

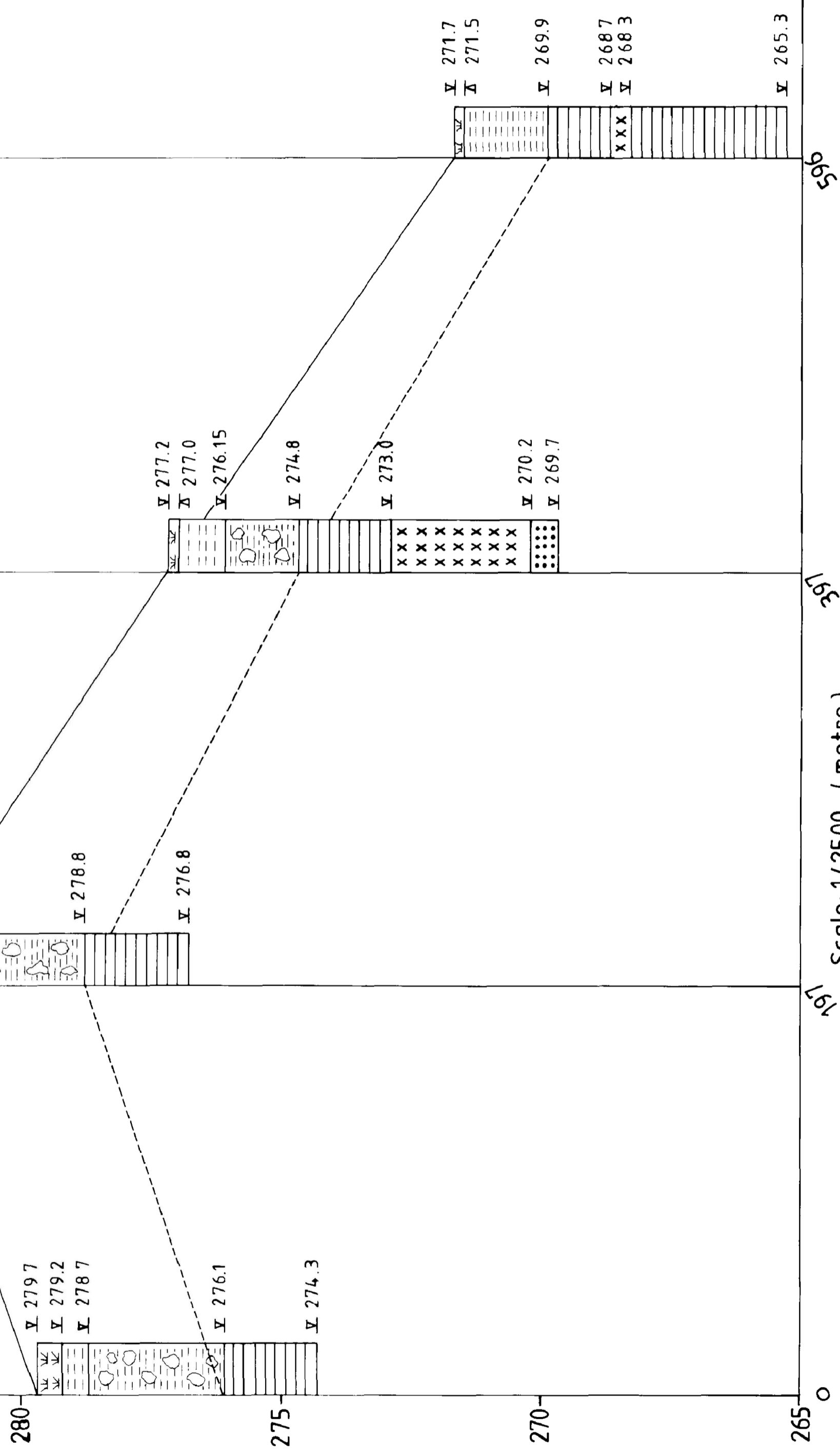
Appendix C

Nant Helen Geotechnical
Borehole Records – Celtic
Energy

Borehole 2008
Borehole 2009
Borehole 2010
Borehole 2011

LEGEND

	Peat
	Clay
	Till
	Mudstone
	Siltstone
	Sandstone



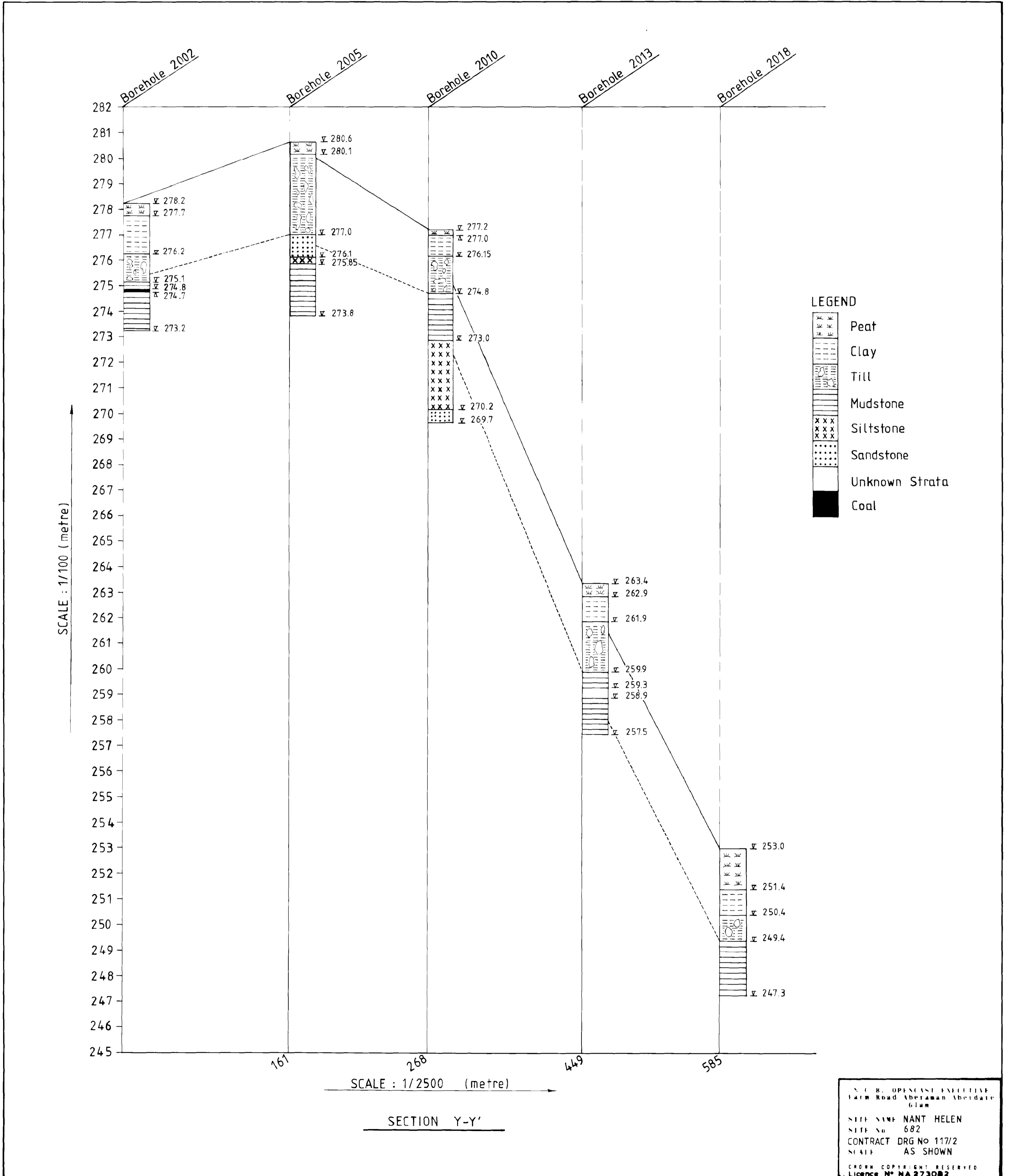
Scale : 1/100 (metre)

Scale: 1/2500 (metre)

SECTION X - X'

T. B. OPIK & SONS LIMITED
 141m Road, Aberdeen, Scotland
 614m
 SITE MANAGER HELEN
 SITE NO 682
 CONTRACT DRG NO 117/1
 SCALE AS SHOWN
 ROOM COPYRIGHT RESERVED
 Licence No NA 273082

DRAWING No. 07D010273
 07A04104.DWG
 (Scale 1:100)



N. C. B. OPENCAST FACILITIES
 FARM ROAD ABERAMAN ABERDARE
 GLAM
 SITE NAME NANT HELEN
 SITE NO 682
 CONTRACT DRG No 117/2
 SCALE AS SHOWN
 CROWN COPYRIGHT RESERVED
 Licence No NA 273002

Appendix D

BGS Borehole Records

D1

Holst Soil Engineering Limited						Borehole No. L1	
Contract No. F3593		BOREHOLE LOG		SN 81SE4			
Location Dyffryn Cellwen		SN 8504 1019		Sheet 1 of 1			
Client Neath B.C.				Chainage.....			
Method of Boring Percussion				Ground Level..... m.A.O.D.			
Diameter of Borehole 150mm				Date 27.4.77			
Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.Q.D.%	Daily Progress
TOPSOIL		0.10					
MADEGROUND: Stiff grey/brown stony clay with sandstone cobbles		0.60			0.50		
MADEGROUND firm dark grey silty clay with coal fragments					1.30		
					3.00	7	
		3.90					
Stiff brown and grey mottled sandy CLAY with mudstone fragments					4.00		
					4.50	38	
		5.00					

<p>Type of Sample</p> <p><input type="checkbox"/> S.P.T. <input type="checkbox"/> Undisturbed</p> <p><input type="checkbox"/> C.P.T. <input checked="" type="checkbox"/> Vane</p> <p><input type="checkbox"/> Jar <input checked="" type="checkbox"/> Water</p> <p><input checked="" type="checkbox"/> Bulk <input checked="" type="checkbox"/> Piezometer</p>	<p>Remarks (Observations of Ground Water etc.)</p> <p>groundwater struck at 1.50m depth rising to 1.30m depth in 10 minutes standing water level at 1.30m depth</p>
---	--

Holst Soil Engineering Limited						Borehole No. L2	
Contract No. F3593		BOREHOLE LOG <i>SN 81SE 5</i>		Sheet 1 of 1			
Location Dyffryn Cellweh		<i>SN 9519 1020</i>		Chainage.....			
Client Neath B.C.				Ground Level..... m.A.O.D.			
Method of Boring Percussion				Date 28.4.77			
Diameter of Borehole 150mm							

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.O.D.%	Daily Progress
TOPSOIL		0.20					
MADEGROUND - clay with coal, wood, stones		0.50			0.50		
MADEGROUND - firm brown & grey mottled silty clay with sandstone & coal fragments		1.50					
MADEGROUND - stiff brown mottled silty clay with sandstone & coal fragments		2.60			1.60 No recovery		
MADEGROUND - stiff dark grey shaly clay with coal fragments		3.00			2.90		
Very stiff brown grey shaly CLAY with large angular sandstone fragments		4.00			3.50	42	

<p>Type of Sample</p> <p>Is S.P.T. <input checked="" type="checkbox"/> Undisturbed</p> <p>Ic. C.P.T. <input checked="" type="checkbox"/> Vane</p> <p>O Jar <input checked="" type="checkbox"/> Water</p> <p>● Bulk <input checked="" type="checkbox"/> Piezometer</p>	<p>Remarks (Observations of Ground Water etc.)</p> <p style="text-align: center;">Borehole dry</p>
---	--

Norwest Holst Soil Engineering Ltd.						Borehole No. 2
Contract No. F8368		BOREHOLE LOG		Sheet 1 of 3		
Location Onllwyn		SN81SW 30		Co-ords 284787.75E 210602.00N		
Client British Coal		Method of Boring Percussion, rotary air flush & rotary open hole		Ground Level 236.48 m.A.O.D.		
Diameter of Borehole 150mm and 105mm		Date 13/2-14/2/89-21/2-23/2/89				

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.O.D.%	Daily Progress
MADE GROUND: Loose to medium dense black sand and gravel mudstone with coal in a black silty clay matrix (colliery waste)	[Cross-hatch pattern]				0.50-0.95 s	"7"	
					2.00-2.95 s	"14"	
					3.50-3.95 s	"8"	
MADE GROUND: Soft grey brown mottled orange and black silty clay with much gravel of weathered sandstone and mudstone	[Cross-hatch pattern]				5.00-5.45 s	"19"	
Grey highly to completely weathered silty MUDSTONE very weak laminated and micaceous	[Cross-hatch pattern]	6.00	230.48		6.00 (48)		
Dark grey IRONSTONE with some SILTSTONE	[X pattern]	7.00	229.48				
Light grey slightly to moderately weathered fine SANDSTONE, strong massive to occasionally cross laminated	[X pattern]	8.05	228.43		7.50 (58)		
Grey and light grey interlaminated moderately weathered silty MUDSTONE and sandy SILTSTONE, moderately weak occasional grey sandstone band	[X pattern]	8.65	227.83		8.65-8.68	25" blows*	
...8.90-9.00 Highly fractured medium to coarse gravel size	[X pattern]	8.90	227.58		ICR SCR	for 25mm	
		9.60	226.88		100% 58% 0%		

() U100 blows *seating blows only

Type of Sample	13/2/89 Borehole dry during drilling
Is S.P.T. Undisturbed	14/2/89 Borehole dry during drilling
Ic. C.P.T. X Vane	21/2/89 initial standing water level 3.45m, casing at 8.60m
O Jar Δ Water	Final standing water level 7.60m, casing at 8.60m
● Bulk Piezometer	

Norwest Holst Soil Engineering Ltd.						Borehole No. 2	
Contract No. F8368		BOREHOLE LOG		Sheet 2 of 3			
Location Onllwyn		SN81SW 30		Co-ords 284787.75E 210602.00N			
Client British Coal				Ground Level 236.48 m.A.O.D.			
Method of Boring Percussion & rotary air flush rotary open hole				Date 13/2-14/2 21/2-23/2/89			
Diameter of Borehole 150mm & 105mm							
Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.Q.D.%	Daily Progress
Grey moderately weathered silty to very silty MUDSTONE, moderately weak Jointed at 60°	x				10.10 TCR SCR		
	x	11.00	225.48			100% 81%	0%
Dark grey slightly weathered silty SANDSTONE, weak. Thin sub horizontal laminations	x				11.95		
	x	11.95	224.53				
Dark grey slightly weathered very slightly silty MUDSTONE moderately weak to weak laminated. Becoming very carbonaceous with depth ...11.95 to 12.70m often fragmented ...13.93 to 14.20m occasional very weak shaly mudstone bands	x					100% 49%	0%
(Boundary planar) vitreous COAL. Evidence of slickensided joint surfaces. ... 14.70-14.72m; Very thin sub-horizontal bed of very dark grey slightly weathered very carbonaceous silty MUDSTONE, weak	x	14.20	222.28		14.35		
	x	15.03	221.45				
Dark grey to grey slightly weathered silty MUDSTONE, moderately weak many carbonaceous plant remains (seatearath)	x					86% 63%	36%
	x	16.08	220.40				
Light grey slightly weathered clayey SILTSTONE moderately weak with occasional bands of thinly laminated silty mudstone ...micaceous from 19.25m	x				16.45		
	x				18.00	94% 53%	26%
	x					100% 77%	44%
	x	19.70	216.78		19.25		
	x					98% 74%	74%
Type of Sample S.P.T. <input type="checkbox"/> Undisturbed C.P.T. <input type="checkbox"/> Vane Jar <input type="checkbox"/> Water Bulk <input type="checkbox"/> Piezometer		Remarks (Observations of Ground Water etc.) 22/2/89 Initial standing water level 5.00m, casing at 8.60m Final standing water level 7.20m, casing at 8.60m 23/2/89 initial standing water level 6.45m, casing at 8.60m Final standing water level 6.20m, casing at 8.60m					

Norwest Holst Soil Engineering Ltd.						Borehole No. 2	
Contract No. F8368		BOREHOLE LOG		Sheet 3 of 3			
Location Onllwyn		Client British Coal		Co-ords SN81SW 30 Co-ords 284787.75E 210602.00N			
Method of Boring Percussion & rotary air flush, rotary open		Ground Level 236.48 m.A.O.D.		hole Date 13/2-14/2 21/2-23/2/89			
Diameter of Borehole 150mm & 105mm							
Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.O.D.%	Daily Progress
Light to dark grey slightly weathered fine and medium SANDSTONE strong massive with occasional cross bedding occasional joints at 75°	[Pattern]	21.65	214.83		TCR SCR		
Grey slightly weathered silty fine SANDSTONE moderately weak thin sub horizontal laminations very occasional plant remains occasional sub vertical joints	[Pattern]	22.30	214.18		100% 78%	78%	
Dark grey/black slightly weathered slightly silty MUDSTONE, moderately to very weak. Often highly fragmented often highly carbonaceous with occasional plant traces Occasional slickenside on joint surfaces	[Pattern]	25.00	211.48		95% 27%	9%	
Open hole from 25.00m Dark grey MUDSTONE	[Pattern]				25.00		
Borehole complete at 30.00m		30.00	206.48				
Type of Sample S.P.T. Undisturbed C.P.T. X Vane Jar Δ Water Bulk Piezometer		Remarks (Observations of Ground Water etc.)					

Norwest Holst Soil Engineering Ltd.						Borehole No. 8	
Contract No. F8368		BOREHOLE LOG		Sheet 1 of 3			
Location Onllwyn		SWSW 36		Co-ords 284862.94E 210586.15N			
Client British Coal		Method of Boring Percussion rotary air flush rotary open hole		Ground Level 237.20 m.A.O.D.			
Diameter of Borehole 150mm & 105mm				Date 16/2/89 & 26/2/89			
Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.O.D.%	Daily Progress
MADE GROUND: Medium dense black sand and gravel of carbonaceous silty mudstone and coal with occasional black silty clay matrix (colliery waste)					0.50-0.95	"11"	
					s		
Firm brown organic CLAY with many rootlets and some peat		3.20	234.00		2.00-2.45	"10"	
		3.40	233.80		s		
Firm to stiff grey brown mottled orange and black silty sandy CLAY with much gravel and occasional cobble of sandstone and mudstone occasional coal fragments					3.50 (33)		
		5.80	231.40		5.00 (42)		
Firm grey brown silty clay with mudstone fragments					6.50 (103)		
Grey brown highly weathered silty micaceous MUDSTONE weak laminated and fragmented some iron staining		6.70	230.50		7.50		
Grey moderately to slightly weathered SILTSTONE moderately weak laminated subhorizontal to massive iron staining on 45° joint planes		7.20	230.00		TCR SCR	90% 20% 0%	
		9.00	228.20		9.00	100% 15% 0%	
Grey moderately weathered slightly silty MUDSTONE weak often highly fragmented							
Type of Sample S.P.T. <input type="checkbox"/> Undisturbed <input type="checkbox"/> Ic. C.P.T. <input type="checkbox"/> Vane <input type="checkbox"/> Jar <input type="checkbox"/> Water <input type="checkbox"/> Bulk <input type="checkbox"/> Piezometer <input type="checkbox"/>		Remarks (Observations of Ground Water etc.) () U100 blows 16/2/89 Seepage of water at 3.20m casing at 3.00m no rise Water sealed at 3.40m 26/2/89 Initial standing water level 6.40m casing at 7.50m Final standing water level 3.50m casing at 7.50m					

Norwest Holst Soil Engineering Ltd.						Borehole No. 8
Contract No. F8368		BOREHOLE LOG		Sheet 2 of 3		
Location Onllwyn		Client SN81SW 36		Co-ords 284862.94E, 210586.15N		
Method of Boring Percussion rotary sir flush rotary open hole		Diameter of Borehole 150mm & 105mm		Ground Level 237.20 m.A.O.D.		
				Date 16/2/89 & 26/2/89		
Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/R.O.D.%
Grey moderately weathered slightly silty MUDSTONE weak often highly fractured ...below 10.20m becomes dark grey & carbonaceous	*				TCR SCR 10.50	
(Boundary Planar) COAL with 45-60° slickensided joint surfaces ...11.90-11.94m; Very thin subhorizontal bed of very dark grey slightly weathered very carbonaceous silty MUDSTONE, weak	*	11.59	225.61		92% 62% 23%	
Grey slightly weathered silty MUDSTONE moderately weak massive many carbonaceous plant remains	*	12.40	224.80		13.00	
Grey slightly weathered SANDSTONE & MUDSTONE	*	13.00	224.20		Open hole drilling	
	*					
	*					
	*	18.00	219.20			
Dark grey slightly weathered SILTSTONE	+					
Type of Sample S.P.T. <input type="checkbox"/> Undisturbed C.P.T. <input type="checkbox"/> Vane Jar <input type="checkbox"/> Water Bulk <input type="checkbox"/> Piezometer		Remarks (Observations of Ground Water etc.) <input type="checkbox"/> U100 blows 16/2/89 Seepage of water at 3.20m, casing at 3.00m no rise Water sealed at 3.40m 26/2/89 Initial standing water level 6.40m, casing at 7.50m Final standing water level 3.50m, casing at 7.50m				

SUBSW 37

Norwest Holst Soil Engineering Ltd.		Trial Pit No. 1
Contract No. F9074		8400 1043
TRIAL PIT LOG		
Location Nant Helen O.C.C.S.		
Client British Coal		Chainage
Excavation Plant 180° excavator		Ground Level m.A.O.D.
Dimensions (l x b x h) 2.00 x 1.00 x 1.90m		Date 4/2/91

ELEVATIONS:—

SIDE A

SIDE B

SIDE C

SIDE D

PLAN (Not to scale)

SAMPLES

No. & Type	Depth m.
	None taken

No.	Depth m.	STRATA DESCRIPTION	Cv/Cp kN/m ²
I	0.00-0.80	Firm orange silty sandy CLAY with some fine and medium angular mudstone gravel, and occasional coarse gravel and cobbles of sandstone.	
II	0.80-1.90	Highly weathered grey and orange laminated MUDSTONE, very weak. Generally recovered as angular gravel size fragments in clay matrix.	
Trial Pit complete at 1.90m depth			
Note: Ground level taken at a point 0.35m below adjacent rail.			

NOTES Cv/Cp Approximate value of undrained shear strength from hand vane/penetrometer
 Groundwater: Slight seepage from 1.00m, in mudstone
 Pumping: None
 Supports/Stability: Unsupported/stable

SN81SW 38

Norwest Holst Soil Engineering Ltd.		Trial Pit No. 2
Contract No. F9074		8403 1044
TRIAL PIT LOG		
Location Nant Helen O.C.C.S		Chainage
Client British Coal		Ground Level m.A.O.D.
Excavation Plant 180° excavator		Date 4/2/91
Dimensions (l x b x h) 2.00 x 1.00 x 2.00m		

ELEVATIONS:—																																
GI. 0.60 1.10 1.80 2.00		PLAN (Not to scale) 																														
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">No. & Type</th> <th style="width: 40%;">Depth m.</th> <th style="width: 50%;"></th> </tr> </thead> <tbody> <tr> <td>B</td> <td>0.60 - 1.10</td> <td>(II)</td> </tr> <tr> <td>B</td> <td>0.60 - 1.10</td> <td>(II)</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	No. & Type	Depth m.		B	0.60 - 1.10	(II)	B	0.60 - 1.10	(II)																					
No. & Type	Depth m.																															
B	0.60 - 1.10	(II)																														
B	0.60 - 1.10	(II)																														

No.	Depth m.	STRATA DESCRIPTION	Cv/Cp kN/m ²
I	0.00-0.60	MADE GROUND: Grey shale and coal fragments with occasional brick and clinker.	
II	0.60-1.10	Firm grey and orange silty sandy CLAY, with occasional fine gravel.	
III	1.10-1.80	Dark grey completely weathered MUDSTONE, recovered as clay with very occasional very weak mudstone lithorelicts.	
IV	1.80-2.00	Highly weathered grey and orange laminated MUDSTONE, very weak. Generally recovered as angular gravel size fragments in clay matrix. Note: Ground level taken at a point 0.40m below adjacent rail. Trial Pit complete at 2.00m depth.	

NOTES	
Cv/Cp: Approximate value of undrained shear strength from hand vane/penetrometer	
Groundwater: Dry	
Pumping: None	
Supports/Stability: None/Stable	

Appendix E

Groundsure EnviroInsight and
GeoInsight Reports



Groundsure

LOCATION INTELLIGENCE

Ove Arup & Partners International Ltd
4 OVE ARUP & PARTNERS, PIERHEAD STREET,
CARDIFF, CF10 4QP

Groundsure
Reference:

GS-6396069

Your Reference: GCORE

Report Date 14 Oct 2019

Report Delivery Method: Email - pdf

Enviro Insight

Address: 282917.86237392283, 211100.677756288,

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviro Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,

Managing Director
Groundsure Limited

Enc.
Groundsure Enviroinsight