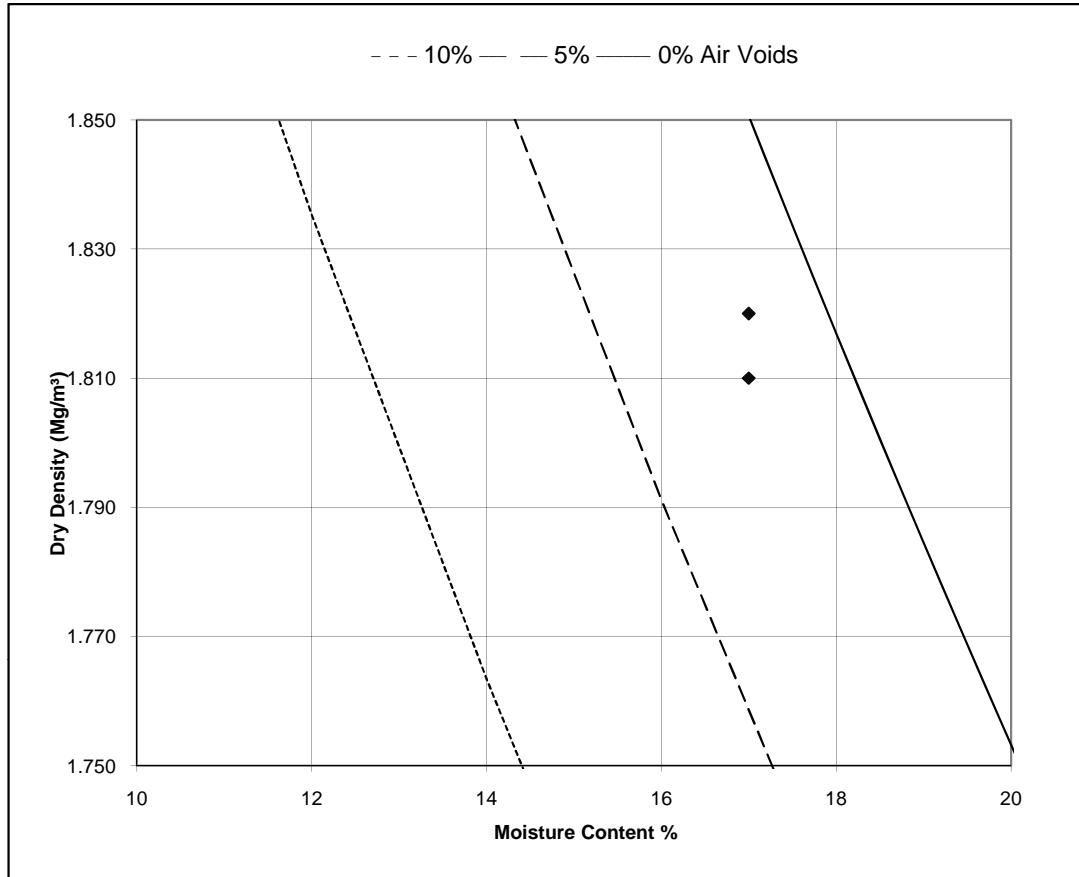
Graph 1 Base



MC	Density
16	1.800
17	1.830
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000

Particle density 2.700

Graph 1 Base




MC	Density
17	1.810
17	1.820
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000
0	0.000

Particle density 2.700

APPENDIX 3:

Specific Gravity and Classification Tests

LABORATORY REPORT FOR INDEX PROPERTY AND CHEMICAL TESTING

Contract: Chadwich Lane.	Customer: Enviroarm Limited, 597 Walsall Road, Great Wyrley, Nr. Walsall Staffordshire. WS6 6AE.	 GIP <small>Ground Investigation & Piling Limited</small> Devonshire House, Ettingshall Road, Wolverhampton. WV2 2JT Phone 01902 459558, Fax 01902 459085, Email lab@gipuk.com
Job No:- L/7582	Page No:- 1 of 1	
Date Received:- 23.03.11	Date Issued:- 30.03.11	

SAMPLE DETAILS			TEST DATE	CLASSIFICATION					CHEMICAL					% PASSING BS SIEVE SIZE		SAMPLE DESCRIPTION	COMMENTS
SAMPLE No.	DEPTH m	SAMPLE TYPE		W %	Index Properties				*Total SO ₄ %	Soluble SO ₄ g/L	pH Value	*L.O.I. %	*ORG %	2.00 mm	0.425 mm		
					WL %	WP %	IP %	PD (Gas Jar) Mg/m ³									
Base	Lift 2	B	23.03.11	16	39	17	22	2.70							Firm red brown slightly sandy slightly gravelly CLAY. Gravel is weak mudstone.		

Sample type	Test abbreviations	Test methods - Unless otherwise stated.	
D Disturbed	W Moisture Content	W% BS1377:Part 2:1990:3.2	Total SO ₄ BS1377:Part 3:1990:5.5
B Bulk disturbed	WL Liquid limit	WL BS1377:Part 2:1990:4.4	Sol SO ₄ BS1377:Part 3:1990:5.5
U Undisturbed	WP Plastic limit	WP BS1377:Part 2:1990:5.3	pH Value BS1377:Part 3:1990:9
S SPT split spoon	IP Index property	IP BS1377:Part 2:1990:5.4	
W Ground water	PD Particle Density	PD BS1377:Part 3:1990:8.2	Approved signatory:-
T Tub	L.O.I Loss on ignition	L.O.I BS1377:Part 3:1990:4	
	ORG Organic content	ORG BS1377:Part 3:1990:3	
Opinions and interpretations are outside the scope of UKAS accreditation			
<i>This test report shall not be reproduced except in full without written approval by the laboratory.</i>			Tony Pearce, Laboratory Director..... <i>A. Pearce</i>



Tests marked * are not UKAS accredited.

The reported results relate only to samples received.

#= Sample mass smaller than BS1377 requirements.

LABORATORY REPORT FOR INDEX PROPERTY AND CHEMICAL TESTING


Contract: Chadwich Lane.
 Job No:- L7603 Page No:- 1 of 1
 Date Received:- 04.05.11 Date Issued:- 17.05.11

Customer: Enviroarm Limited,
 597 Walsall Road,
 Great Wyrley,
 Nr.Walsall
 Staffordshire.
 WS6 6AE.



GIP
 Ltd
 Ground Investigation & Piling Limited
 Devonshire House, Ettingshall Road,
 Wolverhampton. WV2 2JT
 Phone 01902 459558, Fax 01902 459085, Email lab@gipuk.com

SAMPLE DETAILS			TEST DATE	CLASSIFICATION					CHEMICAL					% PASSING BS SIEVE SIZE		SAMPLE DESCRIPTION	COMMENTS
SAMPLE No.	DEPTH m	SAMPLE TYPE		W %	WL %	WP %	IP %	PD (Gas Jar) Mg/m ³	*Total SO ₄ %	Soluble SO ₄ g/L	pH Value	*L.O.I. %	*ORG %	2.00 mm	0.425 mm		
Base	Lift 4	B	04.05.11	18	40	17	23	2.70						99	Firm red brown slightly sandy slightly gravelly CLAY. Gravel is weak mudstone.		

Sample type		Test abbreviations			Test methods - Unless otherwise stated.							 Tests marked * are not UKAS accredited. <i>The reported results relate only to samples received.</i> # = Sample mass smaller than BS1377 requirements.
D Disturbed	W Moisture Content	W% BS1377:Part 2:1990:3.2	Total SO ₄	BS1377:Part 3:1990:5.5								
B Bulk disturbed	WL Liquid limit	WL BS1377:Part 2:1990:4.4	Sol SO ₄	BS1377:Part 3:1990:5.5								
U Undisturbed	WP Plastic limit	WP BS1377:Part 2:1990:5.3	pH Value	BS1377:Part 3:1990:9								
S SPT split spoon	IP Index property PD	IP BS1377:Part 2:1990:5.4	Approved signatory:-									
W Ground water	Particle Density PD BS1377:Part 3:1990:8.2											
T Tub	L.O.I Loss on ignition	L.O.I BS1377:Part 3:1990:4										
		ORG Organic content	ORG BS1377:Part 3:1990:3									
Opinions and interpretations are outside the scope of UKAS accreditation									A.L Pearce			
This test report shall not be reproduced except in full without written approval by the laboratory.									Tony Pearce, Laboratory Director.....			

APPENDIX 4:

Permeability Tests

CHADWICH LANE QUARRY PERMEABILITY TESTS



Phase 3 Section 1: Falling Head Permeability 21/03/2011



Phase 3 Section 1: Falling Head Permeability 23/03/2011

CHADWICH LANE QUARRY PERMEABILITY TESTS



Permeability Test Phase 3 Section 2 4th May 2011



Permeability Test Phase 3 Section 2 6th May 2011

APPENDIX 5:

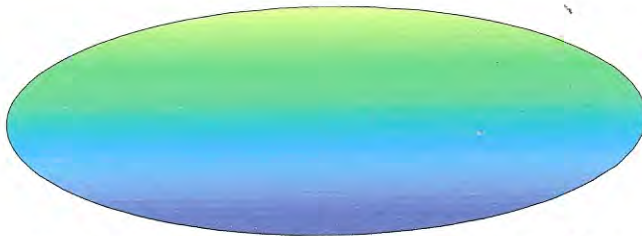
Shear Vane Tests

Shear Vane Test Results:

Date	Test Location:	Passes:	Shear Vane Results kPa
21.03.2011	Base P3.1	Lift 1	102,106
	Base P3.1	Lift 2	98, 106
23.03.2011	Base P3.1	Lift 3	100,94
	Base P3.1	Lift 4	94,112
28.04.2011	Base 3.2	Lift 1	87,92
04.05.2011	Base 3.2	Lift 2	94,102,95
	Base 3.2	Lift 3	104,84,93
06.05.2011	Base 3.2	Lift 4	101,97,96,112,106
AVERAGE			99

APPENDIX 6:

Enviroarm CQA Engineers Daily Logs



ENVIROARM LTD

DAILY SITE RECORD

Site: CHADWICK LANE PHASE 3	Date of Visit: 21/3/2011	Time on Site: 10:45	Time Off Site: 14:20
Personnel/Staff: A.R. MORRIS CLQ	Site Conditions/Weather: CLOUD, DRY, WARM. Rain off: Yes/No <input checked="" type="radio"/>	Equipment: DOOSAN DX300	
Operations Inspected: BASE	Action: COMPACTION TRIAL LIFT 1 & 2.		
Comments on Workmanship: 300mm tracked down to 250mm after 10 passes with excavator. A25 compacting clay.			
Instructions/Information Issued or Required: Same clay source hand as previous.			
Progress Report (use additional sheets if necessary) Core taken to GIP. Shears / LANDFILL B12.			

LIFT 1

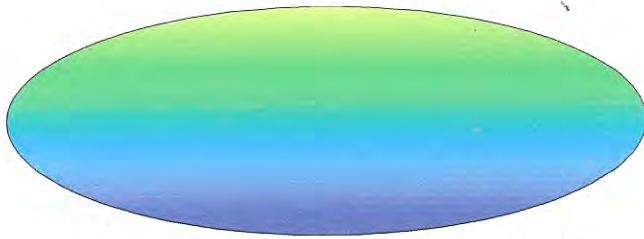
0.102	0.106
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LIFT 2.

0.98	0.106
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Signature: A.R. Morris

Registered Office: 597 Walsall Road, Great Wyrley, Nr Walsall, STAFFS WS6 6AE



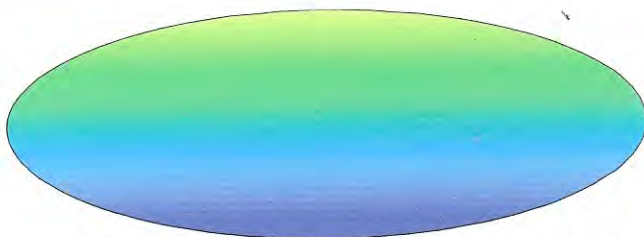
ENVIROARM LTD

DAILY SITE RECORD

Site: CHADWICK LANE	Date of Visit: 23/3/2011	Time on Site: 12:00	Time Off Site: 15:00
Personnel/Staff: A.R. MORRIS CLQ.	Site Conditions/Weather: CLOUDY, SUN WARM Rain off: Yes/No <input checked="" type="radio"/>	Equipment: DOOSAN DX300 A25 VOLVO	
Operations Inspected: BASE P3 SECTION 1.	Action: LIFTS 3 & 4 COMPLETED.		
Comments on Workmanship: 250MM COMPACTED LIFTS.			
Instructions/Information Issued or Required:			
	<p>LIFT 3</p>	<p>LIFT 4</p>	
Progress Report (use additional sheets if necessary) 1 METRE COMPLETED - SECTION 1 CC - LIFT 4, BULK OFF LIFT 2 PRIOR TO PLACEMENT OF LIFT 3.			

Signature: A.R. Morris.

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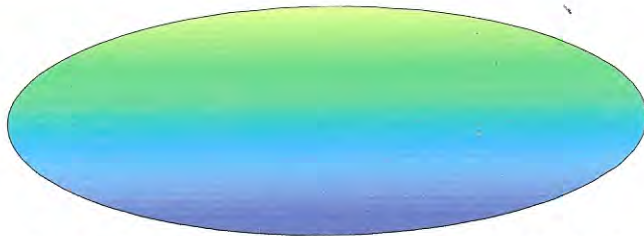
ENVIROARM LTD

DAILY SITE RECORD

Site: CHADWICH LANE QUARRY.	Date of Visit: 28/4/2011	Time on Site: 09:45	Time Off Site: 12:00
Personnel/Staff: A.R. MORRIS	Site Conditions/Weather: SUN Rain off: Yes/No <input checked="" type="radio"/>	Equipment: DOOSAN DX300 CAT D6 VOLVO A25	
Operations Inspected: BASE P3. SECTION 2.	Action: LIFT 1 PLACED.		
Comments on Workmanship: SLOW WORK - CARRYING OUT STABILITY WORK FOLLOWING VISIT FROM HSE. SAND BEING MOVED OUT TO WILDMOOR			
Instructions/Information Issued or Required: TRACKED IN TO 250mm LAYERS WITH CAT D6 <p>HAUL ROAD S1 087 S2 092 + + ← RE GRADING SLOPE AREA</p>			
Progress Report (use additional sheets if necessary) SHEAR TESTS OK.			

Signature: A.R. Morris

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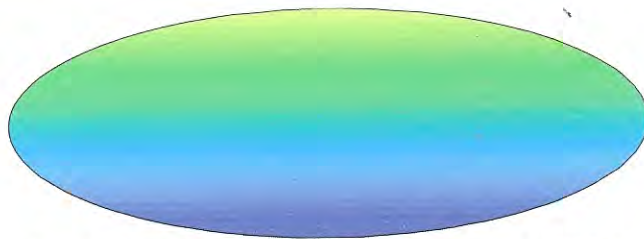
ENVIROARM LTD

DAILY SITE RECORD

Site: CHADWICH LANE QUARRY.	Date of Visit: 4/5/2011	Time on Site: 10:15 -	Time Off Site: 11:40.
Personnel/Staff: A.R. MORRIS	Site Conditions/Weather: SUN Rain off: Yes/No <input checked="" type="radio"/>	Equipment: DOOSAN DX300 VOLVO A25. CAT D6.	
Operations Inspected: PHASE 3 SECTION 2.	Action: LIFT 2 & 3 PLACED.		
Comments on Workmanship: 250mm LAYERS TRACKED IN WITH CAT D6.			
Instructions/Information Issued or Required: <div style="display: flex; justify-content: space-around;"><div style="text-align: center;">SHEARS LIFT 2 SI. S2</div><div style="text-align: center;">LIFT 3. 93</div><div style="text-align: center;">LIFT 4 PERM</div></div>			
Progress Report (use additional sheets if necessary) CORES SENT TO GIP. SHEARS OK. PERM OF L4. <div style="text-align: center;"> SECTION 4</div>			

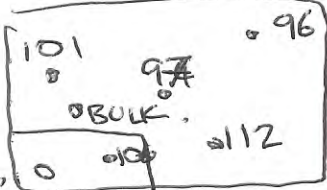
Signature: A.R. MORRIS

Registered Office: 597 Walsall Road, Great Wyrley, Nr Walsall, STAFFS WS6 6AE



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DAILY SITE RECORD

Site: CHADWICH LANE	Date of Visit: 6/5/2011	Time on Site: 11:00	Time Off Site: 12:00
Personnel/Staff: A.R. MORRIS B. WOOD.	Site Conditions/Weather: CLOUD. Rain off: Yes/No	Equipment: DOOSAN DX300	
Operations Inspected: PHASE 3 LIFT 4.	Action: FINAL WORKS ON BASE SECTION 3		
Comments on Workmanship: PERM OK, SHEARS OK FINAL SECTION OF LIFT 4 TRACKED IN.			
Instructions/Information Issued or Required: 			
Progress Report (use additional sheets if necessary) BULK SENT OFF TO 918. SHEARS OK			

Signature: A.R. Morris

Registered Office: 597 Walsall Road, Great Wyrley, Nr Walsall, STAFFS WS6 6AE