

Appendix D

Study Limitations

IMPORTANT: This section should be read before reliance is placed on any of the information, opinions, advice, recommendations, or conclusions contained in this report.

1. This report has been prepared by Arcadis UK Ltd (Arcadis), with all reasonable skill, care, and diligence within the terms of the Appointment and with the resources and manpower agreed with Cardiff County Council. (the 'Client'). Arcadis does not accept responsibility for any matters outside the agreed scope.
2. This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing.
3. Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Arcadis are unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have unpublished, more stringent objectives. Further work may be required by these parties.
4. All work carried out in preparing this report has used, and is based on, Arcadis' professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice, pending changes in legislation, of which Arcadis is aware, have been considered. Following delivery of the report, Arcadis have no obligation to advise the Client or any other party of such changes or their repercussions.
5. This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.
6. Whilst this report and the opinions made are correct to the best of Arcadis' belief, Arcadis cannot guarantee the accuracy or completeness of any information provided by third parties.
7. This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have been received.
8. This report refers, within the limitations stated, to the condition of the Site at the time of the inspections. No warranty is given as to the possibility of changes in the condition of the Site since the time of the investigation.
9. The content of this report represents the professional opinion of experienced environmental consultants. Arcadis does not provide specialist legal or other professional advice. The advice of other professionals may be required.
10. Where intrusive investigation techniques have been employed, they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases, the investigation is further limited by site operations, underground obstructions, and above ground structures. Unless otherwise stated, areas beyond the boundary of the site have not been investigated.
11. If below ground intrusive investigations have been conducted as part of the scope, service tracing for safe location of exploratory holes has been carried out. The location of underground services shown on any drawing in this report has been determined by visual observations and electromagnetic techniques. No guarantee can be given that all services have been identified. Additional services, structures, or other below ground obstructions, not indicated on the drawing, may be present on Site.
12. Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issue.

Appendix E

GeoIndex Borehole Logs

Resurveyed
Nov 2009
9/60

E23

Contract : CARDIFF BAY BARRAGE - PHASE II		Borehole No. BH 279
Client : CARDIFF BAY DEVELOPMENT CORPORATION		
Dates : 6.10.95-	Job Number: A50231	Ground Level : 8.13 m A.O.D.
Location : The Marl	Engineer : ACER WALLACE EVANS	Coordinates: 317995.00 E 173983.50 N

Samples & Tests				STRATA				Water	Install/ Backfill
Depth	Type No	Test Result, N. (Blow Counts)	Depth (Thick- ness)	DESCRIPTION	Red. Level G.L.	Legend			
1	B1		0.25	TOPSOIL... Grass over dark brown slightly sandy silt with occasional fine to medium gravel	7.88				
1.50-2.00				MADE GROUND... Dark brown to black silty sand with much fine subrounded to subangular gravel, ash and clinker					
2			(3.70)						
3	B2								
4			3.95	Bluish grey very silty CLAY	4.18				
5			(2.50)						
6	B3								
7			6.45	Bluish grey slightly sandy clayey SILT	1.68				
8									
9			(6.05)						

Boring Progress and Water Observations						Groundwater			Chiselling		
Date	Time	Depth	Casing	Cas Dia	Water	Struck	Behaviour	Sealed	From	To	Hours
06.10.95		12.50	12.50	150 mm							

Remarks:



THYSSEN GEOTECHNICAL

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Fax: 01554 776150

Operator:
A. Jones

Sheet No.
1 Of 2

Scale:
1:63

Figure No.

Re surveyed
Nov 2000

Contract : CARDIFF BAY BARRAGE - PHASE II		Borehole No. BH 279
Client : CARDIFF BAY DEVELOPMENT CORPORATION		
Dates : 6.10.95-	Job Number: A50231	Ground Level 8.13 m A.O.D.
Location : The Marl	Engineer : ACER WALLACE EVANS	Coordinates: 317995.00 E 173983.50 N

Samples & Tests				STRATA				Water	Install/ Backfill
Depth	Type No	Test Result, N. (Blow Counts)	Depth (Thick- ness)	DESCRIPTION	Red. Level	Legend			
11				Bluish grey slightly sandy clayey SILT					
12			12.50	End of Borehole	4.37				

Boring Progress and Water Observations						Groundwater			Chiselling		
Date	Time	Depth	Casing	Cas Dia	Water	Struck	Behaviour	Sealed	From	To	Hours
06.10.95		12.50	12.50	150 mm							

Remarks:



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Sheet No.
2 Of 2

Scale: .
1:63

Figure No.

Re surveyed 20
Nov 2000 1-11/03

E23

Contract : CARDIFF BAY BARRAGE - PHASE II	Borehole No. BH 278
Client : CARDIFF BAY DEVELOPMENT CORPORATION	
Dates : 4.10.95-5.10.95	Job Number: A50231
Location : The Marl	Engineer : ACER WALLACE EVANS
	Ground Level 8.12 m A.O.D.
	Coordinates: 317995.00 E 173987.00 N

Samples & Tests				STRATA				Water	Install/ Backfill
Depth	Type No	Test Result, N. (Blow Counts)	Depth (Thick- ness)	DESCRIPTION	Red. Level G.L.	Legend			
0.50-1.00	B1		0.08	TOPSOIL... Grass over	8.04				
1				MADE GROUND... Black silty sand with fine to coarse gravel sized fragments of bricks, cobbles, concrete, glass and timber					
2			(3.87)						
3									
4	B2		3.95	Grey very silty CLAY	4.17				
5			(2.50)						
6									
7	B3		6.45	Greenish grey very silty CLAY	1.67				
8									
9			(6.30)						

Boring Progress and Water Observations						Groundwater			Chiselling		
Date	Time	Depth	Casing	Cas Dia	Water	Struck	Behaviour	Sealed	From	To	Hours
05.10.95		18.00	18.00	200 mm	10.20	7.60 10.30	Rose to 7.60 m Rose to 10.20 m		15.60 17.30	17.30 18.00	1 Hr 1 Hr

Remarks: Equipment: Dando 150. Borehole dia. 200 mm.



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Sheet No.
1 Of 2

Scale:
1:63

Figure No.

Re surveyed
Nov 2000
a 62

Contract : CARDIFF BAY BARRAGE - PHASE II		Borehole No. BH 278
Client : CARDIFF BAY DEVELOPMENT CORPORATION		
Dates : 4.10.95-5.10.95	Job Number: A50231	Ground Level 8.12 m A.O.D.
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Samples & Tests				STRATA				Water	Install/ Backfill
Depth	Type No	Test Result, N. (Blow Counts)	Depth (Thick- ness)	DESCRIPTION	Red. Level	Legend			
11				Greenish grey very silty CLAY					
12									
12.75-13.00	B4		12.75	Dark grey silty SAND (coarse) and fine to coarse subrounded GRAVEL with occasional cobbles	-4.63				
13			(1.05)						
13.80-14.20	B5		13.80	Dark grey slightly clayey subrounded fine to coarse slightly silty sandy GRAVEL	-5.68				
14									
15									
16			(4.20)						
17									
18			18.00	End of Borehole	-9.88				

Boring Progress and Water Observations						Groundwater			Chiselling		
Date	Time	Depth	Casing	Cas Dia	Water	Struck	Behaviour	Sealed	From	To	Hours
05.10.95		18.00	18.00	200 mm	10.20	7.60 10.30	Rose to 7.60 m Rose to 10.20 m		15.60 17.30	17.30 18.00	1 Hr 1 Hr

Remarks: Equipment: Dando 150. Borehole dia. 200 mm.

 THYSSEN GEOTECHNICAL	Bynea, Llanelli. Tel: 01554 772244 Fax: 01554 776150	Operator: A. Jones	Sheet No. 2 Of 2	Scale: 1:63	Figure No.

Geol. Dept. Cardiff.

Ref. No.

42

Bore No. 1

{ At F. Bowles & Son
For Ferry Road, CARDIFF

RECORD OF BORE OR PIT

2 1/2 inch sheet.

ST/173E/21

21

Borers. G. Isler & Co. Ltd.,
Purpose. Water Supply
Surface Level above O.D. c. 20
Standing water level below top.
Yield.

Date 1941

GEOLOGICAL NOTES	ORIGINAL DESCRIPTION.	Thickness		Depth.	
		Ft.	In.	Ft.	In.
	Dug Pit	5	-		
	Made Up Ground	5	-	10	-
	Mud and silt.	5	-	15	-
	Clay	18	-	33	-
	Ballast	25	-	58	-
	Red Marl and stones	10	-	68	-
	Sand and pebbles.	1	-	72	-
	Hard Red Marl and stones.	6	-	78	-
	Hard Red Marl	32	-	110	-
	Marl and pebbles.	15	-	125	-
	Very hard red marl & very small pebbles.	4	-	129	-
	Fine conglomerated rock	2	6	131	6
	Marl & Sandstone.	18	6	150	-
	Grey Rock.	1	-	151	-
	Marl	1	-	152	-
	Grey Rock	-	3	152	3
	Hardy Sandstone	4	-	156	3
	Red Marl	-	9	157	-
	Grey Rock	1	-	158	-
	Red Marl	2	6	160	6
	Grey Sandstone	2	-	162	6
	Red Marl	5	-	167	6
	Grey Rock	-	6	168	-
	Marl with pebbles	2	6	170	6
	Red Marl with layer Grey Rock & Grey sandstone.	17	-	187	-
	Grey & Red Marl	13	-	200	-
	Hard Red Marl with stones.	5	-	205	-
	Red Marl	32	-	237	-
	Grey Rock	1	-	238	-
	Red Marl	22	-	260	-
	Hard Red Marl with Marl stones	12	-	272	-
	Marl with Gypsum	78	-	350	-

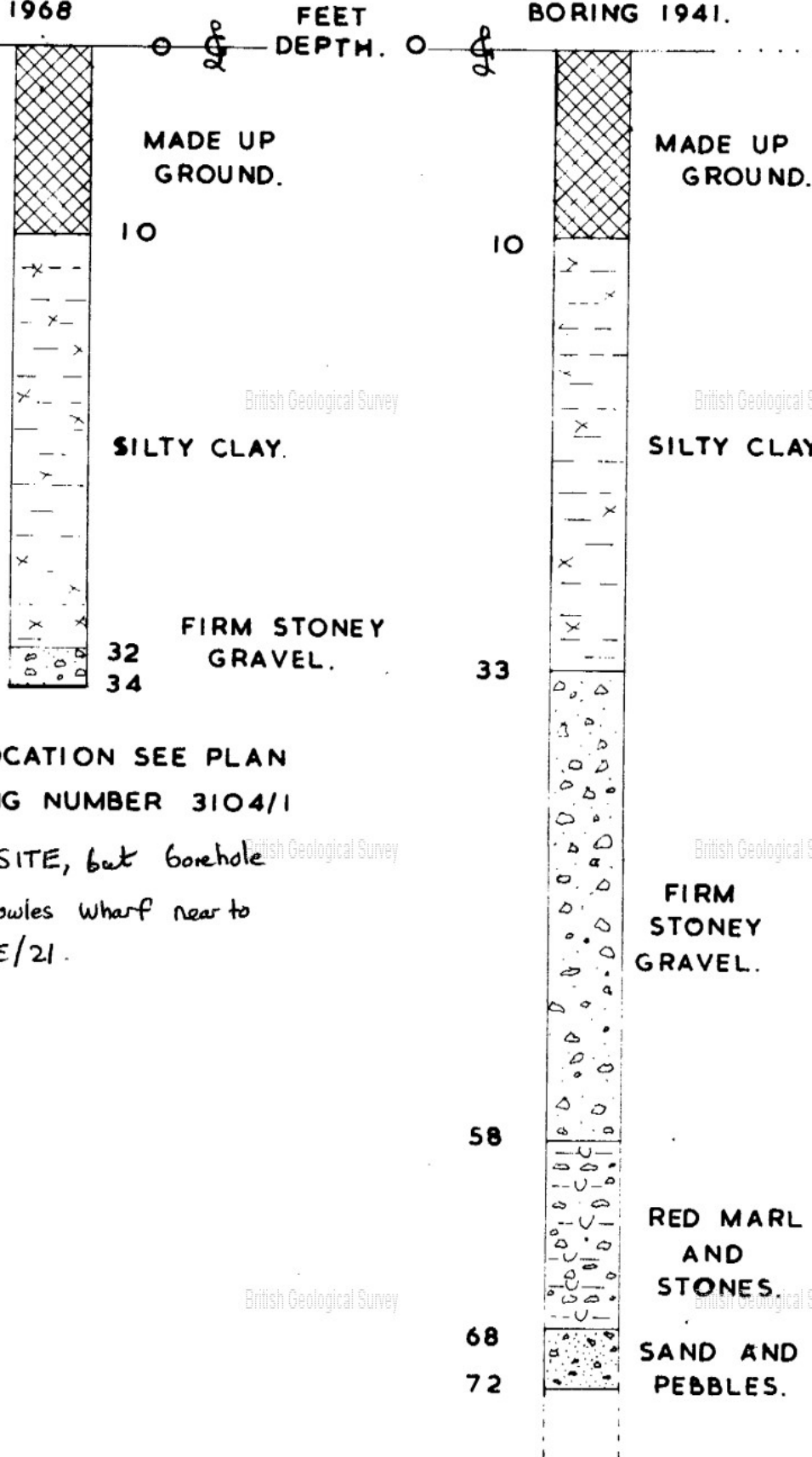
probably
all
Trias

1812. 7425
ST17SE/21

BOREHOLE A.
G. PERCY TRENTHAM
AUGUST 1968

BOREHOLE B
FROM ARTESIAN WELL
BORING 1941.

Approx 23.00
AOD.



FOR LOCATION SEE PLAN
— DRAWING NUMBER 3104/1

NO SITE, but borehole
at Bowles Wharf near to
ST17SE/21.

BOREHOLE DETAILS.

VERT.
SCALE: 1/8 INCH TO 1 FOOT.

ST17SE4403T17SE441

ST17SE1101

ST17SE396

E_ST17SE245

ST17SE245

ST17SE1100

ST17SE246

ST17SE461

ST17SE249

ST17SE250

Grange town

D_ST17SE248

ST17SE248

ST17SE247

C_ST17SE21

ST17SE21

ST17SE357

ST17SE415

ST17SE365

ST17SE370

ST17SE366

ST17SE987

ST17SE988

ST17SE997

ST17SE999

ST17SE992

ST17SE996

ST17SE993

ST17SE994

ST17SE995

ST17SE10003T17SE990

ST17SE998

ST17SE991

A_ST17SE451

ST17SE451ST17SE450

B_ST17SE450

ST17SE452



Resurveyed
Nov 2009
9/60

E23

Contract : CARDIFF BAY BARRAGE - PHASE II		Borehole No. BH 279
Client : CARDIFF BAY DEVELOPMENT CORPORATION		
Dates : 6.10.95-	Job Number: A50231	Ground Level : 8.13 m A.O.D.
Location : The Marl	Engineer : ACER WALLACE EVANS	Coordinates: 317995.00 E 173983.50 N

Samples & Tests				STRATA				Water	Install/ Backfill
Depth	Type No	Test Result, N. (Blow Counts)	Depth (Thick- ness)	DESCRIPTION	Red. Level G.L.	Legend			
1	B1		0.25	TOPSOIL... Grass over dark brown slightly sandy silt with occasional fine to medium gravel	7.88				
				MADE GROUND... Dark brown to black silty sand with much fine subrounded to subangular gravel, ash and clinker					
2			(3.70)						
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4			3.95	Bluish grey very silty CLAY	4.18				
5			(2.50)						
6	B3								
7			6.45	Bluish grey slightly sandy clayey SILT	1.68				
8									
9			(6.05)						

Boring Progress and Water Observations						Groundwater			Chiselling		
Date	Time	Depth	Casing	Cas Dia	Water	Struck	Behaviour	Sealed	From	To	Hours
06.10.95		12.50	12.50	150 mm							

Remarks:



THYSSEN GEOTECHNICAL

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Fax: 01554 776150

Operator:
A. Jones

Sheet No.
1 Of 2

Scale:
1:63

Figure No.

Re surveyed
Nov 2000

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Date	Time	Depth	Casing	Cas Dia	Water	Struck	Behaviour	Sealed	From	To	Hours
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Scale: .
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Figure No.

Re surveyed 20
Nov 2000 1-11/03

E23

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8									
9			(6.30)						

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Date	Time	Depth	Casing	Cas Dia	Water	Struck	Behaviour	Sealed	From	To	Hours
05.10.95		18.00	18.00	200 mm	10.20	7.60 10.30	Rose to 7.60 m Rose to 10.20 m		15.60 17.30	17.30 18.00	1 Hr 1 Hr

Remarks: Equipment: Dando 150. Borehole dia. 200 mm.



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Sheet No.
1 Of 2

Scale:
1:63

Figure No.

Re surveyed
Nov 2000
a 62

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13.80-14.20	B5		13.80	Dark grey slightly clayey subrounded fine to coarse slightly silty sandy GRAVEL	-5.68				
14									
15									
16			(4.20)						
17									
18			18.00	End of Borehole	-9.88				

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Remarks: Equipment: Dando 150. Borehole dia. 200 mm.



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Fax: 01554 776150

Operator:
A. Jones

Sheet No.
2 Of 2

Scale:
1:63

Figure No.

Geol. Dept. Cardiff.

Ref. No.

42

Bore No. 1

{ At F. Bowles & Son
For Ferry Road, CARDIFF

RECORD OF BORE OR PIT

2 1/2 inch sheet.

ST/173E/21

21

Borers. G. Isler & Co. Ltd.,
Purpose. Water Supply
Surface Level above O.D. c. 20
Standing water level below top.
Yield.

Date 1941

GEOLOGICAL NOTES	ORIGINAL DESCRIPTION.	Thickness		Depth.	
		Ft.	In.	Ft.	In.
	Dug Pit	5	-		
	Made Up Ground	5	-	10	-
	Mud and silt.	5	-	15	-
	Clay	18	-	33	-
	Ballast	25	-	58	-
	Red Marl and stones	10	-	68	-
	Sand and pebbles.	1	-	72	-
	Hard Red Marl and stones.	6	-	78	-
	Hard Red Marl	32	-	110	-
	Marl and pebbles.	15	-	125	-
	Very hard red marl & very small pebbles.	4	-	129	-
	Fine conglomerated rock	2	6	131	6
	Marl & Sandstone.	18	6	150	-
	Grey Rock.	1	-	151	-
	Marl	1	-	152	-
	Grey Rock	-	3	152	3
	Hardy Sandstone	4	-	156	3
	Red Marl	-	9	157	-
	Grey Rock	1	-	158	-
	Red Marl	2	6	160	6
	Grey Sandstone	2	-	162	6
	Red Marl	5	-	167	6
	Grey Rock	-	6	168	-
	Marl with pebbles	2	6	170	6
	Red Marl with layer Grey Rock & Grey sandstone.	17	-	187	-
	Grey & Red Marl	13	-	200	-
	Hard Red Marl with stones.	5	-	205	-
	Red Marl	32	-	237	-
	Grey Rock	1	-	238	-
	Red Marl	22	-	260	-
	Hard Red Marl with Marl stones	12	-	272	-
	Marl with Gypsum	78	-	350	-

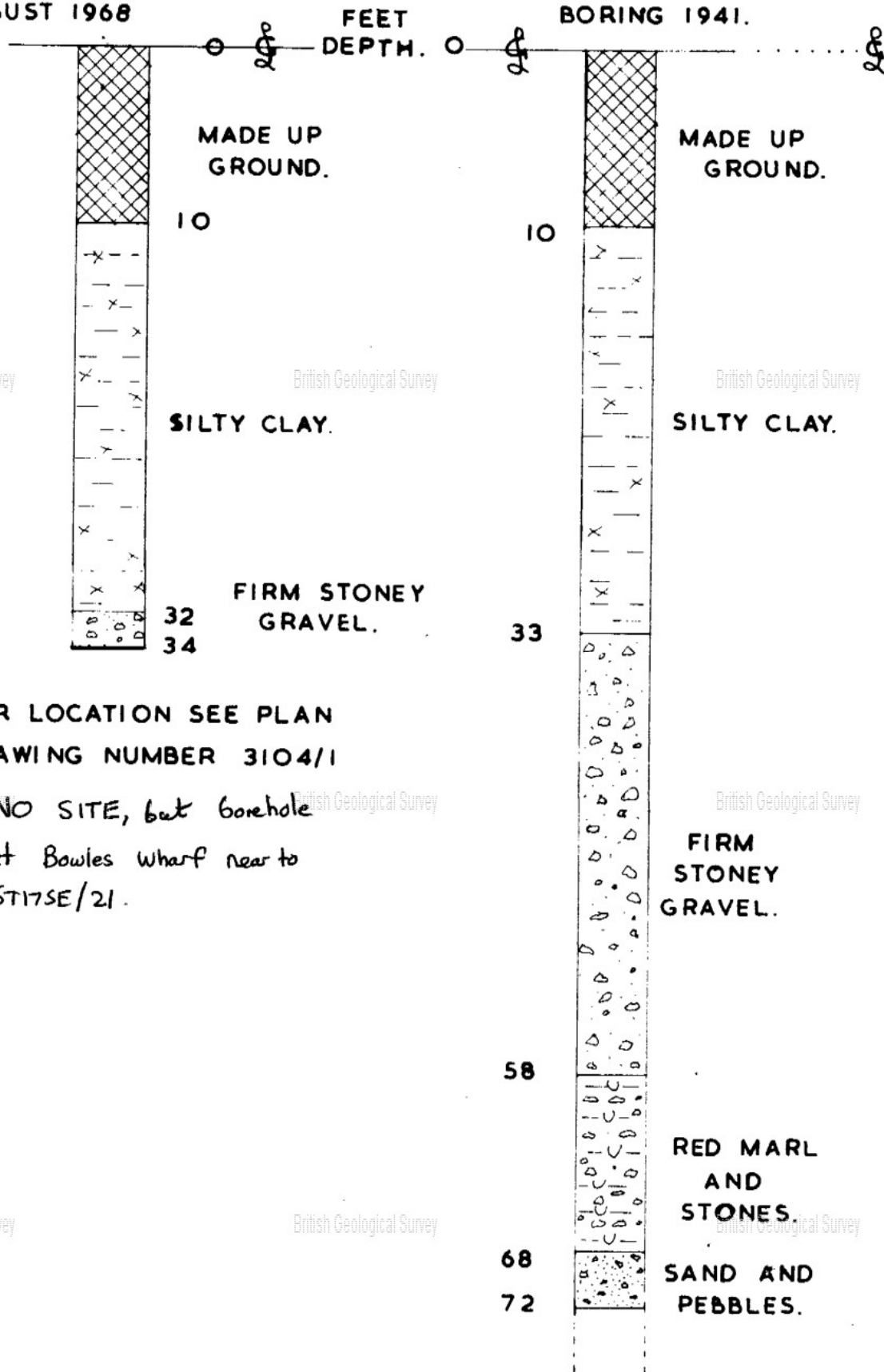
probably
all
Trias

1812. 7425
ST17SE/21

BOREHOLE A.
G. PERCY TRENTHAM
AUGUST 1968

BOREHOLE B
FROM ARTESIAN WELL
BORING 1941.

Approx 23.00
AOD.



FOR LOCATION SEE PLAN
— DRAWING NUMBER 3104/1

NO SITE, but borehole
at Bowles Wharf near to
ST17SE/21.

BOREHOLE DETAILS.

VERT.
SCALE: 1/8 INCH TO 1 FOOT.

Norwest Holst Soil Engineering Ltd.

F5330

Borehole No.

4

Contract No.....

BOREHOLE LOG

1805 7433

Location.....Channel View Recreation Centre

Sheet 1 of 3

Client.....South Glamorgan County Council

Chainage.....

Method of Boring.....Percussion

Ground Level.....7.77 m.A.O.D.

Diameter of Borehole.....150 mm

Date.....12/8/82

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.		0.10	7.67				
MADE GROUND: Brick, ash and stone with some dark brown, very silty, sandy clay.		2.30	5.47		0.50	21	
Soft to firm, brown, silty CLAY.		3.70	4.07		1.50	14	
Soft, grey, silty CLAY.					2.50	(30)	
					3.50	(20)	
					4.50	(20)	
					6.00	12	
					7.50	13	
					9.00	10	

Type of Sample

- Is S.P.T. Undisturbed
 Ic. C.P.T. Vane
 O Jar Water
 ● Bulk Piezometer

Remarks (Observations of Ground Water etc.) () U100 blows.

12/8/82 Slight water inflows at 5.80 m, 7.00 m, and 9.10 m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.
4

Contract No. F5330
Location Channel View Recreation Centre
Client South Glamorgan County Council
Method of Boring Percussion
Diameter of Borehole 150 mm

BOREHOLE LOG

Sheet 2 of 3
Chainage
Ground Level 7.77 m.A.O.D.
Date 12/8/82

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
Soft, grey, silty CLAY.		10.80	-3.03		10.50		
Medium dense to dense, sandy, coarse GRAVEL, and traces of marl from 17.80 m.		19.10-11.33			11.00 12.50 14.00 15.50 17.00 18.50 19.30	20 28 39 51 48 60 94 for 225mm	
Completely weathered, red-brown, silty MUDSTONE (Keuper Marl Zone IVA).							

Type of Sample

- Is S.P.T. Undisturbed
- Ic. C.P.T. Vane
- O Jar Water
- Bulk Piezometer

Remarks (Observations of Ground Water etc.)

12/8/82 Moderate inflow at 10.80 m, final standing level at end of borehole 14.20 m.

Norwest Holst Soil Engineering Ltd.

Borehole No.

4

Contract No. F5330

BOREHOLE LOG

Location...Channel View Recreation Centre

Sheet 3 of 3

Client...South Glamorgan County Council

Chainage.....

Method of Boring...Percussion... British Geological Survey

Ground Level...7.77 m.A.O.D.

Diameter of Borehole...150 mm

Date...12/8/82

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
Highly weathered, red-brown, silty MUDSTONE. (Keuper Marl Zone III).		22.00	14.23		21.00	50 for No Penetration	12/8

Type of Sample

- S.P.T. Undisturbed
 C.P.T. Vane
 Jar Water
 Bulk Piezometer

Remarks (Observations of Ground Water etc.)

Water levels are subject to movement at tidal positions and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.

1

Contract No. F5330
Location Channel View Recreation Centre
Client South Glamorgan County Council
Method of Boring Percussion
Diameter of Borehole 150 mm

BOREHOLE LOG

1805 7440

Sheet 1 of 3

Chainage 7.75

Ground Level m.A.O.D.

Date 10/8/82 - 11/8/82

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	7.65				
MADE GROUND: Brick and ash.					0.50	13	
					1.50	13	
		2.30	5.45				
Soft to firm brown, silty CLAY.					2.50	(30)	
					3.50	(30)	
		3.70	4.05				
Soft, grey, silty CLAY.					4.50	(25)	
					6.00	11	
					7.50	25	
Medium dense, coarse, sandy GRAVEL.		7.50	0.25				
					9.00	22	

Type of Sample

- S.P.T. Undisturbed
- C.P.T. X Vane
- O Jar Δ Water
- Bulk Piezometer

Remarks (Observations of Ground Water etc.) () U100 blows.

10/8/82 Water inflow at 7.50 m, rose to 7.10 m after 20 minutes. Casing to 7.00 m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.

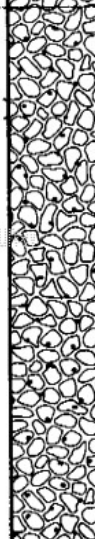
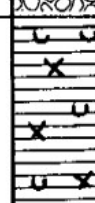
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F5330

BOREHOLE LOG

Contract No.
 Location Channel View Recreation Centre
 Client South Glamorgan County Council
 Method of Boring Percussion
 Diameter of Borehole 150 mm

Sheet 2 of 3
 Chainage
 Ground Level 7.75 m.A.O.D.
 Date 10/8/82 - 11/8/82

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
Medium dense, sandy, coarse GRAVEL.					10.50 12.00 13.50 15.00	27 32 38 55	
Medium dense to dense, red-brown, sandy GRAVEL (possibly driving gravel into marl from 17.00 m onwards)		15.00	-7.25		15.00 16.50 18.00	55 52 60	10/8
Completely / highly weathered, red-brown, silty MUDSTONE. Keuper Marl Zone IVA.		18.70	-10.95		19.00	76 for 150mm	

Type of Sample

- Is S.P.T.  Undisturbed
 Ic. C.P.T.  Vane
 O Jar  Water
 ● Bulk  Piezometer

Remarks (Observations of Ground Water etc.)

Water seepage 7.50 m rising to 7.10 m. Strong inflow from gravel.
 11/8/82 Overnight standing level 10.20 m. Casing at 16.00 m.
 Final standing level 16.10 m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.

1

Contract No. F5330

BOREHOLE LOG

Location Channel View Recreation Centre

Sheet 3 of 3

Client South Glamorgan County Council

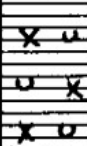
Chainage 7.75

Method of Boring Percussion

Ground Level m.A.O.D.

Diameter of Borehole 150 mm

Date 10/8/82 - 11/8/82

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
Highly weathered, red brown, silty MUDSTONE (Keuper Marl Zone IVA-III).		21.00	-13.25		20.50	50 for No Penetration	

Type of Sample

- Is S.P.T.  Undisturbed
 Ic. C.P.T.  Vane
 O Jar  Water
 ● Bulk  Piezometer

Remarks (Observations of Ground Water etc.)

Water levels are subject to seasonal or tidal variations and should not be taken as constant

OD levels
far too high

ST17SE/114

71/4/B

BORING RECORD

~~OD level~~

DEPTH BELOW EX. SURFACE FT. M.	INCH. MM.	A.O.D.	MOISTURE CONTENT %	SOIL CLASSN.	DESCRIPTION & REMARKS
		16.00	(14.9m)		
7	600	16.00	-2.7		Soft grey silty clay containing organic matter in upper levels
9	750	16.00	-4.8		Soft grey silty clay with cobbles and boulders.
13	400	16.00	-8.5		Slightly clayey gravel.

71/4/A

BORING RECORD

~~OD level~~

ST17SE/113

DEPTH BELOW EX. SURFACE FT. M.	INCH. MM.	A.O.D.	MOISTURE CONTENT %	SOIL CLASSN.	DESCRIPTION & REMARKS
		17.00	(5.2m)		
6	500	16.00			Soft grey silty clay containing a large amount of organic matter in upper levels
7	600	16.00	-2.4		Slightly clayey gravel.

Norwest Holst Soil Engineering Ltd.

Borehole No.

3

Contract No. F8837
Location Butetown Sewr. Diversion
Client South Glamorgan C.C.
Method of Boring Cable Percussion
Diameter of Borehole 150mm

BOREHOLE LOG

ST17SE 322

Sheet 1 of 1
Chainage
Ground Level 5.46 m.A.O.D.
Date 2/6/90

1846 74300

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
Very soft, dark grey silty organic CLAY					1.00 (4) N.R. 1.80 (4) 2.80 (5) 4.30 (4) 5.80 s	"2"	
Dense, brown and dark grey fine to coarse subangular to rounded GRAVEL with occasional cobbles and with much fine to coarse slightly silty sand.		6.60	-1.14		7.00 s	"51"	
Borehole complete at 8.50m.		8.50		8.00			2/6

Type of Sample

- Is S.P.T. ■ Undisturbed
Ic C.P.T. x Vane
0 Jar △ Water
● Bulk ■ Piezometer

Remarks (Observations of Ground Water etc.) () U100 Blows

N.R - No recovery

Groundwater encountered at 6.60m, rising to 5.10m in 20 minutes.
Groundwater level pm. 4.10m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.

2

Contract No. F8837

BOREHOLE LOG

Location Butetown Sewer Diversion

Sheet 1 of 1

Client South Glamorgan C. C.

ST178E 321

Chainage

Method of Boring Cable Percussion

Ground Level 6.10 m.A.O.D.

Diameter of Borehole 150mm

18478 74298

Date 1/6/90

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
MADEGROUND: Clinker and brick		1.00	5.10		1.00 (7)		
Very soft dark grey silty organic CLAY		3.50	2.60		2.00 (6) 3.00 (8)		
Soft, dark grey silty organic CLAY with a little fine to medium rounded gravel.		5.20	0.60		4.50 (12)		
Dense, yellowish brown, fine to coarse, subangular to rounded, GRAVEL and occasional cobbles with some fine to coarse sand		7.50			5.50 7.00	"37" "48"	
Borehole complete at 7.50m.				6.80	s		1/6

Type of Sample

Is S.P.T. ■ Undisturbed

Ic C.P.T. x Vane

0 Jar △ Water

● Bulk ● Piezometer

Remarks (Observations of Ground Water etc.) () U100 Blows

Groundwater encountered at 6.00m, no rise

Groundwater level at 1.00pm, 5.20m

Groundwater level at 3.00pm 4.90m.

Equipment & Methods
Hand dug inspection pit to 1.20m. Cable tool boring, 200mm
dia to 20.00m.

Location No. 169015

Location

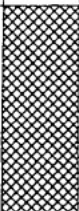
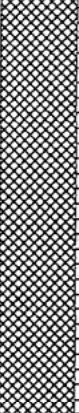
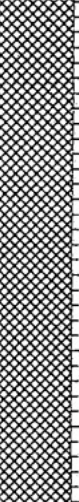
CARDIFF BAY BARRAGE, GROUNDWATER CONTROL SYSTEM

Carried out for
Cardiff Bay Development Corporation

Ground Level
10.39 m AOD

Coordinates
318498.30 mE
174275.90 mN

Date
08/03/1999
10/03/1999

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests			Field Records	
				Depth	Sample			Test
					Type	No.		
Firm brown to grey brown sandy CLAY with some to many gravel sized fragments of brick and siltstone. Some cobbles and boulders. (MADE GROUND)	10.39		(1.40)					
	8.99		1.40					
								
Soft grey, locally brown CLAY with a little sand and some to many gravel, cobble and boulder sized fragments of sandstone. (MADE GROUND).			(6.20)					
				5.50	D	9		
				6.50	D	10		
				7.50	D	11		
				7.70	D	12		
	2.79		7.60					
Firm, below 8.50m becoming soft grey organic CLAY. (ALLUVIUM)			(2.45)					
				8.50	D	13		
				9.50	D	14		

Remarks

1. No samples above 5.50m.
2. Chiselling from 1.40-7.60m for 1.5 hours intermittantly and from 10.10-20.00m for 2.5 hours intermittantly.
3. Water struck at 10.10m, rose to 8.10m in 20 minutes.

Notes:

Logged by

14

Scale

1:50

Fig.

1 / 521 A



Soil Mechanics

BOREHOLE No. BH1/PB1A

Sheet 2 of 4

Equipment & Methods

As sheet 1

Location No. 169015

Location

CARDIFF BAY BARRAGE, GROUNDWATER CONTROL SYSTEM

Carried out for

Cardiff Bay Development Corporation

Ground Level

Coordinates

Date

As sheet 1

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests			Field Records	
				Depth	Sample			Test
					Type	No.		
As sheet 1.	0.34	0.0-0.0	(2.45) 10.05	10.10 10.10	D W	15 16		
		0.0-0.0						
		0.0-0.0						
		0.0-0.0						
		0.0-0.0		11.00	D	17		
		0.0-0.0						
		0.0-0.0						
		0.0-0.0						
		0.0-0.0		12.00	D	18		
		0.0-0.0						
		0.0-0.0						
		0.0-0.0						
		0.0-0.0		13.00	D	19		
		0.0-0.0						
		0.0-0.0						
		0.0-0.0		14.00	D	20		
		0.0-0.0						
		0.0-0.0						
		0.0-0.0						
		0.0-0.0		15.00	D	21		
		0.0-0.0	(9.95 pen)					
		0.0-0.0						
		0.0-0.0						
		0.0-0.0		16.00	D	22		
		0.0-0.0						
		0.0-0.0						
		0.0-0.0						
		0.0-0.0		17.00	D	23		
		0.0-0.0						
		0.0-0.0						
		0.0-0.0		18.00	D	24		
		0.0-0.0						
		0.0-0.0						
		0.0-0.0						
		0.0-0.0		19.00	D	25		
		0.0-0.0						
		0.0-0.0						
		0.0-0.0						
		0.0-0.0		20.00	D	26		
BOREHOLE ENDS AT 20.00 m.	-9.61	0.0-0.0	20.00	20.00	D	26		

Remarks

- 125mm well screen installed at 20.00m upon completion. slotted from 12.00-17.00m.
- Well developed for 3 hours on 15/04/99. approx 3500L airlifted.
- Well developed for 1.5 hours on 16/04/99. approx 1500L airlifted.
- Well developed for 2 hours on 19/04/99.

Notes:

Logged by

IW

Scale

1:50

Fig.

1/001A



Soil Mechanics

BOREHOLE No. BH1/OB1

Sheet 1 of 4

Equipment & Methods
Hand dug inspection pit to 1.20m. Cable tool boring. 300mm
dia to 5.00m. then dia to 19.00m.

Location No. 169015

Location

CARDIFF BAY BARRAGE, GROUNDWATER CONTROL SYSTEM

Carried out for
Cardiff Bay Development Corporation

Ground Level

10.29 m AOD

Coordinates

318511.25 mE

174275.21 mN

Date

11/04/1999

to 12/04/1999

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests			Field Records	
				Depth	Sample			Test
					Type	No.		
Grey brown GRAVEL sized fragments of concrete with some sandy clay matrix. (MADE GROUND)	10.29		(0.80)	0.30 0.30	D D	1 1A		
	9.49		0.80	1.00 1.00	D D	2 2A		
				2.00 2.00	D D	3 3A		
				2.80 2.80	D D	4 4A		
Soft grey brown sandy CLAY with some, locally many gavel, cobble and boulder sized fragments of sanstone and concrete. (MADE GROUND)				(6.10)	3.80 3.80	D D	5A 5	
					4.80 4.80	D D	6 6A	
					5.80 5.80	D D	7A 7	
					6.80 6.80	D D	8 8A	
					7.00 7.00	D D	9 9A	
	3.39			6.90	8.00	D	10	
Firm, below about 9.00m becoming soft grey organic CLAY with some plant remnants and relic roots. (ALLUVIUM)				(3.20)	9.00	D	11	
						10.00	D	12

Remarks

1. Borehole started in 200mm dia. but reamed out with 300mm dia to 5.00m due to excessive raking of casing.
2. Water struck at 10.20m, rose to 9.10m in 20 minutes.
3. Chiselling from 1.80-5.00m for 2.5 hours intermittantly and from 5.00-19.00m intermittantly.

Notes:

Logged by

IW

Scale

1:50

Fig.

1/OB1

(c) Soil Mechanics (Ver 5.7)



BOREHOLE No. BH1/OB1

Sheet 2 of 4

Equipment & Methods

Location No.	169015
--------------	--------

As sheet 1

Location

CARDIFF BAY BARRAGE, GROUNDWATER CONTROL SYSTEM

Carried out for

Ground Level

Coordinates

Date _____

Cardiff Bay Development Corporation

As sheet 1

[illegible]

Remarks

4. Gas standpipes installed at 6.80 and 19.00m upon completion.

5. Deep standpipe developed for 1.5 hours on 21/04/99. 500L airlifted.

Notes:

Logged by	
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IW

Scale

1:50

Fig

(c) Soil Mechanics (Ver 5.7)

1/0B1

Norwest Holst Soil Engineering Ltd.

F5330

Borehole No.

4

Contract No.....

BOREHOLE LOG

1805 7433

Location.....Channel View Recreation Centre

Sheet 1 of 3

Client.....South Glamorgan County Council

Chainage.....

Method of Boring.....Percussion.....British Geological Survey

Ground Level.....7.77 m.A.O.D.

Diameter of Borehole.....150 mm

Date.....12/8/82

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.		0.10	7.67				
MADE GROUND: Brick, ash and stone with some dark brown, very silty, sandy clay.		2.30	5.47		0.50	21	
Soft to firm, brown, silty CLAY.		3.70	4.07		1.50	14	
Soft, grey, silty CLAY.					2.50	(30)	
					3.50	(20)	
					4.50	(20)	
					6.00	12	
					7.50	13	
					9.00	10	

Type of Sample

- Is S.P.T. Undisturbed
 Ic. C.P.T. Vane
 O Jar Water
 ● Bulk Piezometer

Remarks (Observations of Ground Water etc.)

() U100 blows.

12/8/82 Slight water inflows at 5.80 m, 7.00 m, and 9.10 m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.

4

Contract No. F5330
Location Channel View Recreation Centre
Client South Glamorgan County Council
Method of Boring Percussion
Diameter of Borehole 150 mm

BOREHOLE LOG

Sheet 2 of 3
Chainage
Ground Level 7.77 m.A.O.D.
Date 12/8/82

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
Soft, grey, silty CLAY.		10.80	-3.03		10.50		
Medium dense to dense, sandy, coarse GRAVEL, and traces of marl from 17.80 m.					11.00 12.50 14.00 15.50 17.00 18.50 19.10-11.33	20 28 39 51 48 60	
Completely weathered, red-brown, silty MUDSTONE (Keuper Marl Zone IVA).					19.30	94 for 225mm	

Type of Sample

- Is S.P.T. Undisturbed
- Ic. C.P.T. Vane
- O Jar Water
- Bulk Piezometer

Remarks (Observations of Ground Water etc.)

12/8/82 Moderate inflow at 10.80 m, final standing level at end of borehole 14.20 m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.

4

Contract No. F5330

BOREHOLE LOG

Location...Channel View Recreation Centre

Sheet...3 of...3

Client...South Glamorgan County Council

Chainage.....

Method of Boring...Percussion...British Geological Survey

Ground Level...7.77 m.A.O.D.

Diameter of Borehole...150 mm

Date...12/8/82

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
Highly weathered, red-brown, silty MUDSTONE. (Keuper Marl Zone III).		22.00	14.23		21.00	50 for No Penetration	12/8

Type of Sample

- S.P.T. Undisturbed
 C.P.T. Vane
 Jar Water
 Bulk Piezometer

Remarks (Observations of Ground Water etc.)

Water levels are subject to movement at tidal positions and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.

1

Contract No. F5330
Location Channel View Recreation Centre
Client South Glamorgan County Council
Method of Boring Percussion
Diameter of Borehole 150 mm

BOREHOLE LOG

1805 7440

Sheet 1 of 3

Chainage 7.75

Ground Level 10/8/82 - 11/8/82 m.A.O.D.

Date 10/8/82 - 11/8/82

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	7.65				
MADE GROUND: Brick and ash.					0.50	13	
					1.50	13	
		2.30	5.45				
Soft to firm brown, silty CLAY.					2.50	(30)	
					3.50	(30)	
		3.70	4.05				
Soft, grey, silty CLAY.					4.50	(25)	
					6.00	11	
					7.50	25	
Medium dense, coarse, sandy GRAVEL.		7.50	0.25				
					9.00	22	

Type of Sample

- S.P.T. Undisturbed
- C.P.T. X Vane
- O Jar Δ Water
- Bulk Piezometer

Remarks (Observations of Ground Water etc.) () U100 blows.

10/8/82 Water inflow at 7.50 m, rose to 7.10 m after 20 minutes. Casing to 7.00 m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.

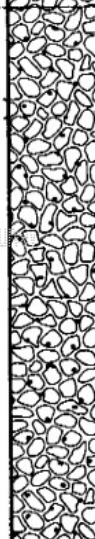
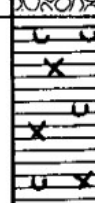
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F5330

BOREHOLE LOG

Contract No.
 Location Channel View Recreation Centre
 Client South Glamorgan County Council
 Method of Boring Percussion
 Diameter of Borehole 150 mm

Sheet 2 of 3
 Chainage
 Ground Level 7.75 m.A.O.D.
 Date 10/8/82 - 11/8/82

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
Medium dense, sandy, coarse GRAVEL.					10.50 12.00 13.50 15.00	27 32 38 55	
Medium dense to dense, red-brown, sandy GRAVEL (possibly driving gravel into marl from 17.00 m onwards)		15.00	-7.25		15.00 16.50 18.00	55 52 60	10/8
Completely / highly weathered, red-brown, silty MUDSTONE. Keuper Marl Zone IVA.		18.70	-10.95		19.00	76 for 150mm	

Type of Sample

- Is S.P.T. ■ Undisturbed
 Ic. C.P.T. X Vane
 O Jar Δ Water
 ● Bulk ■ Piezometer

Remarks (Observations of Ground Water etc.)

Water seepage 7.50 m rising to 7.10 m. Strong inflow from gravel.
 11/8/82 Overnight standing level 10.20 m. Casing at 16.00 m.
 Final standing level 16.10 m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.

1

Contract No. F5330

BOREHOLE LOG

Location Channel View Recreation Centre

Sheet 3 of 3

Client South Glamorgan County Council

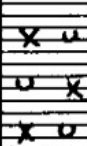
Chainage 7.75

Method of Boring Percussion

Ground Level m.A.O.D.

Diameter of Borehole 150 mm

Date 10/8/82 - 11/8/82

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
Highly weathered, red brown, silty MUDSTONE (Keuper Marl Zone IVA-III).		21.00	-13.25		20.50	50 for No Penetration	

Type of Sample

- Is S.P.T.  Undisturbed
 Ic. C.P.T.  Vane
 O Jar  Water
 ● Bulk  Piezometer

Remarks (Observations of Ground Water etc.)

Water levels are subject to seasonal or tidal variations and should not be taken as constant



OD levels
far too high

ST17SE/114

71/4/B

BORING RECORD

~~OD level~~

DEPTH BELOW EX. SURFACE FT. M.	INCH. MM.	A.O.D.	MOISTURE CONTENT %	SOIL CLASSN.	DESCRIPTION & REMARKS
		16.00	(14.9m)		
7	600	16.00	-2.7		Soft grey silty clay containing organic matter in upper levels
9	750	16.00	-4.8		Soft grey silty clay with cobbles and boulders.
13	400	16.00	-8.5		Slightly clayey gravel.

71/4/A

BORING RECORD

~~OD level~~

ST17SE/113

DEPTH BELOW EX. SURFACE FT. M.	INCH. MM.	A.O.D.	MOISTURE CONTENT %	SOIL CLASSN.	DESCRIPTION & REMARKS
		17.00	(5.2m)		
6	500	16.66			Soft grey silty clay containing a large amount of organic matter in upper levels
7	600	16.66	-2.4		Slightly clayey gravel.

Norwest Holst Soil Engineering Ltd.

Borehole No.

3

Contract No. F8837
Location Butetown Sewr. Diversion
Client South Glamorgan C.C.
Method of Boring Cable Percussion
Diameter of Borehole 150mm

BOREHOLE LOG

ST17SE 322

Sheet 1 of 1
Chainage
Ground Level 5.46 m.A.O.D.
Date 2/6/90

1846 74300

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
Very soft, dark grey silty organic CLAY					1.00 (4) N.R. 1.80 (4) 2.80 (5) 4.30 (4) 5.80 s	"2"	
Dense, brown and dark grey fine to coarse subangular to rounded GRAVEL with occasional cobbles and with much fine to coarse slightly silty sand.		6.60	-1.14		7.00 s	"51"	
Borehole complete at 8.50m.		8.50		8.00			2/6

Type of Sample

- Is S.P.T. ■ Undisturbed
Ic C.P.T. x Vane
0 Jar △ Water
● Bulk ■ Piezometer

Remarks (Observations of Ground Water etc.) () U100 Blows

N.R - No recovery

Groundwater encountered at 6.60m, rising to 5.10m in 20 minutes.
Groundwater level pm. 4.10m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No.

2

Contract No. F8837

BOREHOLE LOG

Location Butetown Sewer Diversion

Sheet 1 of 1

Client South Glamorgan C. C.

ST178E 321

Chainage

Method of Boring Cable Percussion

Ground Level 6.10 m.A.O.D.

Diameter of Borehole 150mm

18478 74298

Date 1/6/90

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
MADEGROUND: Clinker and brick		1.00	5.10		1.00 (7)		
Very soft dark grey silty organic CLAY		3.50	2.60		2.00 (6) 3.00 (8)		
Soft, dark grey silty organic CLAY with a little fine to medium rounded gravel.		5.20	0.60		4.50 (12)		
Dense, yellowish brown, fine to coarse, subangular to rounded, GRAVEL and occasional cobbles with some fine to coarse sand		7.50			5.50 7.00	"37" "48"	
Borehole complete at 7.50m.				6.80	s		1/6

Type of Sample

Is S.P.T. Undisturbed

Ic C.P.T. Vane

0 Jar Water

● Bulk Piezometer

Remarks (Observations of Ground Water etc.) () U100 Blows

Groundwater encountered at 6.00m, no rise

Groundwater level at 1.00pm, 5.20m

Groundwater level at 3.00pm 4.90m.

Equipment & Methods
Hand dug inspection pit to 1.20m. Cable tool boring, 200mm
dia to 20.00m.

Location No. 169015

Location

CARDIFF BAY BARRAGE, GROUNDWATER CONTROL SYSTEM

Carried out for
Cardiff Bay Development Corporation

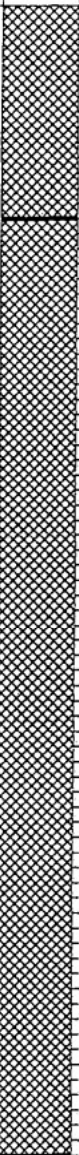
Ground Level
10.39 m AOD

Coordinates

318498.30 mE
174275.90 mN

Date _____

08/03/1999
10/03/1999

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests			Field Records	
				Depth	Sample			Test
					Type	No.		
Firm brown to grey brown sandy CLAY with some to many gravel sized fragments of brick and siltstone. Some cobbles and boulders. (MADE GROUND)	10.39		(1.40)					
	8.99		1.40					
Soft grey, locally brown CLAY with a little sand and some to many gravel, cobble and boulder sized fragments of sandstone. (MADE GROUND).			(6.20)					

Remarks

1. No samples above 5.50m.
2. Chiselling from 1.40-7.60m for 1.5 hours intermittantly and from 10.10-20.00m for 2.5 hours intermittantly.
3. Water struck at 10.10m, rose to 8.10m in 20 minutes.

Notes:

Logged by	
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14

Scale

1:50

Fig.

1 / 521 A



BOREHOLE No. BH1/PB1A

(c) Soil Mechanics (Ver 5.7)



Soil Mechanics

BOREHOLE No. BH1/OB1

Sheet 1 of 4

Equipment & Methods
Hand dug inspection pit to 1.20m. Cable tool boring. 300mm
dia to 5.00m. then dia to 19.00m.

Location No. 169015

Location

CARDIFF BAY BARRAGE, GROUNDWATER CONTROL SYSTEM

Carried out for
Cardiff Bay Development Corporation

Ground Level

10.29 m AOD

Coordinates

318511.25 mE

174275.21 mN

Date

11/04/1999

to 12/04/1999

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests			Field Records	
				Depth	Sample			Test
					Type	No.		
Grey brown GRAVEL sized fragments of concrete with some sandy clay matrix. (MADE GROUND)	10.29		(0.80)	0.30	D	1A		
	9.49		0.80	0.30	D	1A		
Soft grey brown sandy CLAY with some, locally many gavel, cobble and boulder sized fragments of sanstone and concrete. (MADE GROUND)					1.00	D	2A	
					1.00	D	2A	
					2.00	D	3A	
					2.00	D	3A	
					2.80	D	4A	
					2.80	D	4A	
					3.80	D	5A	
					3.80	D	5	
					4.80	D	6A	
					4.80	D	6A	
			5.80	D	7A			
			5.80	D	7			
Firm, below about 9.00m becoming soft grey organic CLAY with some plant remnants and relic roots. (ALLUVIUM)	3.39		6.90	6.80	D	8A		
				6.80	D	8A		
				7.00	D	9A		
				7.00	D	9A		
				8.00	D	10		
				8.00	D	10		
				9.00	D	11		
				9.00	D	11		
			10.00	D	12			
				10.00	D	12		

Remarks

1. Borehole started in 200mm dia. but reamed out with 300mm dia to 5.00m due to excessive raking of casing.
2. Water struck at 10.20m, rose to 9.10m in 20 minutes.
3. Chiselling from 1.80-5.00m for 2.5 hours intermittantly and from 5.00-19.00m intermittantly.

Notes:

Logged by

IW

Scale

1:50

Fig.

1/OB1



BOREHOLE No. BH1/OB1

Sheet 2 of 4

Equipment & Methods

Location No.	169015
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As sheet 1

Location

CARDIFF BAY BARRAGE. GROUNDWATER CONTROL SYSTEM

Carried out for

Ground Level

Coordinates

Date _____

Cardiff Bay Development Corporation

As sheet 1

[illegible]

Remarks

4. Gas standpipes installed at 6.80 and 19.00m upon completion.

5. Deep standpipe developed for 1.5 hours on 21/04/99. 500L airlifted.

Notes:

Logged by	
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IW

Scale

1:50

Fig

170B1

(c) Soil Mechanics (Ver 5.7)



ST17SE4403T17SE441

ST17SE1101

ST17SE396

E_ST17SE245

ST17SE245

ST17SE246

ST17SE1100

ST17SE461

ST17SE249

ST17SE250

Grange town

D_ST17SE248

ST17SE248

ST17SE247

C_ST17SE21

ST17SE21

ST17SE357

ST17SE415

ST17SE365

ST17SE370

ST17SE366

ST17SE987

ST17SE988

ST17SE997

ST17SE999

ST17SE992

ST17SE996

ST17SE993

ST17SE994

ST17SE995

ST17SE10003T17SE990

ST17SE998

ST17SE991

A_ST17SE451

ST17SE451ST17SE450

B_ST17SE450

ST17SE452