

Archaeological Watching Brief Report Arun Tidal Defences, Littlehampton

NGR: Centred 502225,102175 (TQ 022 021)

> ASE Project No: 5671 Site Code: ATD 12

ASE Report No: 2012238 OASIS ID: archaeol6-137953

By Dan Swift



November 2012

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Archaeology South-East

WB: Arun Tidal Defences, Littlehampton ASE Report No: 2011238

Abstract

Archaeology South-East was commissioned by Halcrow group Ltd to conduct an archaeological watching brief during geotechnical investigations on the River Arun in Littlehampton.

No archaeological finds, features or deposits were seen in the watching brief, only modern made ground and natural deposits.

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Archaeology South-East

WB: Arun Tidal Defences, Littlehampton

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1.0 INTRODUCTION

1.1 Site Background

1.1.1 Archaeology South-East (ASE), the contracting division of the Centre for Applied Archaeology (CAA), Institute of Archaeology (IoA), University College London (UCL) was commissioned by Halcrow group Ltd to conduct an archaeological watching brief during geotechnical investigations on the River Arun in Littlehampton (centred on NGR: 502225,102175; Figure 1)

1.2 Geology and Topography

- 1.2.1 The site consisted of a level stretch of land along the eastern bank of the River Arun in Littlehampton. The British Geological Society website (BGS 2012) lists superficial deposits as Raised Marine Deposits clay, silt, sand and gravel formed in shallow seas with mainly siliciclastic sediments (comprising of fragments or clasts of silicate minerals) deposited as mud, silt, sand and gravel.
- 1.2.2 Bedrock geology description: Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Forma. Sedimentary Bedrock formed approximately 71 to 94 million years ago in the Cretaceous Period. Local environment previously dominated by warm chalk seas. They often consist of a calcareous ooze of the microscopic remains of plankton, especially the disc shaped calcite plates or coccoliths that make up the spherical coccolithophores.

1.3 Aims and Objectives

1.3.1 The site required no Written Scheme of Investigation; however, a technical note (Halcrow 2012) listed the following objectives:

The archaeological monitoring will:

- Recover any dateable material that might be thrown up by the investigation
- Establish the archaeological significance of the deposits disturbed by the investigation
- Make a stratigraphic record of the deposits or features exposed
- Produce a report on the stratigraphic sequence of deposits within the exploratory holes and trial pits

1.4 Scope of Report

1.4.1 The scope of the watching brief was to provide archaeological monitoring on geotechnical investigations along the proposed River Arun Tidal Walls scheme in Littlehampton, West Sussex. This document reports on observations made during the investigation with the purpose of informing mitigation against any potential adverse impacts on buried archaeology.

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2.0 ARCHAEOLOGICAL BACKGROUND

- 2.1 The Sussex coastal plain, on which the site is situated, has long attracted human activity due to its fertile and easily worked soils, fresh water from the Rivers Adur and Arun and numerous 'rifes' or tributary streams and proximity to the English Channel and sea routes to the continent.
- 2.2 Neolithic settlement on the coastal plain and the nearby South Downs is known to have occurred from c. 4,000BC, as dated by C14 at such sites as the extensive flint mine sites around nearby Findon. Aside from monuments such as flint mines, causewayed enclosures and burial mounds, little is understood of Neolithic settlement in the area and 'domestic' sites are largely limited to flint scatters or isolated pits/pit groups, which may have had a symbolic rather than domestic purpose.
- 2.3 From the Bronze Age, evidence from numerous sites across the coastal plain suggests a landscape which is becoming increasing partitioned and ordered. Surface finds of flint tools and pottery suggest that activity was occurring in the vicinity of the site during the Bronze Age.
- 2.4 During the Later Iron Age and Romano British periods there is an increasing intensification of activity on the coastal plain as seen through the building of extensive Chichester Entrenchments, Fishbourne Palace and construction the numerous villa's. This is evidenced through the numerous surface finds, settlements and enclosures and funerary remains.
- 2.5 There is little evidence for Saxon or medieval activity other than place name evidence
- 2.6 Littlehampton grew as a town in the 19th century.

3.0 ARCHAEOLOGICAL METHODOLOGY

3.1 Fieldwork Methodology

- 3.1.1 Several visits were made to the site to monitor the risings from several geotechnical boreholes and hand dug investigation pits at the top of borehole locations made in advance of bore holing.
- 3.1.2 At an early stage of works it became clear that progress was slow due to onsite constraints, and that made ground was being routinely exposed as opposed to deposits of potential archaeological interest. Through direct discussion with Halcrow and their client the Environment Agency it was decided to drop visits right down in this instance and see only a few selected boreholes along the scheme.
- 3.1.3 Five visits were made to the site:

Date of Visit	Work at time of visit
18 9 12	Borehole 2
19 9 12	Borehole 5
24 9 12	Borehole 11
25 9 12	Borehole 10
11 10 12	Borehole 16

Table 1: Site visits

3.1.4 Observations were made on standard ASE recording sheets.

3.3 The Site Archive

3.3.1 ASE informed Worthing/Littlehampton Museum prior to the commencement of fieldwork that a site archive would be generated. The site archive is currently held at the offices of ASE and will be deposited with them in due course. The contents of the archive are tabulated below.

Number of Contexts	9
No. of files/paper record	1 file
Digital photographs	17

Table 2: Quantification of site archive

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4.0 RESULTS

No archaeological finds, features or deposits were seen in the watching brief, only modern made ground and (redeposited) natural deposits.

4.1 Borehole 2 monitored 18 9 12

Context	Туре	Description	Deposit Thickness m	Depth below ground
B2 01	-	Concrete	0.30	-
B2 02	Layer	Modern made ground	0.30	0.30
B2 03	Layer	Redeposited brickearth	0.10	0.40
B2 04	Layer	Chalk (rubble?)	+ 0.50	0.50

Table 3: List of recorded contexts in Borehole 2

4.2 Borehole 5 monitored 19 9 12

			Deposit	Depth below
Context	Type	Description	Thickness m	ground
B5 01	-	Concrete	0.30	-
B5 02	Layer	Modern made ground	+ 0.90	0.30

Table 4: List of recorded contexts in Borehole 5

4.3 Borehole 11 monitored 24 9 12

Context	Туре	Description	Deposit Thickness m	Depth below ground
B11 01	-	Concrete	0.10	-
B11 02	Layer	Modern made ground	0.34	0.10
B11 03	Layer	Silty clay	0.36	0.44
B11 04	Layer	Chalk rubble	+ 0.40	0.80

Table 5: List of recorded contexts in Borehole 11

4.4 Borehole 10 monitored 25 9 12

Context	Туре	Description	Deposit Thickness m	Depth ground	below
B10 01	-	Tarmac	0.05	-	
B10 02	Layer	Modern made ground	0.34	0.05	
B10 03	Layer	Chalk	0.09	0.39	
B10 04	Layer	Gravel (made ground)	0.20	0.48	
B10 05	Layer	Chalk	+ 0.40	0.68	·

Table 6: List of recorded contexts in Borehole 10

4.5 Borehole 16 monitored 11 10 12

Context	Туре	Description	Deposit Thickness m	Depth below ground
B16 01	Layer	Topsoil	0.15	-
B16 02	Layer	Natural(?) clay	+ 1.05	0.15

Table 7: List of recorded contexts in Borehole 16

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5.0 DISCUSSION AND CONCLUSIONS

- 5.1 No archaeological finds, features or deposits were seen in the watching brief, only modern made ground and (redeposited) natural deposits.
- 5.2 The results of the watching brief are consistent with those from other boreholes not monitored in the watching brief (see borehole logs in the appendix of this report) which imply that the area monitored consists of modern made ground to varying depth of between 0.75 and 4.50m below ground surface (BGL).
- 5.3 As a very general rule (based on the borehole logs NOT on the observations made during the watching brief) this depth of modern made ground appears to be greater to the south of the area of the scheme (nearer the seafront) and thinner to the north of the scheme.

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WB: Arun Tidal Defences, Littlehampton

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BIBLIOGRAPHY

BGS 2012 http://mapapps.bgs.ac.uk/geologyofbritain/home.html Accessed 20 11 12

Halcrow 2012 Technical Note: River Arun Tidal Walls, Brief for Archaeological Monitoring of Geotechnical Ground Investigation

ACKNOWLEDGEMENTS

ASE would like to thank Halcrow Group Limited for commissioning the work and for their assistance throughout the project. The watching Brief was conducted by Diccon Hart and Antonio Reis. The figures for this report were produced by Antonio Reis. Darryl Palmer managed the fieldwork and Dan Swift managed the post-excavation process.

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HER Summary Form

Site Code	ATD 12					
Identification Name	Archaeolog	Archaeological Watching Brief Report				
and Address	Arun Tidal	Arun Tidal Defences, Littlehampton				
			·			
County, District &/or	Arun, Wes	t Sussex				
Borough	·					
OS Grid Refs.	Centred 50)2225,10217	' 5			
Geology	Chalk					
Arch. South-East	5671					
Project Number						
Type of Fieldwork	Eval.	Excav.	Watching	Standing	Survey	Other
			Brief	Structure		
Type of Site	Green	Shallow	Deep	Other		
	Field	Urban	Urban			
Dates of Fieldwork	Eval.	Excav.	WB.	Other		
			18/9/12-			
			11/10/12			
Sponsor/Client	Halcrow					
Project Manager	Darryl Palr	ner				
Project Supervisor	Diccon Ha	rt/Antonio Re	eis			
Period Summary	Palaeo.	Meso.	Neo.	BA	IA	RB
	AS	MED	PM	Modern		

Summary

Archaeology South-East was commissioned by Halcrow group Ltd to conduct an archaeological watching brief during geotechnical investigations on the River Arun in Littlehampton.

No archaeological finds, features or deposits were seen in the watching brief, only modern made ground and natural deposits.

OASIS Form

OASIS ID: archaeol6-137953

Project details

Project name Arun Tidal Defences, Littlehampton

the project

Short description of Archaeology South-East was commissioned by Halcrow Group Ltd to conduct an archaeological watching brief during geotechnical

investigations on the River Arun in Littlehampton. No archaeological finds, features or deposits were seen in the watching brief, only modern made ground and natural deposits.

Project dates Start: 18-09-2012 End: 11-10-2012

Previous/future

work

No / Not known

Any associated project reference

codes

ATD12 - Sitecode

Type of project Recording project

Site status None

Current Land use Coastland 2 - Inter-tidal

Investigation type "Watching Brief"

Project location

Country England

Site location WEST SUSSEX ARUN LITTLEHAMPTON Arun Tidal Defences,

Littlehampton

Postcode **BN17 5DD**

Site coordinates TQ 022 021 50 0 50 48 31 N 000 32 57 W Point

Project creators

Name of Organisation Archaeology South-East

Project brief originator

Halcrow Group Limited

Project design originator

Halcrow Group Limited

Project director/manager **Darryl Palmer**

Project supervisor Antonio Reis

Project supervisor Diccon Hart

Archaeology South-East

WB: Arun Tidal Defences, Littlehampton ASE Report No: 2011238

Type of

sponsor/funding

body

Client

Name of

sponsor/funding

body

Halcrow Group Limited

Project archives

Digital Archive recipient

Littlehampton Museum

Digital Archive ID

ATD 12

Digital Contents

"Stratigraphic"

Digital Media available

"Text"

Paper Archive

recipient

Littlehampton Museum

Paper Archive ID

ATD 12

Paper Contents

"Stratigraphic"

Paper Media available

"Context sheet","Correspondence","Photograph","Report"

Project bibliography 1

Grey literature (unpublished document/manuscript)

Publication type

Title Archaeological watching brief report, Arun Tidal Defences,

Littlehampton

Author(s)/Editor(s) Swift, D

Other bibliographic

details

ASE Report No: 2012238

Date 2012

Issuer or publisher ASE

Place of issue or

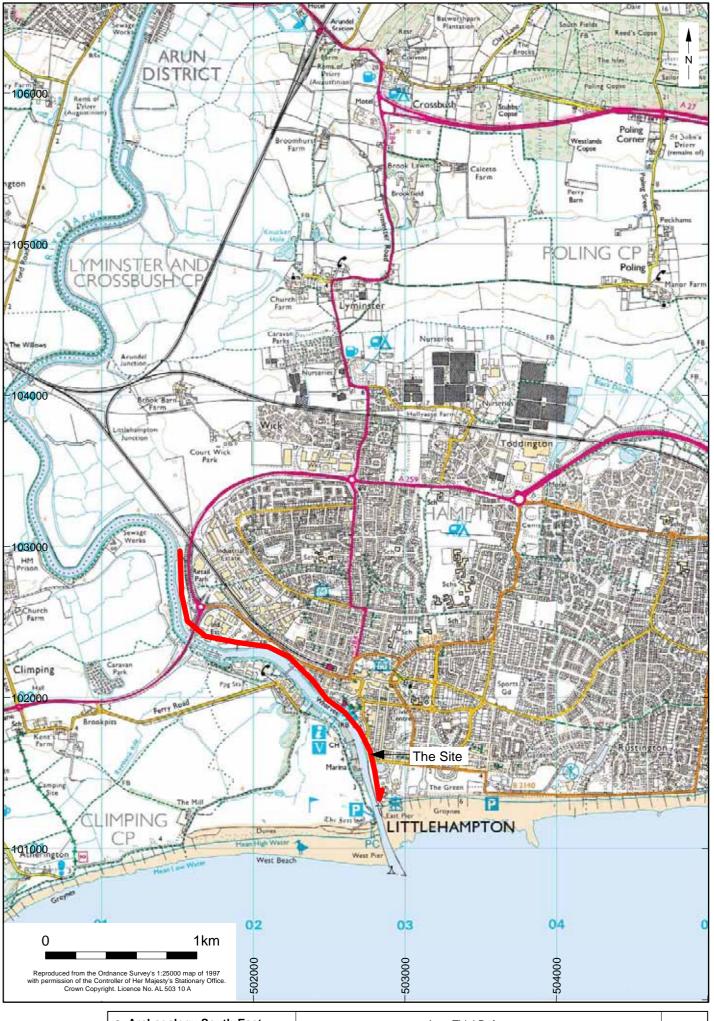
publication

Portslade

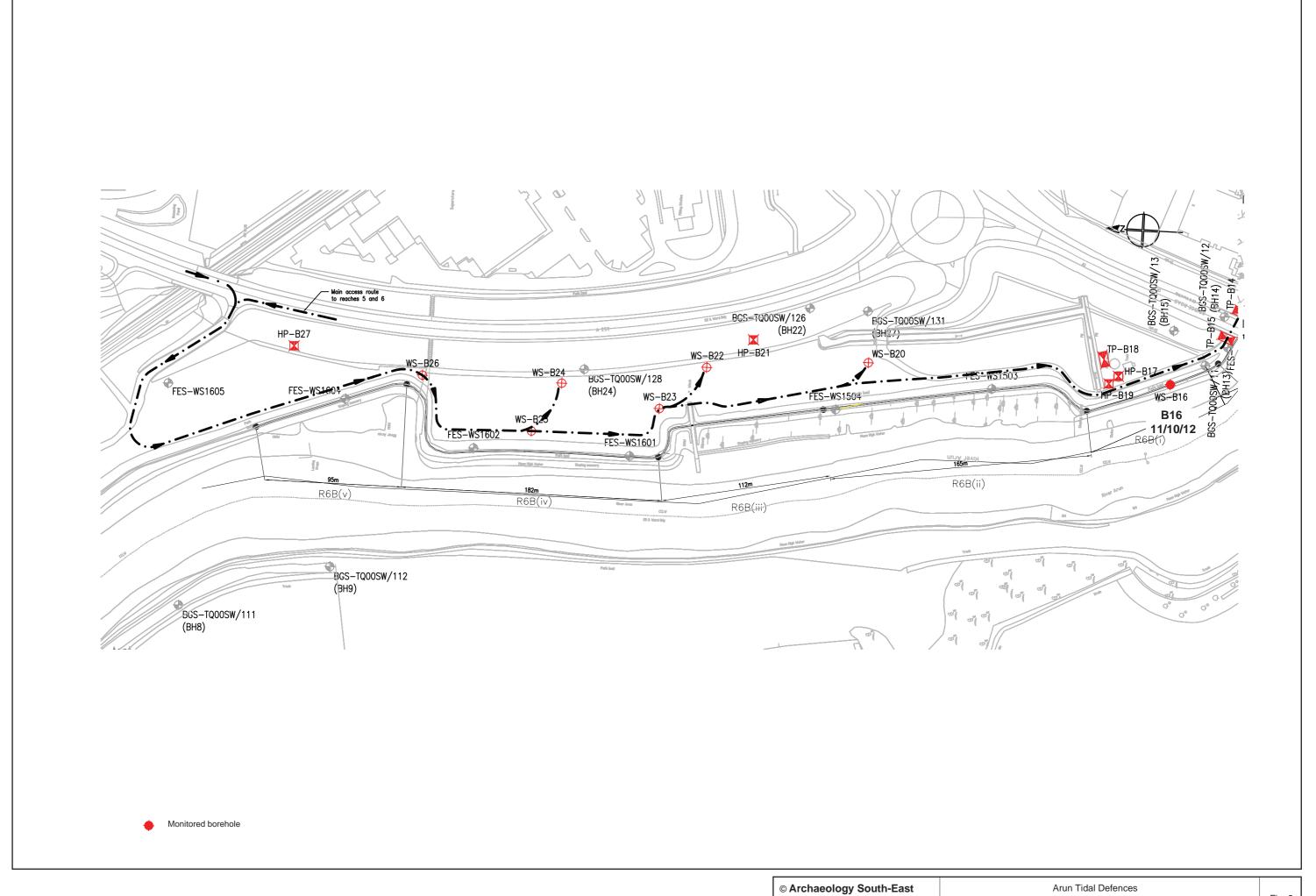
Description grey lit bound rep

Entered by Dan Swift (d.swift@ucl.ac.uk)

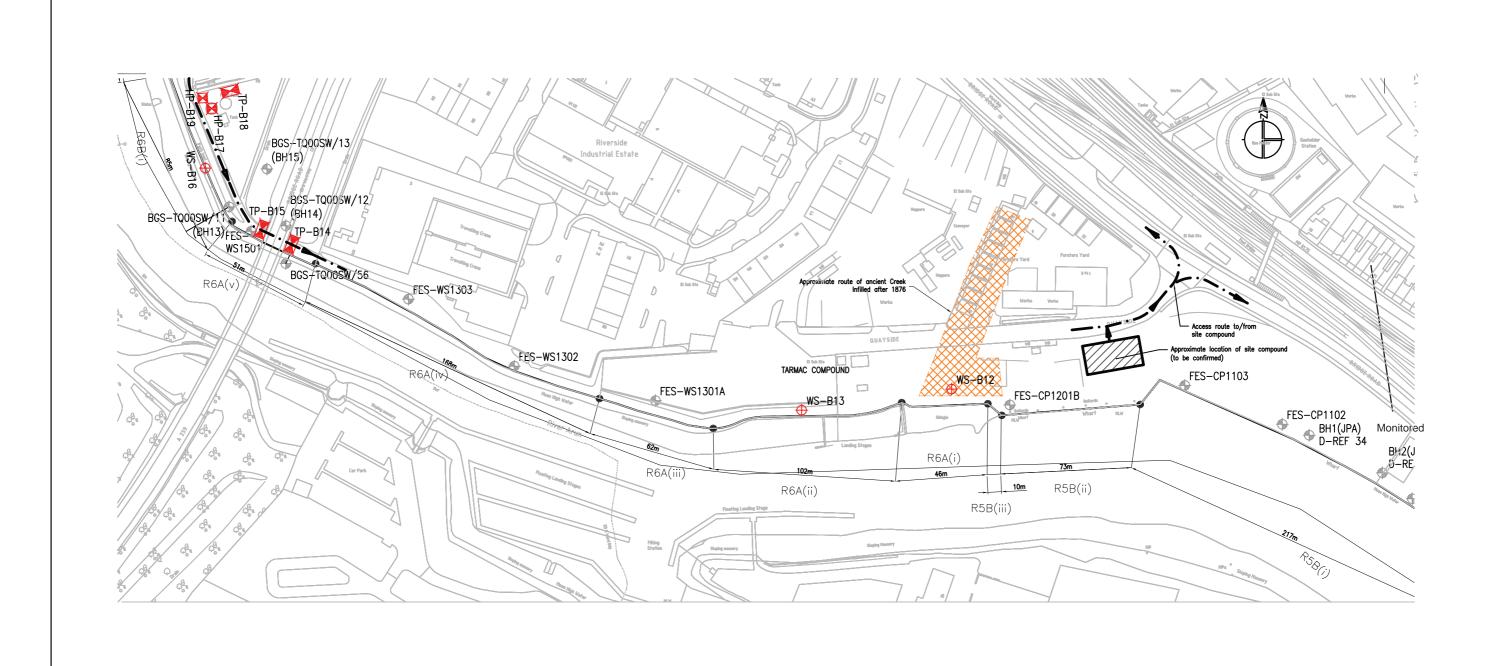
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© Archaeology So	outh-East	Arun Tidal Defences	Fig. 1	
Project Ref: 5671 Nov 2012		Site location	i ig. i	l
Report Ref: 2012238	Drawn by: JLR	Site location		l

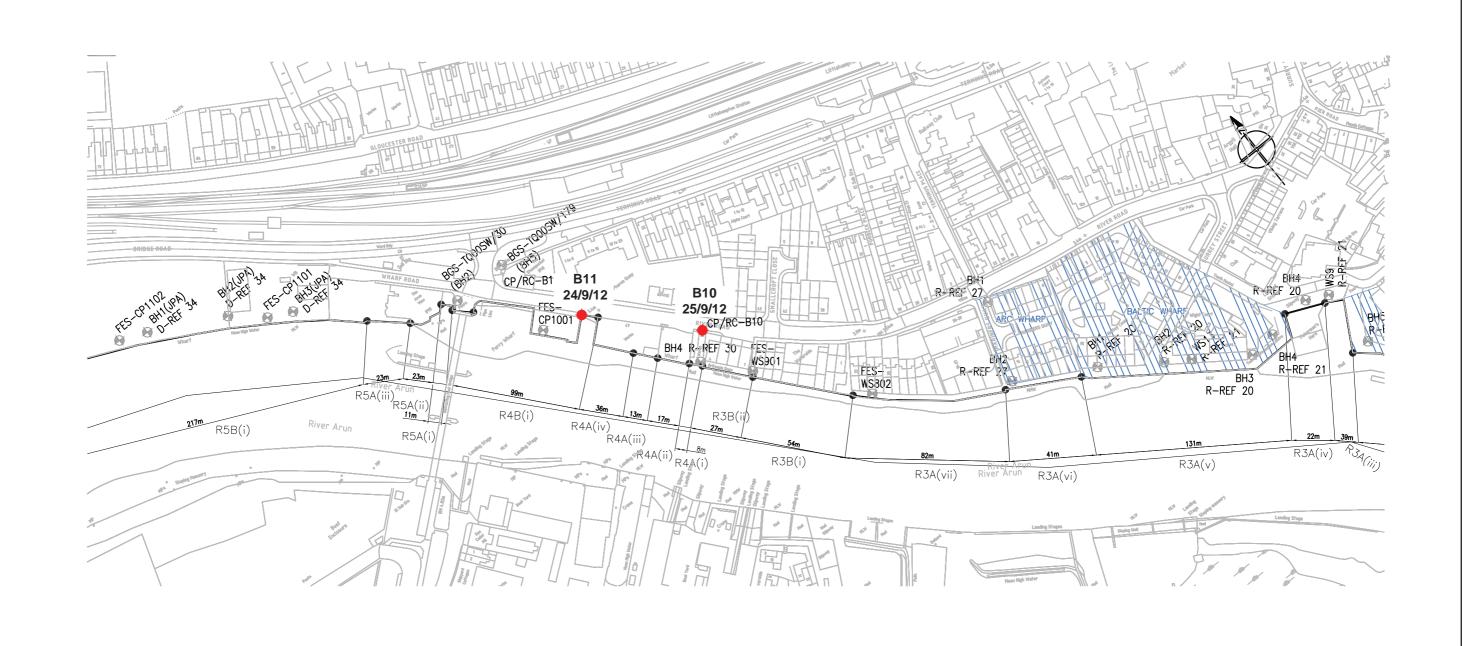


© Archaeology S	outh-East	Arun Tidal Defences	Fig. 2
Project Ref: 5671	Nov 2012	Borehole location 1	rig. z
Report Ref: 2012238	Drawn by: sht	Boreriole location 1	



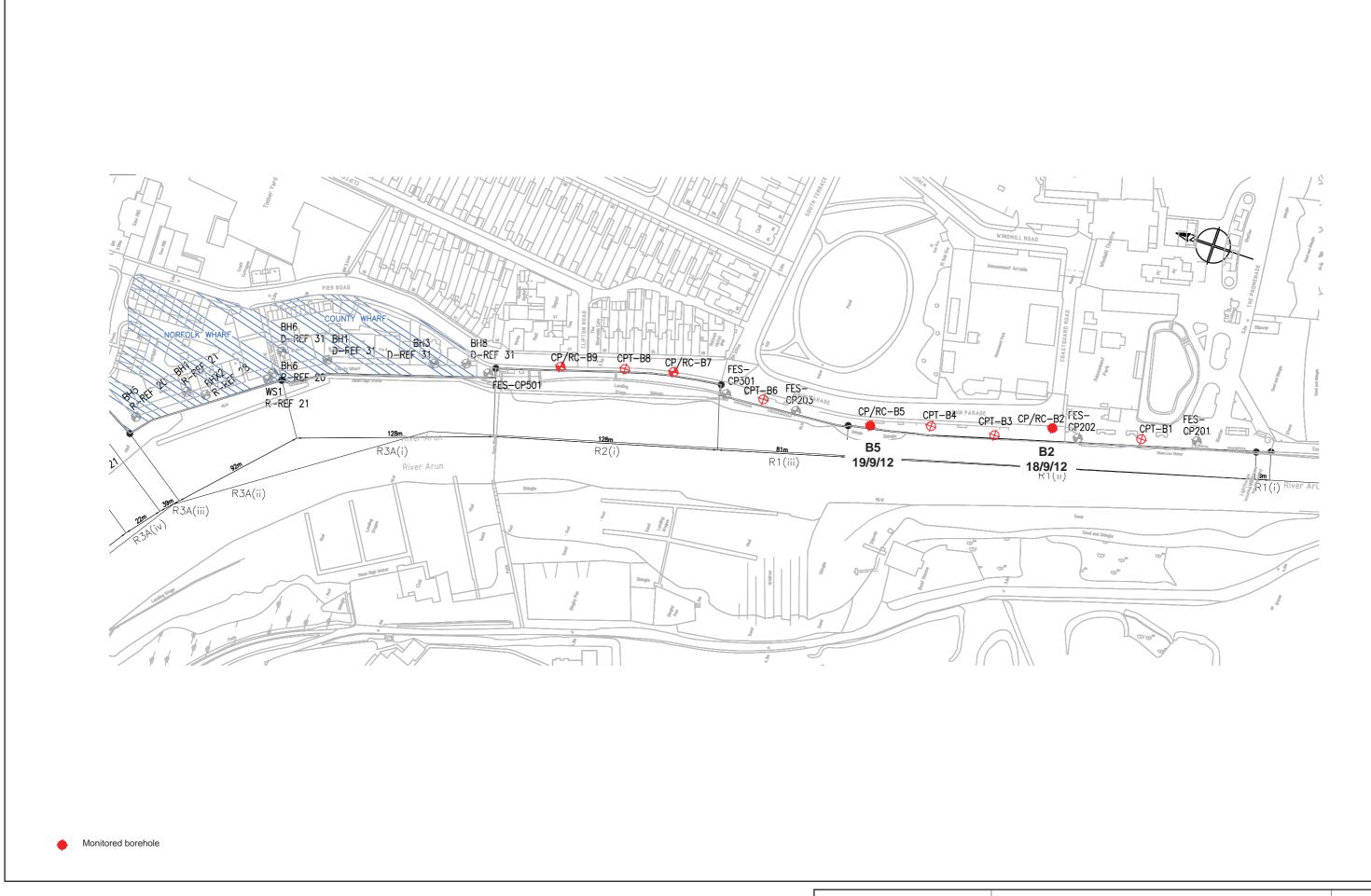
Monitored borehole

© Archaeology S	outh-East	Arun Tidal Defences	Fig. 3
Project Ref: 5671	Nov 2012	Parahala lagationa 2	rig. 3
Report Ref: 2012238	Drawn by: st	Borehole locations 2	



Monitored borehole

© Archaeology South-East		Arun Tidal Defences	Fig. 4
Project Ref: 5671	Nov 2012	Borehole locations 3	1 lg. 4
Report Ref: 2012238	Drawn by: st	Dorentole locations 3	



© Archaeology South-East

Project Ref: 5671 Nov 2012
Report Ref: 2012238 Drawn by: sht

Arun Tidal Defences

Borehole location 4



B2



В5

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Project Ref: 5671	Nov 2012	Calcated whatagraphs	rig. o
Report Ref: 2012238	Drawn by: JI R	Selected photographs	





© Archaeology S	outh-East	Arun Tidal Defences	Fig. 7
Project Ref: 5671	Nov 2012	Calcated photographs	rig. /
Report Ref: 2012238	Drawn by: JLR	Selected photographs	



Drilling Method Cable Percussion and **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB2 200mm to 10.00m 200mm to 10.00m Rotary Equipment Dando 3000 150mm to 19.75m Coordinates 502797 F (National Grid) Knebel 101413 N Ground Level 3.81 m OD Crew/Vessel S Purvis/R Johnson Logged by Compiled by Approved by **Dates Drilled** 18/09/2012 Start AΗ clm End 26/09/2012 19/09/2012 21/09/2012 14/11/2012 Depth SPT U100 Depth Sample Details Date Casing Blows/N Drive Blows/ Recovery Level Legend to (Thick-& Depth **Description of Strata** ness) Water mm Depth (m) Time (m) Type No. (m) From Test Result To (m) 18/09 MADE GROUND: Tarmacadam. (0.05 3.76 0.05 MADE GROUND: Strong dark grey concrete with (0.17 5mm diameter (100mm x 100mm) mesh 3.59 0.22 MADE GROUND: Composed of angular coarse gravel sized fragments of chalk with traces of brown reworked comminuted chalk. (0.98) 2.61 1.20 DRY 1.20-1.65 1 2 s4 MADE GROUND: Composed of white becoming light brown very clayey subangular to subrounded fine and medium gravel and occasional cobble sized chalk and rare subangular medium flint. (Reworked chalk). 1,20-1,70 1.60 DRY 2.00-2.45 2.00-2.50 **S**6 (1.60) 2.80 1.01 Medium dense light grey brown gravelly to very gravelly fine and medium calcareous SAND. Gravel is predominantly subangular locally very angular coarse of flint. Single flint cobble (100mm x 75mm). 3.00-3.45 3.00-3.50 2.90 DRY D S17 (0.70)18/09 2.90 DRY 19/09 2.90 DRY 3.50 0.31 Medium dense brown and grey brown very sandy angular to subrounded fine to coarse flint GRAVEL with low cobble content. Sand is fine to coarse. 4.00-4.50 3.80 GL C15 4.00-4.50 At 4.50m: Gravel is occasionally rounded.

Remarks 1 (See notes

1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Between 5.00m and 5.50m: Gravel becomes fine to coarse with rare flint cobbles (125mm \times

& keysheets) 2 Groundwater was encountered at 3.45m during boring and rose to 3.45m after 5 mins,3.45m after 10 mins,3.45m after 15 mins,3.45m after 20 mins.

3 Chiselled from 2.80m to 3.00m (30 mins); chiselled from 6.50m to 6.80m (30 mins); chiselled from 8.20m to 8.60m (60 mins).

See separate sheet for installation.

5.00-5.50

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Contract No.

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Figure No.

FR1 (1 of 6)

Drilling Method Cable Percussion and **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB2 Rotary 200mm to 10.00m 200mm to 10.00m Equipment Dando 3000 150mm to 19.75m Coordinates 502797 F (National Grid) Ground Level Knebel 101413 N 3.81 m OD Crew/Vessel S Purvis/R Johnson Logged by Compiled by Approved by **Dates Drilled** Start 18/09/2012 ΑН ВĊ clm End 26/09/2012 19/09/2012 21/09/2012 14/11/2012 Depth **SPT** U100 Depth Sample Details Casing Date Blows/N Drive mm Blows/ Recovery mm to Level Legend (Thick-Depth & **Description of Strata** ness) Water Depth (m) Time (m) No. Type (m) From To Test Result (m) 4.90 GI 5.00-5.45 C22 75mm). 6.00-6.50 6.00-6.45 в 10 At 6.00m: Probable cobble. (5.00) 6.00 GL C34 7.50-8.00 в 11 Between 7.50m and 8.00m: Gravel becomes slightly sandy predominantly coarse with rare flint cobbles (73mm x 80mm). 7.40 GL 7.50-7.95 C14 8.50 D 12 8.50 -4.69 Probably very weak white structureless CHALK Probably very weak white structureless char recovered as silt and fine to coarse sand sized comminuted chalk with fine to coarse gravel sized fragments of very weak chalk and angular fine gravel sized fragments of Below 9.00m: Recovered as very weak to weak subrounded cobble sized fragments (100mm x 125mm) of chalk and flint (75mm x 80mm). 8.90 GL 9.00-9.45 s16 9.00-9.50 (1.50) 19/09 10.00 TIDAL 10.00 -6.19 Extremely weak becoming very weak with depth

Remarks

(See notes & keysheets)

Scale 1:25

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Figure No.

FR1 (2 of 6)

301/04

Drilling Method Cable Percussion and

Rotary Dando 3000 Equipment Knebel

Drill Fluid

Polymer GS550 S Purvis/R Johnson Crew/Vessel Dates Drilled Start 18/09/2012 End 26/09/2012

Borehole Diameter 200mm to 10.00m 150mm to 19.75m

19/09/2012

Casing Diameter 200mm to 10.00m **BOREHOLE No.**

CPRCB2

Coordinates (National Grid) Ground Level

502797 **E** 101413 N 3.81 m OD

Approved by BC 14/11/2012 Logged by Compiled by clm 21/09/2012

		Mater	20/03/2				/	05/203		5/2012 14/11/2012	1		_							
Data	C!	Water Depth	Sar	nple/Co	re Rec	overy		SPT Blows	Result		Depth									
&	Casing Depth	(m) (Flush	Depth	(m)	Туре			/N Core	or Fracture	Description of Strata	(Thick- ness)	Level	Legend							
Time	(m)	Return)	From	To	TCR %	SCR %	RQD %	Size (mm)	Index		(m)									
04/00	, ,				,,,	,,	,,,	()	_			- 10	11 11 11							
24/09	10.00	9.50	- - -						3 AZCL	low density orange white and locally orange stained and black speckled CHALK. Fractures are extremely closely to closely spaced (<5/25/200) predominantly	10.00	-6.19								
		(100)	10.00	-10.75	63	53	53			inclined (5 degrees to 50 degrees) locally with <1mm comminuted chalk veneer, orange staining and slight black speckling to surfaces. (B4/B3)										
			- - - - -						2	Between 10.24m and 10.40m: Brown / black flint nodule. Between 10.40m and 10.47m: Non intact. Recovered as extremely weak angular fine	‡ - -									
			- - - -						>25	to coarse gravel sized fragments of chalk. Between 10.47m and 10.75m: Assumed zone of core loss. Between 10.85m and 10.91m: Flint nodule										
			- - -							(65mm x 70mm x 90mm). Between 11.10m and 11.14m: Possible tubular flint nodule recovered as subangular fine and medium gravel sized	‡ • •									
		(100)	_ 10.75	-12.25	100	83	83		NI	fragments. Between 11.25m and 11.52m: Extremely weak with orange staining and slight black speckling.	-									
			11.64	-11.80	CS	15				Between 11.34m and 11.41m: 1 No. flint nodule (40mm x 60mm). Between 11.83m and 11.98m: Recovered as	<u> </u>									
	10.00		- - - -					S48		angular and subangular fine to coarse gravel sized fragments of extremely weak orange chalk. Between 12.11m and 12.13m: 1 No. brown flint (15mm x 20mm).	<u> </u>									
			-						NI	Between 12.25m and 12.41m: Recovered as angular and subangular fine to coarse gravel sized fragments of brown / black	<u> </u>									
		GL	12.25- -	-12.70						flint (up to 30mm x 40mm x 50mm).	<u> </u>									
			12.78	-12.95	Cs	16			>25	Between 12.70m and 12.77m: Non intact. Recovered as subangular medium and coarse gravel sized fragments. Possible highly fracture zone.	‡ ‡ ‡									
		(100)	_ 12.25	-13.75	100	100	81		6	Between 13.09m and 13.17m: Rinded flint nodule (40mm x 80mm).	<u></u>									
			13.33	-13.45	Cs	17										AZCL	Between 13.25m and 13.33m: Recovered as subangular coarse gravel sized fragments with abundant orange staining.	‡ ‡		
	1		H					Ī	NI		⊢									
			- - -														Between 13.66m and 13.69m: 1 No flint nodule (20mm x 70mm). Between 13.75m and 13.85m: Assumed zone	<u> </u>		
	10.00	GL	13.75	-14.02				s28/ 115	NI	of core loss. Between 13.85m and 14.05m: Recovered as angular fine to coarse gravel sized fragments of brown flint (up to 40mm x50mm x 75mm).	<u> </u>									
	40.00		- - - -					NI	Between 14.10m and 14.20m: Recovered as angular fine to coarse gravel sized fragments of black and grey flint (up to 60mm x 60mm x 65mm).	‡ ‡										
		(100)	_ 13.75	-15.25	93	81	81		_	N 14 64- Partin	<u> </u>									
			14.65	-14.87	cs	18			5	At 14.64m: Possible 3mm to 4mm clay band. Between 14.87m and 14.93m: Recovered as	<u> </u>									
			- - -							angular coarse gravel sized fragments (40mm x 40mm x 40mm).	(9.75)									

Remarks (See notes & keysheets)

Scale 1:25

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Figure No.

FR1 (3 of 6)

Drilling Method Cable Percussion and **Borehole Diameter Casing Diameter BOREHOLE No.**

Rotary Dando 3000 200mm to 10.00m 150mm to 19.75m 200mm to 10.00m Equipment

Coordinates (National Grid) Ground Level 502797 E 101413 N 3.81 m OD Knebel Drill Fluid Polymer GS550 S Purvis/R Johnson Crew/Vessel Dates Drilled Approved by BC 14/11/2012 Logged by Compiled by Start 18/09/2012 End 26/09/2012 AH clm 19/09/2012 21/09/2012

CPRCB2

	1.	End	26/09/2012				/09/201	12 21/0	9/2012 14/11/2012			
Date	Casing	Water Depth	Sample/C	ore Re	covery	<u>' </u>	SPT	Result		Depth		
& Time	Depth (m)	(m) (Flush	Depth (m)		No.	RQD	/N Core	or Fracture	Description of Strata	(Thick- ness)	Level	Legen
IIIIC	(111)	Return) %	From To	%	%	% %	Size (mm)	Index		(m)		
			- -						Between 15.13m and 15.25m: Recovered as	Ţ		
			- -					_	angular fine to coarse gravel sized	ļ		
			15.25-15.4	8			S50/	5	fragments of extremely weak orange chalk with abundant comminuted chalk.	‡		11,11
	10.00	GL	15.25-15.3	8 CS	19		130			Ŧ		
										F		
			- -						Datasan 15 50m and 15 01m Danasan 3 an	‡		11,11
			<u>-</u>						Between 15.70m and 15.91m: Recovered as angular and subangular fine to coarse	ļ.		111111
			E						gravel sized fragments of brown flint.	Ē		i l'i
		(100)	_ _ 15.25-16.7	5 100	100	100				Ł		11,1,11
			-					5	Between 16.11m and 16.13m: Recovered as angular and subangular fine to coarse	ţ		
			-						gravel sized fragments of brown flint (2mm).	‡		
			E						Between 16.22m and 16.25m: Recovered as	F		11,11
			-						angular fine and medium gravel sized fragments of brown flint (<1mm to 1mm).	ţ		
			<u> </u>					NI		†		
			16.58-16.7	5 CS	20				Between 16.68m and 16.70m: 1 No. flint nodule (15mm x 20mm diameter).	ŧ		11,11
	10.00	GL	16.75-17.2	0			s38		Between 16.75m and 17.00m: Recovered as angular and subangular fine to coarse	Ŧ		1,1,1,
	10.00	0.2		Ĭ				8	gravel sized fragments of brown flint and extremely weak chalk.	ţ		
			_ _ 16.98-17.1	0 Cs	21			8	extremely weak chalk.	<u> </u>		11,11
			-							Ŧ		
										E		
			- -							‡		11,11
		(100)	_ 16.75-18.2	5 100	100	89				‡		
		(100)	_ 10.75-10.2	3 100	100	"				F		
			<u>.</u>					NI		ţ		11,11
			-							ţ		
			-						Between 17.91m and 18.00m: Recovered as angular and subangular fine to coarse	ŧ		11,11
			<u></u>						gravel sized fragments of brown flint and extremely weak weathered chalk.	F		11,11
1/09	10.00	GL	-					1	Between 18.00m and 18.12m: 1 No. subangular brown flint nodule (100mm x	ţ		
	10.00	8.40	10 25 10 5	<i>c</i>					100mm x 120mm). Between 18.25m and 18.90m: Assumed zone	‡		11,11
	10.00	GL	18.25-18.5				S30/ 160		of core loss.	Ŧ.		11,11
			_							<u> </u>		ir ir
			- -							‡		11,11
			Ė					1		Ē		1,11
										<u>F</u>		ir ir
		(100)	10 05 10 5			57			Data - 10 04 1 10 16- Gabbari - 1	ţ		11,1,1
		(100)	_ 18.25-19.7 - 18.96-19.2			57			Between 19.04m and 19.16m: Subhorizontal orange bands (<2mm thick) pervasive	F		1
			[through core. Between 19.18m and 19.41m: Recovered as	Ŧ.		
			 - -					1	angular and subangular fine to coarse gravel sized fragments of brown flint	ţ		
			<u> </u>						(<1mm to 2mm) and extremely weak orange chalk.	ţ		
			<u> </u>						Between 19.54m and 19.75m: Recovered as	‡		
									subangular fine to coarse gravel sized fragments of extremely weak chalk with	[
	10.00	2.60	19.75-20.0	6			S34/ 155		occasional angular fine to coarse gravel sized fragments of brown flint.	19.75	-15.94	
	10.00	8.40			1	+			End of Borehole	1		
			<u> </u>						-	‡		
	<u> </u>	<u></u>									<u></u>	
	1											

Remarks

(See notes & keysheets)

Scale 1:25

Tugro	Project LITTLEHAMPTON ARUN TIDAL DEFENCES	Contract No.	G120043U	
		Figure No.	FR1 (4 of 6)	304/03

Drilling Method Cable Percussion and **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB2 Rotary 200mm to 10.00m 200mm to 10.00m Coordinates (National Grid) Ground Level Equipment Dando 3000 150mm to 19.75m 502797 **E** Knebel 101413 N 3.81 m OD **Drill Fluid** Polymer GS550 Approved by BC Crew/Vessel S Purvis/R Johnson Logged by Compiled by **Dates Drilled** Start 18/09/2012 clm 19/09/2012 14/11/2012 End 26/09/2012 21/09/2012 Water SPT Blows /N Sample/Core Recovery Depth Depth (m) Result Date Casing (Thick-ness) Type No. Level Legend or & Depth **Description of Strata** Depth (m) (Flush Return) % Core Size (mm) Fracture TCR % SCR % Time (m) RQD % Index From То (m) Remarks (See notes & keysheets) Scale 1:25 **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES

Figure No.

FR1 (5 of 6)

304/03

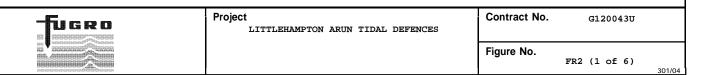
Drilling Method Cable Percussion and **BOREHOLE No. Borehole Diameter** CPRCB2 200mm to 10.00m 150mm to 19.75m Rotary Dando 3000 Coordinates (National Grid) Ground Level Equipment 502797 E Knebel 101413 N Polymer GS550 3.81 m OD Crew/Vessel S Purvis/R Johnson Compiled by Logged by Approved by BC **Dates Drilled** 18/09/2012 Start 19/09/2012 21/09/2012 14/11/2012 End 26/09/2012 Installation Water Strata Level **Installation Details** Strata Details Depth (m) m OD Strikes Depth (m) Concrete MADE GROUND Instrumentation: 0.50 3.31 50mm slotted Bentonite Seal section (SL) from 15.00 to 18.00m 2.80 Gravelly SAND $\nabla oldsymbol{\Psi}$ 3.50 Sandy GRAVEL 8.50 CHALK 14.50 -10.69 Pea Gravel Filter SL=15.00-18.00m 18.50 -14.69 Bentonite Seal 19.75 -15.94 19.75 Base of Hole Remarks (See notes & keysheets) Water Strike **▼** Water Rise Flush stopcock box cover. Pipe diameter 50mm to 18.00m, installed on 25/09/2012. **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No. FR1 (6 of 6)

Drilling Method Cable Percussion and Borehole Diameter **Casing Diameter BOREHOLE No.** CPRCB5 Rotary Dando 2000 200mm to 8.50m 200mm to 8.50m Equipment Coordinates (National Grid) Ground Level 150mm to 20.10m 502770 E Knebel 101512 N 3.48 m OD Approved by S Pervis/R Johnson Start 19/09/2012 Crew/Vessel Logged by Compiled by

Dates L	Drilled	Start End	19/09/2012 26/09/2012			Logged IS		lm BC	proved by : !/11/2012				
	Casing Depth	Depth to	Sample D	etails		SPT Blows/N Drive	U100 Blows/ Recovery	1,03,2012	Description of	Strata	Depth (Thick-	Level	Legend
Time	(m)	Water (m)	Depth (m) From To	Туре	No.	Test	Result				ness) (m)		
9/09			-			1001	Result	MADE GROUND: T	Tarmacadam.		(0.05)		
			0.15	D	2					grey concrete with cement (100mm x	0.05 (0.14) - 0.19 (0.10)	3.43	
			0.50	В	1			fine and mediu subangular fin	um sand. Grav ne and mediu	dark brown gravelly vel is angular and m flint with zed fragments of	0.29	3.19	
			_ 1.00	D	3			subangular fin fragments of w cobble sized f and locally wi	ne to coarse weak chalk w Elint fragmen th traces o	ith occasional nts (100mm x 100mm)	(1.21)		
20/09		DRY	<u>-</u>					comminuted cha	ıık.		-		
.0,09		DKI	- -								-		
	1.40	DRY	1.50-1.95 - 1.50-2.00	D B	4 5	s3		sandy angular gravel sized f very weak whit	and subangu ragments of e chalk with	grey brown clayey lar fine to coarse flint, chert and h rare flint and is fine to	1.50	1.98	
			- -								_(1.00)		
	2.30	DRY	- - - - - 2.50-2.95	D	6	s 7					- - - - 2.50	0.98	
			2.50-3.00	В	7			fine to coarse	gravel and very weak lig	ght brown reworked	- - - - - -		
			- - - -								- - - -		
	3.00	DRY	3.50-3.95 - 3.50-4.00	D B	8	S4					- - - -(2.00)		
			-	b							- - - -		
			<u>-</u> -								- - - - -		
	4.40	1.00	4.50-4.95	D	10	s27					- - - - - - 4.50	-1.02	
	1.10		- 4.50-5.00		11	,		gravelly fine	and medium	silty slightly SAND. Gravel is m flint and chert.	(0.30)		× · · · · · · · · · · · · · · · · · · ·
									ne to coarse	y sandy subrounded flint GRAVEL. Sand	4.80 - - -	-1.32	

Remarks 1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located. Chiselled from 5.80m to 6.00m (45 mins); chiselled from 6.30m to 6.50m (45 mins). See separate sheet for installation. Groundwater was encountered at 3.90m during boring and rose to 3.90m after 5 mins,3.90m after 10 mins,3.85m after 15 mins,3.85m after 20 mins. (See notes & keysheets) 2

Scale 1:25



Drilling Method Cable Percussion and Rotary
Equipment Dando 2000 Borehole Diameter 200mm to 8.50m 150mm to 20.10m

Borehole Diameter 200mm to 8.50m 200mm to 8.50m 502770 E

Coordinates 502770 E
(National Grid) 101512 N
Ground Level 3.48 m OD

		End	26/09/2012					2 24/0	9/2012 14/11/2012			
Date	Casing	Water Depth	Sample/Co	re Rec	overy		SPT Blows	Result or U100		Depth		
&	Depth	(ṁ)	Depth (m)	Type	No.	j	/N	Blows/ Rec. mm	Description of Strata	(Thick-	Level	Legend
Time	(m)	i (Flush	,	TCR	SCR	RQD	Core Size (mm)	or Fracture	2000p.10 0u.u	ness)		
	_ ` _	Return) %	From To	%	%	%	(mm)	Index		(m)		
			- -							- -		
			- -							<u> </u>		
			_							<u> </u>		
			-							Ĺ		
			<u>-</u>									
			<u>-</u>							<u> </u>		
			<u>-</u>							(1.80)		
			<u>-</u>							t		
			- -							<u> </u>		
	5.90	1.00	_ 6.00-6.50	В	12		C34			<u>L</u>		
			- -							<u> </u>		
			- -							- -		
			- -							-		
			- -							ţ		
			-							<u>L</u>		
			6.60	D	13					6.60	-3.12	
			-						Probably structureless CHALK recovered as	•		
			- -						white and yellow white subangular fine to coarse gravel sized fragments of very	 - -		11,1,1,1,1
			- -						weak chalk in a comminuted chalk matrix.	<u> </u>		
			-							L		
			-							(0.90)		
			-							<u> </u>		
			=- -							F		
			-							<u> </u>		
	5.90	1.00	7.50-7.95	D	14 15		S15		Double black and the second state of the secon	7.50	-4.02	11 11 11
			7.50-8.00	В	15				Probably weak to very weak CHALK recovered as white and yellow white	Ī		
			_						angular and subangular predominantly coarse gravel and cobble sized fragments	E		
			-						of weak chalk and fine to medium gravel	E		
			-						sized fragments of flint.	[
			<u>-</u> -							(1.00)		
			- -							<u> </u>		
			<u>-</u>							‡		
			- -	1						‡		<u> </u>
20/09	8.50	3.70	-							۰ - ۲	E 00	
26/09	8.50	6.10	-	1			1		Extremely weak becoming very weak with	_ 8.50 -	-5.02	
			-					AZCL	depth low density orange white, orange stained and black speckled CHALK.	Ŧ		
			- -						Fractures are extremely closely to very	F		
			F	1					closely spaced (5/20/60) predominantly inclined 5 degrees to 60 degrees closed	F		
			-						tight surfaces stained orange and black speckled. (B5)	F		
		(100)	8.50-9.60	64	0	0			Between 8.50m and 8.90m: Assumed zone of	F		
			[>25	core loss. Between 8.90m and 9.10m: Recovered as	E		
			<u>-</u>						silty very angular to subrounded fine to coarse gravel sized fragments of	ŀ		
			<u>-</u>						extremely weak orange chalk and brown	ł		
			- -	1					flint. Between 9.10m and 9.40m: Possible non	L		
			-	1]		intact zone. Recovered as angular medium	t		
	8.00		9.60-10.05	5			s15		and coarse gravel sized fragments of extremely weak orange chalk and	t		
			-	1				3	comminuted chalk. Moderate orange staining and slight to moderate brown	<u> </u>		
			-	1					speckling.	ţ		
			10.00-10.16	C	16				Between 9.40m and 9.55m: Recovered as gravelly comminuted chalk. Gravel is	Ł		
Pomai		<u> </u>							subangular fine to coarse of extremely	<u> </u>		

Remarks (See notes

Scale 1:25



Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR2 (2 of 6)

Drilling Method Cable Percussion and

Rotary Dando 2000 Equipment Knebel

Drill Fluid Crew/Vessel Dates Drilled

Polymer GS550 S Pervis/R Johnson

Start 19/09/2012 End 26/09/2012

Borehole Diameter 200mm to 8.50m 150mm to 20.10m **Casing Diameter** 200mm to 8.50m

BOREHOLE No. Coordinates (National Grid) Ground Level

502770 E 101512 N 3.48 m OD

CPRCB5

Logged by Compiled by Annroyed by IS clm 20/09/2012 24/09/2012

14/11/2012

IJУ	Apploved by
	BC

- 1	o	Water Depth	Sa	mple/Co	re Rec	overy		SPT	Posula		Depth		
&	Casing	(m)	Daniel	h ()	Туре	No.		Blows /N	Result or	Description of Strata	(Thick-	Level	Lege
me	Depth (m)	(Flush Return) %	From	h (m) To	TCR %	SCR %	RQD	Core Size (mm)	Fracture Index	Description of Strata	ness) (m)		
		(100)	-)-11.10			13	()	>25	weak orange chalk and occasional very angular fine to coarse brown flint. Between 9.55m and 9.60m: 1 No. possible subangular to well rounded brown flint. Between 9.87m and 10.00m: Recovered as subangular fine to coarse gravel sized fragments of grey brown flint. Between 10.16m and 10.20m: 1 No. subrounded coarse gravel sized grey brown flint (35mm x 35mm x 40mm). Between 10.20m and 11.10m: Zone of possible extremely closely spaced to very closely spaced randomly orientated fractures with much orange staining and slight brown speckling.	(4.80)		
			11.10)-11.48				s37/	AZCL	Between 11.10m and 11.20m: Assumed zone of core loss. Between 11.20m and 11.90m: Recovered as	ŧ		
	8.00		-					230	>25	silty very angular to subrounded fine to coarse gravel sized fragments of extremely weak orange chalk with occasional very angular fine to coarse gravel sized grey brown flint.			
		(100)	11.10	-12.60	93	0	0			Between 11.90m and 11.96m: Very angular to subangular medium and coarse gravel	ŧ		
			- - - -							sized grey brown flint (up to 50mm x 50mm x 60mm). Between 12.10m and 12.15m: 1 No. embedded flint (40mm x 70mm).	 - - -		
	-		- - - -						4	Between 12.40m and 12.60m: Recovered as subangular fine to coarse gravel sized fragments of extremely weak to weak orange chalk. Between 12.60m and 12.65m: Assumed zone	<u> </u>		
	8.00		12.60 - - -)-12.97				S39/ 220		of core loss. Between 12.65m and 13.03m: Possible zone of very closely spaced fractures inclined 40 degrees to 60 degrees planar to undulating rough surfaces stained orange and speckled black.	‡ + 1		
		(100))-13.43)-14.10		17 71	66			Between 13.20m and 13.30m: Recovered as very angular fine to coarse gravel sized fragments of brown flint (up to 18mm x 25mm x 40mm) with abundant comminuted chalk (drill induced).	13.30	-9.82	
			- - - - - -						8	Extremely weak to weak low to medium density cream white and locally orange stained and black speckled CHALK. Fractures are very closely spaced (80/100/200) predominantly subhorizontal to inclined 60 degrees closed clean with slight orange and brown staining and	† 		
	8.00		-	7-14.10 0-14.55		18		S32	AZCL	slight black speckling. (B4/B3) Between 13.91m and 13.95m: 1 No. embedded black brown flint (45mm x 70mm). Between 14.10m and 14.30m: Assumed zone	<u> </u>		
	3.00			,⊸±4.33				J 3 Z	6	of core loss.	‡		
			- -							Between 14.54m and 14.76m: Recovered as angular and subangular fine to coarse gravel sized fragments of weak orange	-		
		(100)	- 14.10)-15.60	87	61	59		>25	chalk and brown flint 1mm. Between 14.99m and 15.07m: 1 No. cobble sized brown flint.	‡ - - -		

Remarks

(See notes & keysheets)

Scale 1:25

-	Ē	G	R	

Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR2 (3 of 6)

304/03

Drilling Method Cable Percussion and Borehole Diameter Casing Diameter BOREHOL

Rotary 200mm to 8.50m 200mm to 8.50m
Equipment Dando 2000 150mm to 20.10m
Knebel

chole Diameter Omm to 8.50m Omm to 20.10m Om

Crew/Vessel S Pervis/R Johnson Logged by Compiled by Approved by Dates Drilled Start 19/09/2012 IS clm BC 20/09/2012 24/09/2012 14/11/2012

Coordinates 502770 E
(National Grid) 101512 N
Ground Level 3.48 m OD
roved by

End 26/09/2012			20/		L2 24/0							
Date Casing Depth		Sample/Core Recovery			ı	SPT Blows Resu /N or			Depth			
& Time	Depth (m)	(ṁ) (Flush Return)	Depth (m)	Type TCR	No.	ROD	Core Size	Fracture	Description of Strata	(Thick- ness)	Level	Legen
	(,	%	From To	%	%	%	(mm)	Index		(m)		
			-					-		‡		
										Ē		
										E		11, 11,
			-					8		‡		
		_ 15.47-15.60	С	19				Between 15.60m and 15.70m: Assumed zone	-		11,11	
		15.60-15.85				S30/ AZCI		of core loss. Between 15.70m and 16.02m: Recovered as	Ŧ		11,11	
	8.00		<u>-</u>				100	NI	subangular to subrounded fine to coarse gravel sized fragments of dark brown	<u></u>		
			-						flint and extremely weak chalk with abundant comminuted chalk (drill	‡		
			-					-	induced).	ļ.		1,1,1,
			5						Between 16.12m and 16.22m: Recovered as angular to subrounded fine to coarse	Ŧ		
			- -						gravel sized grey brown flint.	‡		11, 11,
		(100)	15.60-17.10	93 93		83				ŧ		
			<u> </u>							Ł		
			-							‡		11, 11,
			-					6		(6.80)		
			16 05 15 01							F		
		16.85-17.01	C 20						‡			
		-							F			
		17.10-17.41				s37/			Ŧ			
	8.00		-				155			‡		
		-						Between 17.39m and 17.50m: Recovered as very angular fine to coarse gravel sized	‡			
									brown flint and subangular fine to coarse gravel sized fragments of extremely weak	F		11,11
			-						chalk.	ţ		
			<u>-</u> -							‡		
		(100)	17.10-18.60	100	100	91				Ŧ		
			17.94-18.10	С	21			9		<u>L</u>		
			-							ŧ		11,11
									Between 18.27m and 18.37m: Recovered as	£		
			-						very angular and angular fine to coarse gravel sized grey brown flint.	‡		11,11
			-						3 * * * * * * * * * * * * * * * * * * *	Ł		1,1,1,
			-						Between 18.60m and 18.70m: Assumed zone of core loss.	F		
	8.00		18.60-18.77				S27/ 18	AZCL	Between 18.70m and 19.05m: Recovered as very angular to subangular fine to coarse	‡		11,11
	0.00		-				10		gravel sized fragments of grey brown	Ŧ		
			-						flint.	ţ		
			- -							†		
			19.15-19.41	С	22					ŧ		
			-							F		
		(100)	18.60-20.10	93	93	82		10		ţ		
			-						Between 19.56m and 19.70m: Brown flint nodule recovered as angular fine to	F		
			-						coarse gravel sized fragments (up to 70mm	Ŧ		
			- -						x 90mm).	‡		
			-						Between 19.89m and 19.81m: 1 No. brown	‡		
			<u>-</u>						flint nodule (20mm x 20mm). Between 19.95m and 19.98m: 1 No. flint	Ł		
emar	<u> </u>	L							nodule (30mm x 20mm).			

Remarks (See notes & keysheets)

Drill Fluid

Polymer GS550

Scale 1:25



Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR2 (4 of 6)

Drilling Method Cable Percussion and **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB5 Rotary 200mm to 8.50m 200mm to 8.50m Equipment Dando 2000 Coordinates (National Grid) Ground Level 150mm to 20.10m 502770 **E** Knebel 101512 **N Drill Fluid** 3.48 m OD Polymer GS550 Crew/Vessel S Pervis/R Johnson Logged by Compiled by Approved by **Dates Drilled** Start 19/09/2012 clm End 26/09/2012 20/09/2012 24/09/2012 14/11/2012 Water SPT Blows /N Sample/Core Recovery Depth Depth (m) Result Date Casing (Thick-ness) Туре No. Level Legend or & Depth **Description of Strata** Depth (m) (Flush Return) % Core Size (mm) Fracture TCR % SCR % Time (m) RQD % Index From То (m) 20.10-20.39 S26/ 135 26/09 8.50 15.20 11,11 20.10 -16.62 8.00 End of Borehole Remarks (See notes & keysheets) Scale 1:25 **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No. FR2 (5 of 6) 304/03

Drilling Method Cable Percussion and **BOREHOLE No. Borehole Diameter** CPRCB5 200mm to 8.50m 150mm to 20.10m Rotary Dando 2000 Coordinates (National Grid) Ground Level Equipment 502770 E 101512 **N** Knebel 3.48 m OD Polymer GS550 Crew/Vessel S Pervis/R Johnson Compiled by Approved by BC Logged by IS **Dates Drilled** Start 19/09/2012 20/09/2012 24/09/2012 14/11/2012 End 26/09/2012 Installation Water Strata Level **Installation Details** Strata Details Depth (m) m OD Strikes Depth (m) Concrete MADE GROUND Instrumentation: 0.50 2.98 75mm slotted Grout section (SL) from 16.60 to 19.60m ⊻▼ 4.50 Silty gravelly SAND 4.80 Sandy GRAVEL 6.60 CHALK 15.10 -11.62 Bentonite Seal 16.10 -12.62 Gravel Filter SL=16.60-19.60m 20.10 -16.62 20.10 Base of Hole Remarks (See notes & keysheets) Water Strike **▼** Water Rise Flush stopcock box cover. Pipe diameter 75mm to 19.60m, installed on 26/09/2012. **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No. FR2 (6 of 6)

Drilling Method Cable Percussion			Borehole Diameter Casing Diameter			BOREHOLE No. CPRCB6							
Equipn		Dando	2000							Coordinates (National Grid) Ground Level	502765 101569 3.57	E N m OD	
Crew/\ Dates	Vessel Drilled	s Pur Start	vis 02/10/2	2012			Logge		Compiled by Approved by BC				
		End	02/10/2				02/10/	2012 0	8/10/2012 14/11/2012		T T		
&	Casing Depth	Depth to Water	Sa Depth	mple D			SPT Blows/N Drive mm	U100 Blows/ Recovery mm	Description of	Strata	Depth (Thick- ness)	Level	Legend
Time	(m)	(m)	From	То	Туре	No.	Test	Result			(m)		
02/10			-						MADE GROUND: Tarmacadam.		(0.13) 0.13	3.44	
			- - -						MADE GROUND: Reinforced of diameter 200mm mesh).	(0.17)	3.27		
			- - - -						MADE GROUND: Composed of angular to subangular fin gravel. Sand is fine to o At 0.30m: Plastic membran	e to coarse flint coarse.	(0.50)		
02/10		DRY	- -									0.77	
									End of Bore	hole	0.80	2.77	
			- - -										
			= - -								[- -		
			-								<u> </u>		
											[- -		
			-								<u>-</u>		
			- - -								[- -		
											-		
											F		
			- - -										
			- - -								<u>-</u> -		
			-								[- -		
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			- - -								<u> </u>		
			- - -								<u> </u>		
Remarl		Prior	to bori	ng a Ca	able i	Avoid	ance To	ol (CAT) survey was carried out.	An inspection pit was	hand-dug	g to 0.	80m
(See note	es	depth	and res	canned	using	g the	CAT to	check	for services. Service enco	ountered at 0.80m tren	ding nort	:h-west	south

east across pit.

The borehole was backfilled on completion with materials arising.

Groundwater not encountered during boring.

Scale 1:25

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Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No. G120043U

Figure No.

FR3 (1 of 1)

Drilling Method Cable Percussion & Rotary **Borehole Diameter Casing Diameter**

Logged by

Equipment Dando 2000

Knebel **Drill Fluid** Polymer GS550

Crew/Vessel S Purvis/M McKinney **Dates Drilled** Start 03/10/2012

200mm to 4.50m 150mm to 30.60m

Compiled by

200mm to 4.50m

Approved by

Coordinates (National Grid) Ground Level

BOREHOLE No.

CPRCB6A 502764 E

101575 **N** 3.57 m OD

Dates	Vessel Drilled		03/10/2	2012	Ϋ́		AH	ged by	clm	piled by Approved by BC 0/2012 14/11/2012				
		Water	10/10/2 San	nple/Co	re Rec	overv	05/	SPT	2 08/1 Result or	0/2012 14/11/2012		Donth		
Date & Time	Casing Depth (m)	Depth (m) (Flush Return)	Depth	•	Type TCR	No.	RQD	Blows /N	U100 Blows/ Rec. mm or Fracture	Description	of Strata	Depth (Thick- ness)	Level	Leger
03/10	(,	%	From	То	%	%	%	(mm)	Index	MADE GROUND: Tarmacada	_	(m)		
73/10			<u>-</u> - -							MADE GROUND: Tarmacada MADE GROUND: Concrete. At 0.30m: Plastic memb		0.14	3.43	
			- 0.50 - 0.50 - 0.50		B ES D	1 2 3				MADE GROUND: Composed angular to subrounded gravel of flint. Sand	of yellow sandy fine to coarse	(0.50)	3.27	
			- - - - - 1.00 - 1.00-	-1.00	D ES B	4 5 6				MADE GROUND: Composed black clayey sandy ang fine to coarse gravel occasional cobble size concrete, single fragm	ular to subangular of flint with d fragments of	0.80	2.77	
		DRY	1.20- 1.20-		D B	7 8		s13		5mm diameter mesh rein MADE GROUND: Composed slightly sandy gravell cobble sized fragments	forcement. of firm brown y clay with rare	1.20	2.37	
					D	9				is very angular to sub coarse of flint, brick is fine to coarse.	rounded fine to	(0.80)		
	1.90	DRY	2.00-		D B	10 11		s10		Possible MADE GROUND:	Composed of white	2.00	1.57	
			-							and brown mottled silt to coarse gravel and r fragments of extremely in a comminuted chalk	y subangular fine are cobble sized weak to weak chalk	 - - -		
			2.50 2.50-	-3.00	D B	12 13						-		
	2.90	DRY	- - - - 3.00-		D B	14 15		s11				(1.55)		
			- 3.00- - - -	-3.30	B	13								
			3.50 - 3.50-	-4.00	D B	16 17				Light brown silty sand		3.55	0.02	×
	3.90	DRY	- - - - 4.00-	-4.45	D	18		S17		and weak chalk with ra Sand is fine to coarse reworked).	re chalk cobbles.	4.00	-0.43	×
		-		-4.50	В	19				Probably extremely wea CHALK recovered as cla subangular fine to coa cobble sized fragments rare flint in a commin	yey slightly sandy rse gravel and of weak chalk and	(0.50)		
3/10	4.50	TIDAL	= = =									4.50	-0.93	
0/10	4.50	2.70	-					1	AZCL	Probably extremely wea flint nodules recovere		4.50	-0.93	
		(90)	- - - - 4.50- - -	-5.10	83	0	0		NI	subangular coarse grav fragments of brown and (up to 70mm x 90mm x 1 Between 4.50m and 4.60 core loss. Between 5.00m and 5.10	el and cobble sized dark brown flint 10mm). m: Assumed zone of m: 1No. subrounded	(0.60)		

- Remarks 1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located. (See notes & keysheets)

 - Chiselled from 3.60m to 3.90m (30 mins).

 See separate sheet for installation.

 Groundwater was encountered at 4.50m during boring and rose to 4.45m after 5 mins,4.40m after 10 mins,4.35m after 15 mins,4.35m after 20 mins.

cobble of weak weathered chalk (60mm \times

Scale 1:25



Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR4 (1 of 8)

Drilling Method Cable Percussion & Rotary

Borehole Diameter
200mm to 4.50m

Casing Diameter
200mm to 4.50m

BOREHOLE No.

Equipment Dando 2000 150mm to 4.50m Knebel

Drill Fluid Polymer GS550
Crew/Vessel S Purvis/M McKinney
Dates Drilled Start 03/10/2012

S Purvis/M McKinney Logged by Compiled by Approved by Start 03/10/2012 AH clm BC 05/10/2012 08/10/2012 14/11/2012

Coordinates 502764 E
(National Grid) 101575 N
Ground Level 3.57 m OD

CPRCB6A

		End	10/10/2012			05/		2 08/1	0/2012 14/11/2012			
Date	Casing	Water Depth (m)	Sample/Co	re Rec	<u>_</u>	1	SPT Blows /N	Result		Depth (Thick-	Level	Legen
& Time	Depth (m)	(Flush Return) %	Depth (m) From To		SCR %	RQD %	Core Size (mm)	or Fracture Index	Description of Strata	ness)	2010	
	4.50	2.70	5.10-5.25	70	76	76	s50/ 75		60mm x 90mm). Between 5.00m and 5.10m: 1 No. subrounded cobble of weak weathered chalk (60mm x 60mm x 90mm).	5.10	-1.53	
		(80)	5.10-6.60	13	0	0		AZCL	Extremely weak to very weak orange and locally black speckled low density CHALK. Fractures are very closely to closely spaced (20/60/150) predominantly subvertical to inclined 20 degrees to 90 degrees planar smooth closed and tight with slight to moderate orange staining and moderate brown speckling to surfaces. (B4/B3). Between 5.10m and 6.40m: Assumed zone of core loss. Between 5.10m and 6.40m: Assumed zone of core loss.			
			-					NI	Between 6.40m and 6.60m: Recovered as subangular fine to coarse gravel sized fragments of very weak orange chalk and	- -		
	4.50	2.70	6.60-7.05				s1		comminuted chalk and very angular and subangular coarse gravel sized fragments of brown and dark brown flint. Between 6.60m and 7.10m: Assumed zone of core loss.			
		(90)	6.60-7.35	33	0	0		AZCL				
			- - -					NI				
			7.35-7.42	С	20					<u> </u> - -		
		(90)	7.35-8.10	100	0	0		>25				
			-				-		Between 8.05m and 8.10m: Recovered as very angular medium and coarse gravel sized fragments of dark brown flint and	-		
	4.50	2.70	8.10-8.55 - -				S10		comminuted chalk. Between 8.10m and 8.95m: Assumed zone of core loss.			
			<u> </u>					AZCL		<u> </u>		
		(90)	8.10-9.60	43	0	0				<u> </u> -		
								>25		<u> </u>		
									Between 9.60m and 9.90m: Assumed zone of	<u>-</u>		
								AZCL	core loss.	<u> </u>		
		(80)	9.60-10.35	60	0	0				<u> </u>		

Remarks (See notes & keysheets)

Scale 1:25

TUGRO _______ **Project**

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No. G

G120043U

Figure No.

FR4 (2 of 8)

Drilling Method Cable Percussion & Rotary

Borehole Diameter
200mm to 4.50m

Casing Diameter
200mm to 4.50m

BOREHOLE No.

200mm to 4.50m
Equipment Dando 2000 150mm to 30.60m
Knebel

Drill Fluid Polymer GS550
Crew/Vessel S Purvis/M McKinney
Dates Drilled Start 03/10/2012

Coordinates 502764 E
(National Grid) 101575 N
Ground Level 3.57 m OD

CPRCB6A

		End	10/10/2012			05/		L2 08/1	0/2012 14/11/2012			
Data	C!	Water Depth	Sample/C	ore Rec	overy		SPT Blows	Result		Depth		
&	Casing Depth	(m) (Flush	Depth (m)	Туре			/N	or Fracture	Description of Strata	(Thick- ness)	Level	Legend
Time	(m)	Return)	From To	TCR	SCR %	RQD %	Core Size (mm)	Index		(m)		
			-									1,1,1,1,1
			- -					>25		‡		11, 11, 11
			-							‡		
			-							‡		
	4.50	2.70	11.00-11.4	5			s17	AZCL		‡		
										F		
			-							F		
		(80)	_ 10.35-11.1	0 93	0	0		>25		<u> </u>		
					0.1					<u> </u>		11,11,11
			10.90-11.0	5 C	21					<u> </u>		11, 11, 11
			-						Between 11.10m and 11.15m: Assumed zone of core loss.	‡		
			-					AZCL	Between 11.15m and 11.21m: Very angular			
			- -						coarse gravel and cobble sized fragments (60mm x 60mm x 100mm) of dark brown	(12.30)		
			-					4	flint.	Ī.		11, 11, 11,
								-		F		
										Ŧ I		
			- -					-	Between 11.81m and 11.85m: 40mm flint	<u> </u>		11,11,11
		(90)	11.10-12.6	0 97	0	0			nodule.	<u> </u>		11, 11, 11,
		(30)	- 11.10-12.0	"	"	U				!		
			- -							-		
			-					>25		‡		11,11,11
			<u>-</u>							F		11, 11, 11
			-							[
			<u>. </u>							E		
			-						Between 12.60m and 12.65m: Assumed zone of core loss.	<u> </u>		11,11,11
			- -					AZCL	or core loss.	<u> </u>		11, 11, 11
			- -						Between 12.82m and 12.92m: Recovered as	.		
			12.92-13.0	8 C	22				subangular medium and coarse gravel of very weak chalk with slight orange	‡		
									staining and moderate brown speckling on	Ļ │		
			-						>2 surfaces.	ļ l		1111111
										E		
		(90)	12.60-14.1	0 97	60	60		6		<u> </u>		
		(30)	12.00-14.1	ĭ	00	80		ľ		t		
			-							 		
			-							‡		
			-							F		
			13.85-13.9	5 C	23					[
			_							<u> </u>		
									Between 14.10m and 14.20m: Assumed zone of core loss.	<u> </u>		
	4.50	2.70	14.10-14.5	5			S47	AZCL	or core ross.	<u> </u>		
			_							t		<u> </u>
			-					7		‡		
			<u>-</u>					′		 		
			- -							‡		
			-					-	Between 14.72m and 14.99m: Recovered as subangular fine to coarse gravel sized	‡		
		,							fragments of chalk and comminuted chalk	₽		
		(70)	14.10-15.6	93	77	77			with very angular fine to coarse gravel sized fragments of dark brown flint.	Ŧ I		
			_							F		11 11 11
Domar				—	—							

Remarks (See notes & keysheets)

Scale 1:25

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Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No. G120043U

Figure No.

FR4 (3 of 8)

Drilling Method Cable Percussion & Rotary **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB6A 200mm to 4.50m 150mm to 30.60m 200mm to 4.50m

Equipment Dando 2000 Knebel

Drill Fluid Polymer GS550 Crew/Vessel Dates Drilled S Purvis/M McKinney

Logged by Compiled by Approved by Coordinates (National Grid) Ground Level 502764 E 101575 N 3.57 m OD

Start 03/10/2012 End 10/10/2012 AH clm 05/10/2012 08/10/2012 BC 14/11/2012

	End 10/10/2012						05/		.2 08/1	0/2012 14/11/2012			
Date	Casing	Water Depth	Sai	mple/Co		— -		SPT Blows	Result		Depth		
& Fime	Depth (m)	(ṁ) (Flush Return)	Depth	(m)	Type TCR	No. SCR	RQD	Blows /N Core Size (mm)		Description of Strata	(Thick- ness)	Level	Legen
	(,	%	From	То	%	%	%	(mm)	Index		(m)		
			-						>25		‡		11, 11,
			[F		
			_								ŧ		1,1,1,
			_								Ļ		11,11
			-							Between 15.60m and 15.75m: Assumed zone of core loss.	‡		
									AZCL		Ŧ		
											Ŧ		
			-								‡		
			-								F		11,11
										Between 16.18m and 16.21m: 1 No. tubular dark brown flint nodule (25mm x 25mm x	Ŧ		11,11
			16.24	-16.40	С	25				60mm). Between 16.33m and 16.36m: 1 No. dark	F		11111
		(80)	15.60	-17.10	90	90	79			brown flint nodule (30mm x 30mm).	‡		11,11
			Ļ								‡		
			Ē						10		Ŧ		
			_								ţ		1,,,1
			-								‡		11,11
			-								‡		
											F		1,1,1,
	4.50	2.70	17.10	-17.55				s51			Ŧ		
			- 17.28	-17.55	С	26					‡		
			-								17.40	-13.83	
			-							Very weak low to medium density grey white and locally black speckled CHALK.	F		
			-							Fractures are medium spaced (100/400/1000) subhorizontal to inclined	‡		
			_							20 degrees planar smooth closed tight with slight orange and grey staining and	ŧ		11,11
		(90)	17.10	-18.60	100	100	100			slight brown black speckling to surfaces.	Ŧ		
			_							(B2 / A2).	L		
			-								‡		1,1
			Ē								£		
			_								ŧ		
			_								‡		
											F		
											Ŧ		
			-							Between 18.75m and 18.82m: Dark brown and grey flint recovered as angular coarse	‡		
			-							gravel sized fragments. Between 18.97m and 19.01m: 1 No. dark	ŧ		
			F						4	brown flint nodule (40mm x 50mm).	F		
										Between 19.23m and 19.30m: 2 No. dark	ţ		
			<u> </u>							brown flint nodules (50mm \times 40mm and 60mm	‡		
		(90)	18.60	-20.10	100	100	100			x 40mm). Between 19.34m and 19.37m: 1 No. dark	Ŧ		
										brown flint nodule (30mm x 40mm).	Ł		
			-								‡		
			-								‡		
			Ē								Ŧ		
			[Ŧ		
			_ 20.00	-20.10	С	27					H		ш

Remarks (See notes & keysheets)

Scale 1:25

Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR4 (4 of 8)

Drilling Method Cable Percussion & Rotary

Equipment Dando 2000 Knebel Polymer GS550

Drill Fluid

Crew/Vessel Dates Drilled S Purvis/M McKinney Start 03/10/2012 End 10/10/2012

Borehole Diameter

200mm to 4.50m 150mm to 30.60m

Casing Diameter

200mm to 4.50m

BOREHOLE No.

CPRCB6A

Coordinates (National Grid) Ground Level 502764 E 101575 N 3.57 m OD

Logged by	Compiled by	Approved by
AH	clm	BC
05/10/2012	08/10/2012	14/11/2012

ate	Casing	Water Depth	San	Sample/Core Recovery SPT Blows Result	Depth								
&	Depth	(ṁ) (Flush	Depth	(m)	Туре			/N	or Fracture	Description of Strata	(Thick- ness)	Level	Legen
me	(m)	Return)	From	То	%	SCR %	RQD %	Core Size (mm)	Index		(m)		
			-								‡		1, 1,
	4.50	2.70	20.10-	-20.32				s50/ 75			ŧ		
	1.50	2.70	- -					, ,			ţ		
			20.38-	-20.51	С	28				Between 20.50m and 20.57m: Dark brown	Ł		
			- -							flint nodule recovered as subangular fine to coarse gravel sized fragments.	F		11,11
			- -							to coarse graver sized fragments.	‡		
		(90)	20.10-	-21 60	87	87	87				Ŧ.		
		(30)	20.10	21.00	0,	"	"		2		‡		
											F		11,11
			-							Between 21.23m and 21.40m: Recovered as subangular to subrounded fine to coarse	‡		
			- - -							gravel sized fragments of extremely weak orange weathered chalk and dark brown	Ŧ		
			-						AZCL	flint (60mm x 80mm x 70mm). Between 21.40m and 21.60m: Assumed zone	‡		
			- -						AZCI	of core loss.	F		
			- -							Between 21.72m and 21.76m: 1 No. dark brown flint nodule (40mm x 50mm).	ŧ		
			- -							DIOWN TITHE HOUSE (40mm x 30mm).	Ŧ.		
			-							Between 21.94m and 22.00m: 1 No. subangular cobble sized dark brown flint.	ŧ		
			- -							subangular comple bized dark brown liling.	F		11,11
			-								ŧ		
		(90)	21.60-	-23.10	100	100	100			Between 22.40m and 22.44m: 1 No. dark	Ŧ.		11,11
		(30)		23.10						brown flint nodule (20mm x 40mm).	Ł		
			- -								F		
			- -								ŧ		
			- -								Ŧ.		<u> </u>
			<u>-</u>						1		Ł		
			-								ţ		<u> </u>
	4.50	2.70	23.10-	-23.55				s50			Ē		
			- -								‡		
			23.50-	-23.69	С	29					Ł		
			- -								‡		
			- - -							Between 23.76m and 23.81m: Very angular	£		
		(70)	23.10-	-24.60	90	90	90			fine to coarse gravel sized fragments of dark brown black flint.	‡		
			24.00-	-24.32	С	30					(13.20)		
			- -								ŧ		11,11
			<u>.</u>								‡		
			- -							Between 24.32m and 24.41m: 1 No. very angular and subangular cobble sized	ŧ		
			- -						AZCL	fragment of black flint (60mm x 75mm x 80mm).	<u> </u>		
			-							Between 24.45m and 24.60m: Assumed zone of core loss.	ŧ		
			- -							Between 24.75m and 24.79m: 1 No. dark	‡		
			- -							brown flint nodule (30mm x 35mm).	ŧ		
			-								F		

Remarks (See notes & keysheets)

Scale 1:25

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Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR4 (5 of 8)

Drilling Method Cable Percussion & Rotary

Equipment

Dando 2000 Knebel Drill Fluid Polymer GS550

Crew/Vessel Dates Drilled S Purvis/M McKinney Start 03/10/2012 End 10/10/2012

Borehole Diameter 200mm to 4.50m 150mm to 30.60m **Casing Diameter** 200mm to 4.50m **BOREHOLE No.**

CPRCB6A

Logged by Compiled by Approved by AH clm 05/10/2012 08/10/2012

BC 14/11/2012

Coordinates (National Grid) Ground Level 502764 E 101575 N 3.57 m OD

		End	10/10/				05/		2 08/1	0/2012 14/11/2012	1		1
Date	Casing	Water Depth	Saı	nple/Co	_	— -		SPT Blows /N	Result		Depth		
&	Depth	(ṁ) (Flush	Depth	(m)	Туре		[Description of Strata	(Thick- ness)	Level	Legend
Time	(m)	Return)	From	То	TCR %	SCR %	RQD %	Core Size (mm)	Index		(m)		
		- 7.0	-					<u> </u>			,		777
										Between 25.21m and 25.32m: Recovered as	ŧ		
			-							subangular medium and coarse gravel sized	Ŧ		
		(60)	24.60	-26.10	100	100	100			fragments of very weak chalk and dark brown flint.	ł		
			_								L		
			-								‡		
			25.67	-26.00	С	31					Ŧ		
			[F		
			-								ţ		
			26.00	-26.10	С	32					ļ .		
			26.10	-26.45				S50/			‡		11,11,11
	4.50	2.70	_ 20.10	20.13				210			ŧ		
										Between 26.40m and 26.46m: Very angular	Ŧ		
			_							<pre>medium and coarse gravel sized fragments of black flint.</pre>	L		
			-						2		‡		
											ŧ		
		(0)				100					Ŧ		
		(0)	26.10	-27.60	100	100	100				ŧ		
			-							Between 27.04m and 27.07m: 1 No. black flint nodule (30mm x 40mm).	ļ-		
			-							Between 27.21m and 27.24m: Probable	‡		
			-							cobble sized flint nodule.	Ŧ		
			27.36	-27.60	С	33					Ŧ.		
			_								L		
			-							Between 27.60m and 27.65m: 1No.black flint nodule (50mm x 50mm).	‡		
			-							Between 27.69m and 27.75m: Recovered as subangular medium and coarse gravel sized	Ŧ		
										fragments of very weak chalk and dark brown and black flint.	F		
			-							brown and brack firmt.	ţ		
			-								F		
			-								ŧ		
			_								F		11, 11, 1
		(60)	27.60	-29.10	100	100	99				ţ		
			_							Between 28.51m and 28.55m: 1 No. flint	Ļ		
										nodule (20mm x 70mm).	ŧ		
											E		
			-								ţ		
			-								‡		
			-								F		
	4.50	3.80		-29.55				s53			[
			29.19	-29.32	C	34					‡		
			-						4		‡		
			<u>-</u>						-		‡		
										Between 29.63m and 29.67m: Recovered as	Ŧ		
										<pre>very angular and subangular coarse gravel sized fragments of black flint.</pre>	E		
		(80)	29.10	-30.60	90	90	90			-	ŧ		
		(30)	23.10	30.00			"				ţ		
			_								†		

Remarks (See notes & keysheets)

Scale 1:25

Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR4 (6 of 8)

Drilling Method Cable Percussion & Rotary **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB6A 200mm to 4.50m 200mm to 4.50m Equipment Coordinates (National Grid) Ground Level 150mm to 30.60m Dando 2000 502764 E Knebel 101575 **N Drill Fluid** 3.57 m OD Polymer GS550 Crew/Vessel S Purvis/M McKinney Logged by Compiled by Approved by **Dates Drilled** Start 03/10/2012 ВC clm End 10/10/2012 05/10/2012 08/10/2012 14/11/2012 Water Sample/Core Recovery SPT Blows /N Depth Depth (m) Result Casing Date Туре No. (Thick-Level Legend or & Depth **Description of Strata** Depth (m) (Flush Return) % Fracture ness) Core Size (mm) Time (m) TCR % SCR % RQD % Index From То (m) Between 30.23m and 30.26m: 1 No. bivalve shell (25mm \times 30mm). 30.16-30.45 C 35 Between 30.45m and 30.60m: Assumed zone AZCL of core loss. 10/10 4.50 4.50 30.60-31.05 -27.03 S48 30.60 4.50 4.80 End of Borehole Remarks (See notes & keysheets) Scale 1:25 **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No.

FR4 (7 of 8)

Drilling Method Cable Percussion & Rotary **BOREHOLE No. Borehole Diameter** CPRCB6A 200mm to 4.50m 150mm to 30.60m Coordinates (National Grid) Ground Level Equipment Dando 2000 502764 E Knebel 101575 **N** 3.57 m OD Polymer GS550 Crew/Vessel S Purvis/M McKinney Compiled by Logged by Approved by BC **Dates Drilled** Start 03/10/2012 05/10/2012 08/10/2012 14/11/2012 End 10/10/2012 Installation Water Strata Level **Installation Details** Strata Details Depth (m) m OD **Strikes** Depth (m) Concrete MADE GROUND Instrumentation: 0.50 3.07 75mm slotted Grout 1.00 2.57 section (SL) Bentonite Seal from 24.00 to 30.00m 3.55 Silty sandy GRAVEL 4.00 $\nabla_{\overline{\Delta}}$ CHALK 23.50 -19.93 Gravel Filter SL=24.00-30.00m 30.60 -27.03 30.60 Base of Hole Remarks (See notes & keysheets) Water Strike **▼** Water Rise Flush stopcock box cover. Pipe diameter 75mm to 30.00m, installed on 11/10/2012. **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No. FR4 (8 of 8)

Drilling Method Cable Percussion and **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB9 Rotary 200mm to 0.95m Equipment Dando 2000 Coordinates 502747 E (National Grid) Ground Level 101687 N **Drill Fluid** 3.48 m OD Polymer GS550 Crew/Vessel Logged by Compiled by S Purvis Approved by **Dates Drilled** Start 01/10/2012 clm End 01/10/2012 01/10/2012 10/10/2012 14/11/2012 Water Sample/Core Recovery SPT Depth Depth (m) Blows /N Date Casing No. Level Legend Type (Thick-Depth **Description of Strata** & Depth (m) (Flush Return) % ness) Core Size (mm) Time (m) TCR % SCR % RQD From Τo % (m) 0.10 01/10 MADE GROUND: Tarmacadam. 3.38 MADE GROUND: Reinforced concrete. (5mm (0.15) diameter mesh reinforcement). 3.23 0.25 MADE GROUND: Composed of yellow brown slightly silty sandy subangular and subrounded fine to coarse flint gravel. -(0.55)0.80 2.68 MADE GROUND: Composed of brown silty slightly clayey angular to subrounded locally rounded fine to coarse flint (0.15) 01/10 DRY 0.95 2.53 gravel. End of Borehole

Remarks (See notes & keysheets)

Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 0.95m depth and rescanned using the CAT to check for services. An unknown service was encountered at 0.95m and the

- borehole was abandoned and relocated as $\ensuremath{\mathtt{CPRCB9A}}$. The borehole was backfilled on completion with materials arising.
- Groundwater not encountered during boring.

Scale 1:25

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Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR5 (1 of 1)

Drilling Method Cable Percussion & Rotary **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB9A 200mm to 8.50m 200mm to 7.40m Equipment 150mm to 30.30m Dando 2000

Approved by BC S Purvis/R Johnson Start 04/10/2012 Crew/Vessel Logged by Compiled by **Dates Drilled** clm

Knebel

Coordinates (National Grid) Ground Level 502747 E 101686 N 3.48 m OD

Dates	Drilled	Start End	04/10/2012 08/10/2012			AH 05/10/		Elm BC 8/10/2012 14/11/2012			
Date & Time	Casing Depth (m)	Depth to Water	Sample I	1	ı	SPT Blows/N Drive mm	U100 Blows/ Recovery mm	Description of Strata	Depth (Thick- ness)	Level	Legen
Tille	(111)	(m)	From To	Туре	NO.	Test	Result		(m)		
4/10			- - - - - - - 0.50 0.50	B D ES	1 2 3			MADE GROUND: Tarmacadam. MADE GROUND: Reinforced concrete. (5mm diameter mesh). MADE GROUND: Composed of yellow brown slightly silty sandy angular and subangular fine to coarse flint gravel. Sand is fine to coarse.	(0.10) 0.10 (0.15) 0.25 (0.55)	3.38	
		GL	1.00 - 1.00 - 1.00 - 1.20-1.65 - 1.20-1.70	B D ES D B	4 5 6 7 8	s19		Probable MADE GROUND: Composed of brown clayey sandy angular to rounded fine to coarse flint gravel with occasional gravel sized pockets of dark grey clay and rare cobble sized flint fragments. Sand is fine to coarse. Medium dense brown very sandy angular to well rounded fine to coarse flint GRAVEL. Sand is fine to coarse.	1.20	2.68	
	1.90	GL	2.00-2.45 2.00 2.00-2.50 2.00-2.50	D D B	9 10 11	S18			(2.30)		
	3.00	GL		D D B	13 14 15	S18			- - - - - - - - - -		
			3.50-4.00	В	16			Medium dense brown grey slightly gravelly to gravelly fine to coarse SAND. Gravel is very angular to well rounded fine to coarse flint.	3.50 - - - - - - -	-0.02	
	3.90	GL	4.00-4.45 - 4.00 - 4.00-4.50	D D B	17 18 19	s19			(1.10)		
			4.60	D	20			Very soft to soft grey brown to brown slightly sandy slightly gravelly CLAY. Gravel is subangular fine to coarse of flint. Sand is fine to coarse.	4.60	-1.12	
	4.60	GL	5.00-5.45	D	21	s9			F		: 0

Remarks 1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located. Chiselled from 2.70m to 2.80m (30 mins); chiselled from 8.00m to 8.30m (30 mins). See separate sheet for installation. Groundwater not encountered during boring. (See notes & keysheets) 2

Scale 1:25

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Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No. G120043U

Figure No.

FR6 (1 of 8)

Drilling Method Cable Percussion & Rotary

Equipment Dando 2000 Knebel

Drill Fluid Knebel
Polymer GS550

Crew/Vessel S Purvis/R Johnson
Dates Drilled Start 04/10/2012
End 08/10/2012

Borehole Diameter 200mm to 8.50m 150mm to 30.30m Casing Diameter 200mm to 7.40m

BOREHOLE No.

CPRCB9A

 Coordinates
 502747
 E

 (National Grid)
 101686
 N

 Ground Level
 3.48
 m OD

 Logged by
 Compiled by clm
 Approved by BC

 05/10/2012
 08/10/2012
 14/11/2012

		Ena Water	08/10/2012			037	10/201		0/2012 14/11/2012			_
Date	Casing	Water Depth	Sample/Co			1	SPT Blows /N	Result or U100		Depth	Level	Learn
& Time	Depth (m)	(III) (Flush Return)	Depth (m)	Type TCR	SCR		Core Size (mm)	Blows/ Rec. mm or Fracture	Description of Strata	(Thick- ness)	Level	Legen
		% ′	From To	% D	% 22	%	(mm)	Index		(m)		٠.٠.
			5.00-5.50	В	23					(1.40)		
			- 5.50-6.00 	В	24					 - - - - -		0.00
			- - - 6.00-6.45 - 6.00 - 6.00-6.50	B D B	25 26 27				Soft orange brown slightly sandy slightly gravelly CLAY. Gravel is subangular fine	- - - 6.00	-2.52	
	6.00	GL	6.00-6.45				s8		to coarse of extremely weak chalk and flint. Sand is fine to coarse.	(0.50)	2.00	0.0.0
			_ 6.50-7.00 - - - - - -	В	28				Probably extremely weak brown white CHALK recovered as silty very angular to subrounded fine to coarse gravel and cobble sized fragments of chalk and flint.	- 6.50 -	-3.02	
			7.00	D	29					‡ - - - - -		
	7.40	GL	7.50-8.00 7.50-7.95	В	30		s33			_(2.00)		
			8.00-8.50	В	31					- - - - -		
1/10	7.40	GL	-								5.00	
5/10	7.40	2.10	8.50-9.30	44	0	0		AZCL	Extremely weak low density orange white and black speckled CHALK. Fractures are very closely spaced (10/30/100) inclined 40 degrees to 80 degrees planar smooth generally clean surfaces orange stained and black speckled. (B4/A4) Between 8.50m and 8.95m: Assumed zone of	- 0.30 I I I I	-5.02	
			- - - -					NI	core loss. Between 9.00m and 9.08m: 3No coarse gravel sized flint nodules. Between 9.30m and 9.90m: Assumed zone of	<u></u>		
	8.50	2.10	9.30-9.75				s1		core loss.	<u> </u>		
		(20)	9.30-10.30	60	0	0		AZCL		† - -		
									Between 9.90m and 12.10m: Recovered as very angular and subangular medium and coarse gravel sized fragments of chalk and flint.	<u> </u>		

Remarks (See notes & keysheets)

Scale 1:25

TUGRO **Project**

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR6 (2 of 8)

Drilling Method Cable Percussion & Rotary **Borehole Diameter Casing Diameter**

Equipment Dando 2000 Knebel

Drill Fluid Polymer GS550 Crew/Vessel Dates Drilled S Purvis/R Johnson

Start 04/10/2012

200mm to 8.50m 150mm to 30.30m

200mm to 7.40m

BOREHOLE No. Coordinates (National Grid) Ground Level

CPRCB9A 502747 E 101686 N 3.48 m OD

Approved by BC Logged by Compiled by clm

ates	Drilled	End	04/10/2				05/	/10/201	cim L2 08/1	0/2012 14/11/2012			
	0	Water Depth	Sar	nple/Co	re Rec	overy		SPT	Result		Depth		
&	Casing Depth	(ṁ) (Flush	Depth	(m)		No.	-	SPT Blows /N	or Fracture	Description of Strata	(Thick- ness)	Level	Lege
ime	(m)	Return)	From	То	TCR %	SCR %	RQD %	Core Size (mm)	Index		(m)		
			<u>-</u> -						NI		‡		
			<u> </u>							Between 10.30m and 10.40m: Recovered as	Ŧ		11,11
								1		very angular medium and coarse gravel	Ŧ		11,11
			<u>-</u>							sized fragments of flint.	ŧ		
			-						>25		†		1, 1,
			 - -							Between 10.70m and 10.80m: Recovered as	‡		11,11
										very angular medium and coarse gravel sized fragments of flint.	Ŧ		
									AZCL	Between 10.80m and 10.85m: Assumed zone	Ŧ		
		(40)	10.30	-11.55	70	0	0			of core loss.	L		11/1
			- -								‡		
			<u>-</u>								‡		
			<u> </u>								Ŧ		
			<u>-</u>							Between 11.45m and 11.59m: Recovered as	ŧ		
			_					-		<pre>very angular fine to coarse gravel sized fragments of flint.</pre>	†		
	8.50	2.10	12.00	-12.45	5			s36		-	‡		
											Ŧ		
			[(6.80)		
		(30)	11.55- - 12.00-	-12.30 -12.17	75 C	53 32	53				Ł		
			- -								‡		쀼
			12.17	-12.30	C	33			>25		‡		
			-		-				>25		Ŧ		
											Ŧ		11,1
			_								+		
			- -								‡		i l
			<u> </u>								Ŧ		
			<u> </u>								Ŧ		
			<u> </u>								Ł		
		(30)	12.30-	-13.80	93	67	67				‡		
			F								‡		
			E								Ŧ		
			-								‡		
			<u> </u>								F		
			- -							Between 13.70m and 13.80m: Assumed zone	‡		
									AZCL	of core loss.	Ŧ		14
											Ŧ		
			-							Between 14.01m and 14.10m: Recovered as	<u> </u>		
			 							very angular fine to coarse gravel sized fragments of flint.	‡		
			Ē							Between 14.20m and 14.23m: Possible flint nodule recovered as angular fragments.	Ē		
			E							Between 14.24m and 14.30m: Dark brown flint nodule.	E		
			<u> </u>								†		
		(50)	_ - 13.80-	-15.30	100	93	93		9	Between 14.50m and 14.57m: Dark brown flint nodule.	†		
			 								‡		
			F								‡		
			Ľ		1				I		Ť		$\ln^{10} p$

Remarks (See notes & keysheets)

Scale 1:25

Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR6 (3 of 8)

Drilling Method Cable Percussion & Rotary

Borehole Diameter
200mm to 8.50m

Casing Diameter
200mm to 7.40m

BOREHOLE No.

200mm to 8.50m
Equipment Dando 2000 150mm to 30.30m
Knebel

Drill Fluid Polymer GS550
Crew/Vessel S Purvis/R Johnson
Dates Drilled Start 04/10/2012

S Purvis/R Johnson

Start 04/10/2012
End 08/10/2012

Logged by Compiled by Approved by

AH clm BC

05/10/2012 08/10/2012 14/11/2012

Coordinates 502747 E
(National Grid) 101686 N
Ground Level 3.48 m OD

CPRCB9A

		End	08/10/2012			05/		.2 08/1	0/2012 14/11/2012			
Date	Casing	Water Depth	Sample/Co	re Rec	overy		SPT Blows	Result		Depth		
&	Depth	(ṁ)	Depth (m)	Туре	No.		/N	or	Description of Strata	(Thick-	Level	Legend
Time	(m)	(Flush		TCR	SCR	RQD	Core Size (mm)	Fracture	Description of Strata	ness)		
	(,	Return)	From To	%	%	%	(mm)	Index		(m)		
										-		
			15.09-15.23	C C	34					‡		
05/10	8.50	6.30	<u>-</u>						Between 15.25m and 15.30m: Dark brown	‡		
	0.50		- 15 00 15 5						flint nodule.	15.30	-11.82	
08/10	8.50 8.50	2.70 2.10	15.30-15.75	ľ			S44		Very weak low density locally medium	 		
			_						density white and locally orange and	F		
			15.57-15.75	. c	35				black speckled CHALK. Fractures are closely to medium spaced (100/300/500)	F		
									inclined 60 degrees to 90 degrees planar	‡		
			-						<pre>smooth closed locally grey stained and black speckled. (B4/B3)</pre>	<u> </u>		
			_					6	Between 15.30m and 15.34m: Recovered as	ţ		
			<u>-</u> _						very angular fine to coarse gravel sized fragments of flint.	L		
		(60)	15.30-16.80	73	73	73			Between 15.82m and 15.92m: Recovered as	-		
			-						very angular fine to coarse gravel sized fragments of flint.	Ţ		
			-						ragments of rime.	ļ.		
			-						Between 16.40m and 16.94m: Assumed zone	<u> </u>		
			-						of core loss.	‡		
			-							F		
			ŀ							ţ		
			_					AZCL		L		
							-			F		
			-							Ī		
			_ 16.94-17.21	С	36					F		
			Ī							ļ		
			-							<u> </u>		
			- -						Between 17.31m and 17.34m: Recovered as very angular fine to coarse gravel sized	 		
									fragments of flint.	ļ		$\mu''\mu''\mu'$
			_							<u>L</u>		
		(50)	16.80-18.30	91	91	91				ţ		
			_							<u>t</u>		
			-						Between 17.84m and 17.94m: Recovered as	ŀ		
			-						very angular fine to coarse gravel sized	Į.		
			[fragments of flint.	Į.		
			-							F		
			-							‡		
			18.21-18.30	C	37					ļ.		
			-	1			1	3		(6.10)		11, 11, 11,
	8.50	2.70	18.30-18.75	5			S36			‡ `` ` ``		
			<u> </u>							 		
			-						Patron 10 81m and 10 50 5	ţ		
			<u> </u>						Between 18.71m and 18.76m: Recovered as very angular coarse gravel sized	Ł		
			}						fragments of brown flint.	ł		
			F							F		
		(50)	L		100	1				F		
		(50)	18.30-19.80	1 100	100	100			Between 19.18m and 19.25m: Recovered as	Ī		
			F						very angular and subangular fine to	‡		
			- -						coarse gravel sized fragments of brown flint.	ţ		
			19.40-19.58	, ,	38					‡		
			_ 19.40-19.50	1	30					L		
			-						Between 19.59m and 19.69m: Recovered as very angular and subangular fine to	ţ		
			<u> </u>						coarse gravel sized fragments of brown	t		
			<u>-</u>						flint and chalk.	ŀ		
			-					AZCL		F		11, 11, 11
			F							F		
Pomari												

Remarks (See notes & keysheets)

Scale 1:25

TUGRO (

Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No. G120043U

Figure No.

FR6 (4 of 8)

Drilling Method Cable Percussion & Rotary

Equipment

Drill Fluid Crew/Vessel Dates Drilled Dando 2000 Knebel Polymer GS550

S Purvis/R Johnson Start 04/10/2012 End 08/10/2012

Borehole Diameter

200mm to 8.50m 150mm to 30.30m

Casing Diameter 200mm to 7.40m

BOREHOLE No.

Coordinates (National Grid) Ground Level

502747 **E** 101686 N 3.48 m OD

CPRCB9A

Approved by BC 14/11/2012 Logged by Compiled by AH 05/10/2012 clm

08/10/2012

_		Water					•				1		1
te	Casing	Depth	Sar	mple/Co	re Rec	overy		SPT	Result		Depth		
	Dansh	(m)	Depth	(m)	Type	No.		Blows /N	or	Description of Strata	(Thick-	Level	Lege
ne	(m)	(Flush Return) %				SCR	RQD	Core Size (mm)	Fracture Index		`ness)		
_		%	From	То	%	%	%	(mm)			(m)		<u> </u>
			-								Ŧ		
			20.18	-20.45	С	39					Ŧ		11,11
			Ī								Ŧ		11,11
											‡		1, 1,
			_								L		
		(30)	19.80	-21.30	90	90	90		3	Between 20.66m and 20.82m: Cobble sized	‡		
			= =						3	flint nodule.	†		li I
			-								t		
			_								ţ		
			-								Ł		14
											ł		11,11
			_								ł		
]		Between 21.30m and 21.40m: Assumed zone of core loss.	F		
	8.50	2.70	21.30	-21.75				S32	AZCL	or core loss.	<u> </u>		
			-							Very weak medium density grey white and	21.40	-17.92	
										locally black speckled CHALK. Fractures	F		11
			-							are medium to widely spaced (100/500/1000) subhorizontal to inclined	Ŧ		11
			_							20 degrees planar smooth clean locally	Ŧ		H
										stained grey and black speckled. (B3/B2)	Ŧ		
			01 04	00.00	_	40					Į.		h T
		(0)		-22.20 -22.80		40 93	93				F		
			-								1		
			-								‡		ΗΉ
			= =								‡		
			-								‡		
			-								F		
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			-								‡		HH
			-								F		HT.
			-								‡		
			-								‡		
			-							Between 23.34m and 23.40m: Recovered as very angular and subangular fine to	‡		11
			23.43	-23.72	C	41				coarse gravel sized fragments of brown	‡		Щ
		(20)	22.80	-24.30	100	100	91			black flint.	F		
			<u>-</u> -								‡		
			-								‡		
			-							Between 23.83m and 23.89m: Recovered as very angular and subangular fine to	‡		
			-							coarse gravel sized fragments of brown flint.	‡		1
			-							TITHE.	F		H
			-								‡		
			-								‡		
			24.30	-24.65	1			S50/			ţ		
	8.50	2.70	-	-24.60		42		200			‡		
			24.30	-24.60	٠	42					F		H
			‡								ţ		
			_								‡		
			-								‡		
			<u> </u>								t		
		l l	<u> </u>		1	1	l	I			\vdash		11,1,1

Remarks

(See notes & keysheets)

Scale 1:25



Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR6 (5 of 8)

Drilling Method Cable Percussion & Rotary

Equipment Dando 2000 Knebel

Drill Fluid

Polymer GS550 Crew/Vessel Dates Drilled S Purvis/R Johnson Start 04/10/2012 End 08/10/2012

Borehole Diameter 200mm to 8.50m 150mm to 30.30m **Casing Diameter** 200mm to 7.40m **BOREHOLE No.**

CPRCB9A 502747 **E**

Approved by BC 14/11/2012 Logged by Compiled by AH clm 05/10/2012 08/10/2012

Coordinates (National Grid) Ground Level 101686 N 3.48 m OD

		Ena Water	08/10/2						.2 08/1	0/2012 14/11/2012	1		1
Date	Casing	Water Depth	San	nple/Co				SPT Blows /N	Result		Depth		
&	Daniela	(m)	Depth	(m)	Туре		ĺ	/N		Description of Strata	(Thick- ness)	Level	Legen
Γime	(m)	(Flush Return) %	From	To	TCR	SCR %	RQD	Core Size (mm)	Fracture Index	·			
		(20)	24.30			-	100	(111111)			(m)		
		(20)	24.30-	-25.60	100	100	100				ł		
			- -								L		
			_								t		
			- -							Between 25.46m and 25.48m: 2No medium and	‡		
			-							coarse gravel sized flint nodules.	F		
			= -								‡		
											Ŧ.		
			-						3	Between 25.85m and 26.44m: 4No coarse gravel sized flint nodules.	(8.90)		
											Ł		
			26.05	-26.24	С	43					F		
			-								ţ		
			-								‡		
			-								‡		
											1		
		(10)	25.80	-27.30	100	100	96				Ŧ		
											E		
			-								ł		
			-								‡		
			_ 27.03-	-27.18	С	44					†		<u> </u>
			-								‡		
8/10	8.50	4.80	= -								‡		
			27.30	-27.45				S50/			Ŧ		
	8.50	2.70						75			Ł		
			-								F		
			_								t		11, 11,
			-								‡		111111
			-								‡		
		(00)	- 05 30	00.00	100						1		
		(20)	27.30	-28.80	100	75	75				Ŧ		
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			- -								‡		11, 11,
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			<u>-</u>								L		
			29.12	-29.42	ď	45					ţ		
				27.72	Ĭ						‡		
			- -								ţ		
			29.42	-29.80	С	46					‡		
		(20)	<u>L</u>				100				F		
		(∠0)	28.80	-30.30	100	100	100				Ŧ		
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			_								t		
				20 2-	_						t		
			29.98	-30.20	С	47					\vdash		كبيا

Remarks

(See notes & keysheets)

Scale 1:25

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Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR6 (6 of 8)

Drilling Method Cable Percussion & Rotary **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB9A 200mm to 8.50m 200mm to 7.40m Equipment Coordinates (National Grid) Ground Level Dando 2000 150mm to 30.30m 502747 E Knebel 101686 N **Drill Fluid** 3.48 m OD Polymer GS550 Approved by BC Crew/Vessel S Purvis/R Johnson Logged by Compiled by **Dates Drilled** Start 04/10/2012 clm 05/10/2012 End 08/10/2012 08/10/2012 14/11/2012 Water SPT Blows /N Sample/Core Recovery Depth Depth (m) Result Date Casing (Thick-ness) Туре No. Level Legend or & Depth **Description of Strata** Depth (m) (Flush Return) % Core Size (mm) Fracture TCR % SCR % Time (m) RQD % Index From То (m) 30.30 End of Borehole Remarks (See notes & keysheets) Scale 1:25 **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No. FR6 (7 of 8) 304/03

Drilling Method Cable Percussion & Rotary **BOREHOLE No. Borehole Diameter** CPRCB9A Coordinates (National Grid) Ground Level 150mm to 30.30m Equipment Dando 2000 502747 E Knebel 101686 N 3.48 m OD Polymer GS550 Crew/Vessel S Purvis/R Johnson Compiled by Approved by BC Logged by AH **Dates Drilled** 04/10/2012 Start 05/10/2012 14/11/2012 End 08/10/2012 08/10/2012 Installation Water Strata Level **Installation Details** Strata Details m OD Depth (m) Strikes Depth (m) Concrete MADE GROUND Instrumentation: 2.98 75mm slotted Bentonite Pellets section (SL) from 23.50 to Sandy GRAVEL 29.50m 3.50 Gravelly SAND 4.60 Sandy gravelly CLAY 6.50 CHALK 23.00 -19.52 Gravel Filter SL=23.50-29.50m 30.30 -26.82 30.30 Base of Hole Remarks (See notes & keysheets) Water Strike **▼** Water Rise Flush lockable stopcock box cover. Pipe diameter 75mm to 29.50m, installed on 09/10/2012. **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No. FR6 (8 of 8)

Drilling Method Cable Percussion and **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB10 Rotary 200mm to 4.50m 200mm to 4.50m Equipment Dando 3000 150mm to 20.00m 502361 E

Approved by Crew/Vessel S Purvis/R Johnson Logged by Compiled by **Dates Drilled** Start 25/09/2012

Knebel

Polymer GS550

Drill Fluid

Coordinates (National Grid) Ground Level 102140 N 3.27 m OD

Dates	Drilled	Start End	25/09/2 01/10/2				AH 26/	09/201	clm .2 27/0	BC 9/2012 14/11/2012			
Date	Casing	Water Depth	San	nple/Co	_	r – –		SPT Blows	Result or U100	•	Depth		
& Time	Depth (m)	(ṁ) (Flush Return)	Depth	(m)	Type	No. SCR	ROD	Core Size (mm)	Blows/ Rec. mm or	Description of Strata	(Thick- ness)		Legen
111110	("")	%	From	То	%	%	\%	(mm)	Fracture Index		(m)		
25/09			<u>-</u>							MADE GROUND: Tarmacadam.	(0.07		
			0.30 0.30 0.30		ES B D	1 2 3				MADE GROUND: Composed of dark grey bro silty very sandy subrounded to rounded fine to coarse gravel of flint and rar chalk. Sand is fine to coarse.	vn (0.27	2.93	
			- 0.50 0.50		ES D	4 4A				MADE GROUND: Composed of subangular coarse gravel sized fragments of weak chalk.	0.40	2.87	
			<u>-</u>							MADE GROUND: Composed of dark grey bro			
			Ė							silty sandy subangular to subrounded f to coarse gravel of flint with rare	/t		
			1.00 1.00		D D	5 5A				coarse gravel sized fragments of brick Sand is fine to coarse.)	
		DRY	1.20-	-1.65 -1.70	D B	6		S40		MADE GROUND: Composed of subangular coarse gravel and occasional cobble si fragments of weak chalk with a little reworked chalk.	zed 1.13	2.14	
			1.20		D	7A				MADE GROUND: Composed of clayey slight sandy subangular and subrounded fine t coarse gravel of flint, chalk and occasional brick. Sand is fine to coar	0.87)	
	2.00	DRY		-2.45 -2.50	D B D	8 9 9A		S12		MADE GROUND: Composed of orange slight clayey sandy very angular to subangula fine to coarse gravel sized fragments flint, red brick and extremely weak orange weathered chalk. Sand is fine t coarse.	e e	1.27	
			- 2.00 		<u> </u>	, ja				Probably structureless CHALK recovered orange and mottled brown silty sandy subangular and subrounded fine to coar gravel and occasional cobble sized fragments of flint and weak orange weathered chalk.	Į.		
	3.00	DRY		-3.45 -3.50	D B D	10 11 11A		S17			_(2.00)	
			- - - - - - - - - -								- - - - - - - - - - - - - - - - - -		
	4.00	DRY	4.00- - 4.00	-4.45	D D	12 13A		s15		Probably structureless CHALK recovered orange white slightly sandy gravelly comminuted chalk. Gravel is subangular and subrounded fine to coarse of	ł		
25/09	4.50	4.25	- - - -							extremely weak to weak orange weathere chalk and very angular and subangular fine to coarse gravel of flint.	1		
28/09	4.50	DRY			1			1	AZCL	Extremely weak low density white orang	4.50	-1.23	
		(100)	4.50-	-5.00	80	0	0		NI	and locally black speckled CHALK. Fractures are very closely spaced (10/20/60) undulating rough closed and clean surfaces locally stained orange brown and brown speckled. (B4) Between 4.50m and 4.60m: Assumed zone core loss.	‡		

Remarks 1 (See notes & keysheets)

Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

- The borehole was backfilled on completion with bentonite pellets.

 Groundwater was encountered at 4.50m during boring and rose to 4.35m after 5 mins,4.35m after 10 mins,4.30m after 15 mins,4.25m after 20 mins. 3
- Chiselled from 1.80m to 2.00m (30 mins).
- See separate sheet for installation.

Scale 1:25



Project LITTLEHAMPTON ARUN TIDAL DEFENCES Contract No. G120043U

Figure No.

FR7 (1 of 6)

Drilling Method Cable Percussion and Borehole Diameter Casing Diameter BOREHOLE No.

Rotary 200mm to 4.50m
Equipment Dando 3000 150mm to 20.00m
Knebel

Drill Fluid Crew/Vessel Dates Drilled 200mm to 4.50m
150mm to 20.00m

Coordinates
(National Grid)
Ground Level

3.27 m OD

CPRCB10

304/03

| Polymer GS550 | S Purvis/R Johnson | Logged by Compiled by Approved by Start 25/09/2012 | AH | clm | BC | End | 01/10/2012 | 26/09/2012 | 27/09/2012 | 14/11/2012

								_	.Z Z// 0				
		Water	Sar	mple/Co	re Rec	overy		SPT	Desuit		Depth		
Date &	Casing Depth	Depth (m) (Flush	Depth	(m)	Туре	No.	!	Blows /N Core	Result or Fracture	Description of Strata	(Thick- ness)	Level	Legend
Time	(m)	Return)	From	То	TCR %	SCR %	RQD %	Size (mm)	Index		(m)		
			5.33	-5.49	С	14			>25	Between 4.60m and 5.00m: Recovered as subrounded fine to predominantly coarse gravel sized fragments of extremely weak orange chalk. Between 4.80m and 4.90m: Recovered as comminuted chalk with very angular fine to coarse gravel sized fragments of grey brown flint.	(1.10)		
		(100)	5.00	-6.50	40	23	43			Between 5.00m and 5.25m: Recovered as subrounded fine to predominantly coarse gravel sized fragments of extremely weak orange chalk and comminuted chalk with occasional flint fragments.	5.60	-2.33	
									AZCL	Extremely weak to weak low to medium density white and locally orange and black speckled CHALK. Fractures are extremely closely to very closely spaced (10/60/200) predominantly inclined 5 degrees to subvertical planar smooth closed clean with slight orange staining and slight to moderate brown speckling to surfaces. (B4 / B5).	- - - - - - - - - -		
	4.50	DRY	6.50	-6.95				s33	-	Between 5.60m and 6.50m: Assumed zone of core loss. Between 6.50m and 6.60m: Recovered as	 - -		
		(100)		-8.00	100 C	15	23		>25	angular and subangular fine to coarse gravel sized fragments of grey brown flint. Between 6.60m and 6.80m: Recovered as subangular fine to coarse gravel sized fragments of extremely weak orange chalk and abundant comminuted chalk. Between 6.90m and 7.00m: Recovered as subangular fine to coarse gravel sized fragments of weak orange chalk. Possible zone of very closely spaced fractures. Between 7.00m and 7.05m: Very angular and subangular fine to coarse gravel sized grey brown flint. Between 7.58m and 8.00m: Recovered as angular and subangular fine to coarse gravel sized gravel sized fragments of extremely weak orange chalk. Possibly very closely fractured. Between 7.60m and 7.70m: Very angular dark brown flint nodule (90mm x 40mm). Between 7.78m and 7.87m: With occasional subrounded fine to coarse gravel sized fragments of dark brown flint. 8.00m and 8.10m: Recovered as angular and subangular fine to coarse gravel sized fragments of extremely weak chalk and angular fine to coarse grey brown flint. Between 8.41m and 8.49m: 1 No.cobble sized flint nodule (60mm x 70mm x 80mm).			
		(100)	8.00·	-9.50	87	8	8			Between 8.50m and 8.95m: Possible zone of very closely spaced fractures. Between 8.61m and 8.71m: 1 No. cobble sized brown flint nodule (100mm x 100mm x 120mm). Between 8.95m and 9.30m: Recovered as angular and subangular fine to coarse	† † † †		
			-							gravel sized fragments of orange chalk and comminuted chalk. Between 9.30m and 9.50m: Assumed zone of	<u> </u>		
28/09	4.50	GL	- - - -						AZCL	core loss.	 - -		
01/10	4.50 4.50	GL	9.50	-9.71				\$50/ 75		Between 9.57m and 9.77m: Recovered as subangular fine to coarse gravel sized fragments of grey chalk and comminuted chalk.	— - - - - - -		

Remarks (See notes & keysheets)

Scale 1:25

Project
LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No. G120043U

Figure No. FR7 (2 of 6)

Drilling Method Cable Percussion and

Rotary E

Borehole Diameter 200mm to 4.50m

Casing Diameter 200mm to 4.50m

BOREHOLE No.

CPRCB10

E00061	_
502361	E
102140	N
3.27	m OD
	502361 102140 3.27

		End Water	01/10/					09/201		9/2012 14/11/2012	_		
ate	Casing	Depth	Sai	mple/Co	_		ı	SPT Blows			Depth		
S.	Depth	(m) (Flush	Depth	(m)	Туре		ĺ	/N Core	or Fracture	Description of Strata	(Thick- ness)	Level	Lege
me	(m)	Return)	From	To	TCR %	SCR %	RQD %	Size (mm)	Index		(m)		
		70	-					()			(,		
			-							Between 10.16m and 10.21m: Recovered as very angular fine to coarse gravel sized	‡		11,11
		(100)	9.50	-11.00	95	35	31			dark brown flint and communited chalk.	‡		11111
			- -								‡		1111
			-								‡		1,1,1
			-								F		11,1
											Ŧ		
			<u>[</u>								Ŧ		
			-								<u> </u>		
			10.93	-11.00	С	16			>25		Ł		14
	4.50	GL	11.00	-11.25				S50/ 100			†		
	4.50	GП	-					100			‡		
			-							Between 11.36m and 11.52m: Recovered as	(11.40)		
			-							subangular fine to coarse gravel sized fragments of weak chalk and dark brown	‡		4
			_ 11.50	-11.62	С	17				flint.	1		쀼
			-							Between 11.63m and 11.66m: Recovered as	‡		
		(100)	11 00	-12.50	100	100	100			angular fine to coarse gravel sized dark brown flint.	Ŧ		
		(100)	_ 11.00	-12.50	100	100	100			BIOWN TITHE.	F		H
										Between 11.96m and 12.06m: Brown black	Ŧ		쀼
			_							flint nodule (40mm \times 60mm \times 100mm).	+		
			_								†		
			_								†		
			- -							Between 12.35m and 12.50m: Recovered as subangular fine to coarse gravel sized	‡		쀼
			- -							fragments of chalk and comminuted chalk. Between 12.50m and 12.55m: Assumed zone	‡		
	4.50	GL	12.50	-12.95				S40	AZCL	of core loss.	F		
			-								Ŧ		H
			_ -						>25		<u> </u>		
			-						- 25		†		
			<u>-</u>								<u> </u>		
			-								‡		
		(100)	12 50	-14.00	97	97	92				‡		
		(100)	- 12.50	11.00	,] ,					Ŧ		
											Ŧ l		H
			_								+		
			-								†		
			-						3		‡		
			-								‡		
			13.91	-14.00	С	18					E		
	4.50	GL	14.00	-14.24				s50/ 85		Potwoon 14 14m and 14 10m. Parameter -	F		
	4.50	GT						65		Between 14.14m and 14.19m: Recovered as angular fine to coarse gravel sized	†		
			_							fragmentsof dark brown flint.	†		
			-								†		
			_							Between 14.53m and 14.58m: Recovered as	<u> </u>		i l'
			-							fine to coarse gravel sized fragments of dark brown flint.	‡		14
		(100)	14.00	-15.50	100	27	25				‡		
		(100)		13.30		~′					F		
									>25	Between 14.96m and 15.00m: Dark brown	Ŧ I		
			<u>_</u>		I					flint nodule.	-		السل

Remarks (See notes & keysheets)

Scale 1:25

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Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR7 (3 of 6)

Drilling Method Cable Percussion and

Rotary Dando 3000 Equipment Knebel

Drill Fluid Crew/Vessel Dates Drilled

Polymer GS550 S Purvis/R Johnson **Borehole Diameter** 200mm to 4.50m 150mm to 20.00m **Casing Diameter** 200mm to 4.50m

BOREHOLE No.

CPRCB10

Coordinates (National Grid) Ground Level 502361 **E** 102140 N 3.27 m OD

Approved by BC 14/11/2012 Logged by Compiled by

Crew/\ Dates	Vessel Drilled	Start	vis/R Johnson 25/09/2012			AH	ged by	clm	piled by Approved by BC				
		End Water	01/10/2012 Sample/Co	ro Poo	OVOTV		09/201 SPT	.2 27/0	9/2012 14/11/2012				
&	Casing Depth	Depth (m) (Flush	Depth (m)	Туре		J	Blows /N Core Size	Fracture	Description o	of Strata	Depth (Thick- ness)	Level	Legen
Time	(m)	Return)	From To	%	%	%	Size (mm)	Index			(m)		
			15.40-15.50	С	19			AZCL	Between 15.15m and 15.1 flint nodule. Between 15.25m and 15.4 of very closely spaced Between 15.50m and 15.7 of core loss. Between 15.70m and 15.7 subangular fine to coar fragments of chalk and	Om: Possible zone fractures. Om: Assumed zone Sm: Recovered as se gravel sized			
		(100)	- - - - - - - - - - - - - - - - - - -	87	20	17		>25	flint. Between 16.00m and 16.2 angular and subangular gravel sized fragments occasional dark brown f	5m: Recovered as fine to coarse of chalk and			
	4.50	GL (100)	17.00-17.18 17.09-17.35	С	20	80	\$50/ 70	9	Very weak low to medium white and rare black sp Fractures are closely spredominantly subhorized closed clean with sligh staining and brown spect (B3) Between 17.12m and 17.1 fragments (2mm to 3mm the Between 17.22m and 17.2 nodule (15mm x 20mm).	peckled CHALK. paced (20/120/500) ntal planar rough tt orange and brown ckling to surfaces. 5m: Bivalve shell hick).		-13.73	
		(100)	18.55-18.88 	100	100	85					_(3.00)		
01/10	4.50	GL	- -									16 55	
									End of Bor	rehole	_20.00	-16.73	

Remarks

(See notes & keysheets)

Scale 1:25

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Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR7 (4 of 6)

Drilling Method Cable Percussion and **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB10 200mm to 4.50m 150mm to 20.00m Rotary 200mm to 4.50m Equipment Dando 3000 Coordinates (National Grid) Ground Level 502361 E Knebel 102140 N **Drill Fluid** 3.27 m OD Polymer GS550 Approved by BC Crew/Vessel S Purvis/R Johnson Logged by Compiled by **Dates Drilled** Start 25/09/2012 clm 26/09/2012 End 01/10/2012 27/09/2012 14/11/2012 Water SPT Blows /N Sample/Core Recovery Depth Depth (m) Result Date Casing (Thick-ness) Type No. Level Legend or & Depth **Description of Strata** Depth (m) (Flush Return) % Core Size (mm) Fracture TCR % SCR % Time (m) RQD % Index From То (m) 20.00-20.35 s50/ 195 -16.73 20.00 4.50 GL Remarks (See notes & keysheets) Scale 1:25 **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No. FR7 (5 of 6)

Drilling Method Cable Percussion and **BOREHOLE No. Borehole Diameter** CPRCB10 200mm to 4.50m 150mm to 20.00m Rotary Dando 3000 Coordinates (National Grid) Ground Level Equipment 502361 E Knebel 102140 N 3.27 m OD Polymer GS550 Crew/Vessel S Purvis/R Johnson Compiled by Logged by Approved by BC **Dates Drilled** 25/09/2012 Start 26/09/2012 27/09/2012 14/11/2012 End 01/10/2012 Installation Water Strata Level **Installation Details** Strata Details Depth (m) m OD Strikes Depth (m) Concrete MADE GROUND Instrumentation: 0.50 2.77 50mm slotted Cement/Bentonite Grout section (SL) from 16.50 to 19.50m 2.00 CHALK **▼** 15.00 -11.73 Bentonite Seal 16.00 -12.73 Gravel Filter SL=16.50-19.50m 20.00 -16.73 20.00 Base of Hole Remarks (See notes & keysheets) Water Strike **▼** Water Rise Flush lockable stopcock box cover. Pipe diameter 50mm to 19.50m, installed on 01/10/2012. **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No. FR7 (6 of 6)

Drilling Method Cable Percussion and Rotary

Borehole Diameter 200mm to 4.50m

Casing Diameter 200mm to 4.50m

BOREHOLE No.

26/09/2012

Rotary 200mm to 4.50m Equipment Dando 3000 150mm to 20.10m

Equipment Dando 3000 150mm to 20.

Knebel
Drill Fluid Polymer GS550

S Purvis/M McKinney

24/09/2012

03/10/2012

Start

End

Crew/Vessel

Dates Drilled

Logged by Compiled by Approved by

14/11/2012

fine and medium of black and brown flint.

Probably structureless CHALK recovered as orange white silty subangular fine to coarse gravel and occasional cobble sized fragments of extremely weak orange

Between 4.00m and 4..50m: With very

Probably extremely weak CHALK. No recovery. Between 4.50m and 6.40m: No recovery.

Assumed zone of core loss.

angular fine to coarse gravel of brown flint.

weathered chalk.

27/09/2012

clm

Coordinates 502324 E
(National Grid) 102178 N
Ground Level 3.29 m OD

3.00

(1.50)

4.50

0.29

-1.21

CPRCB11

Water Sample/Core Recovery Result or SPT Depth Depth (m) Blows /N U100 Date Casing Blows/ Rec. mm No. Level Legend Type (Thick-& Depth Depth (m) **Description of Strata** (Flush Return) % ness) Core Size (mm) TCR SCR RQD Time (m) Fracture Index From Τo % % % (m) 24/09 MADE GROUND: Concrete paving slab. (0.05) 3.24 0.05 MADE GROUND: Yellow fine to medium sand. (0.10) 0.15 3.14 (0.05) MADE GROUND: Light brown type 1 sub base. 0.36 D Α 0.20 3.09 (0.16) MADE GROUND: Composed of firm brown slightly gravelly sandy clay. Gravel is subangular to subrounded fine to coarse 2.93 0.50 в 1 0.36 (0.10) 0.50 D 0.50 D 27 of brick, chalk and flint. Sand is fine 0.46 2.83 0.50 ES to coarse. (0.38) MADE GROUND: Composed of dark brown slightly gravelly fine to coarse sand. Gravel is subangular to subrounded fine 0.84 2.45 1.00 В to coarse of flint, brick and rare (0.36) 1.00 D 44 ceramics. 5 1.00 ES MADE GROUND: Composed of weak and medium 1.20 2.09 DRY 1.20-1.65 5 S47 strong cobbles of white chalk with some 1.20-1.70 В light brown reworked chalk. 1.20 6A MADE GROUND: Composed of brown and white grey slightly sandy slightly gravelly reworked chalk with subangular to (0.80)subrounded cobbles of weak grey and white chalk (200mm x 300mm x 350mm). Very soft to soft brown and brown grey Very soft to soft brown and brown grey sandy gravelly CLAY with rare subrounded cobbles of chalk (60mm x 80mm x 100mm). Gravel is subangular fine to coarse of flint and weak white chalk. Sand is fine 2.00 DRY 2.00-2.45 2.00-2.50 s8 2.00 1.29 в 2.00 D 8A to coarse. Soft becoming firm with depth brown mottled orange brown very sandy gravelly CLAY. Gravel is subangular to subrounded (0.70) fine to coarse of flint. Sand is fine to 2.50 D 9 coarse. Between 2.00m and 2.50m: With occasional gravel of extremely weak to weak weathered chalk. 2.70 0.59 Grey mottled brown slightly clayey (0.30) slightly gravelly fine to coarse SAND. Gravel is very angular and subangular 2.90

Remarks 1 See notes & keysheets) Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

4.50-5.10

3.00-3.45 3.00-3.50

3.00

4.00

4.00

4.00-4.45

3.00

3.50

3.50

4.00

4.50

4.50

24/09

25/09

25/09

02/10

DRY

3.70

2.05

DRY

2.20

2.00

(100)

11 12

12A

13

D

0 0

S14

s19

0

D

2 Groundwater was encountered at 3.80m during boring and rose to 3.75m after 5 mins,3.75m after 10 mins,3.75m after 15 mins,3.70m after 20 mins.

3 Chiselled from 1.40m to 1.70m (45 mins).

4 See separate sheet for installation.

Scale 1:25

TUGRO	Project LITTLEHAMPTON ARUN TIDAL DEFENCES	Contract No.	G120043U
		Figure No.	FR8 (1 of 6)

Drilling Method Cable Percussion and **Borehole Diameter**

Rotary Dando 3000 Equipment Knebel

Polymer GS550 S Purvis/M Mcl Drill Fluid Crew/Vessel Dates Drilled

Start 24/09/2012 End 03/10/2012

200mm to 4.50m 150mm to 20.10m

Casing Diameter 200mm to 4.50m

BOREHOLE No.

CPRCB11

Coordinates (National Grid) Ground Level 502324 E 102178 N 3.29 m OD

M McKinney	Logged by	Compiled by	Approved by
09/2012	AH	clm	BC
10/2012	26/09/2012	27/09/2012	14/11/2012

ate	Casing	Water Depth	San	nple/Co	т —	T i		SPT Blows	Result		Depth		
&	Depth	(ṁ) (Flush	Depth	(m)	Туре			/N	or Fracture	Description of Strata	(Thick- ness)	Level	Lege
ime	(m)	Return)	From	То	ICR %	SCR %	RQD %	Core Size (mm)	Index		(m)		
			<u>.</u>								<u> </u>		11111
	4.50	GL	5.10	-5.55				S11			‡		ir ir
			= -								‡		11,11
			-						AZCL		(1.90)		11,11
			_						AZCI		- (11.50)		
			[Ŧ		
											E		H
		(70)	10	-6.60	13	0	0				‡		
		(70)	3.10-	-6.60	13	"	١				ţ		i, T
			-								†		
			-								‡		H
			-								‡		
			-								<u></u>		
			Ŀ						NI	Extremely weak locally weak low density	6.40	-3.11	1,1,
			-							brown white and locally black speckled	<u> </u>		11,11
	4.50	GL	6.60	-7.05				S13		CHALK. Fractures are very closely spaced (10/20/100) inclined 60 degrees to	‡		
			-							subvertical planar smooth closed and clean surfaces stained brown and black	‡		
			-						AZCL	speckled. (B4/A4) Between 6.60m and 7.25m: Assumed zone of	‡		1,1,
			<u>-</u>						AZCL	core loss.	<u> </u>		11
			- -								‡		1
			-							Between 7.25m and 8.10m: Recovered as	Ŧ		
					l	_			NI	subangular to subrounded fine to coarse	Ŧ		11,1,
		(80)	6.60	-8.10	57	0	0			gravel sized fragments of extremely weak chalk with abundant orange staining and	Ŧ		11,
			<u></u>							black speckling. Possible highly fractured zone.	<u> </u>		H
			-								‡		
			_						>25		‡		11,
			-								‡		11.
			7.05	-8.05	c	15					‡		H
			- 7.95	-0.05	١	15				Between 8.10m and 8.45m: Assumed zone of	F		
	4.50	GL	8.10-	-8.55				S24		core loss.	Ŧ		11,
			[AZCL		F		11
			-							Detrees 9 45m and 9 95m. Degenerad of	‡		i i
		(60)	8.10-	-8.85	53	0	0			Between 8.45m and 8.85m: Recovered as subangular to subrounded fine to coarse	L		1, 1,
			- -						>25	gravel sized fragments of extremely weak chalk and rare brown flint.	‡		11
			-								Ŧ		11
										Between 8.85m and 9.30m: Assumed zone of	F		
										core loss.	E		1,11
			F						AZCL		+		11
			<u>-</u>								ţ		
		(60)	8.85	-9.60	40	40	40			Between 9.30m and 9.60m: Cobble sized	‡		11.
			-							dark brown flint nodule.	ţ		1,1,
			- -						NI		‡		11
			F							Between 9.60m and 9.75m: Assumed zone of	F		
								1	AZCL	core loss.	Ŧ		
			Ē							Between 9.75m and 9.86m: Recovered as very angular to subangular medium and	F		
			_							coarse gravel sized fragments of brown	E		
		(50)	9.60	-10.35	80	64	64			flint.	Ł		

Remarks

(See notes & keysheets)

Scale 1:25

8				
	hee			m
			m.m	w
			P	
2000	•	*******		*******
- W	,		4	

Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR8 (2 of 6)

Drilling Method Cable Percussion and **Borehole Diameter Casing Diameter BOREHOLE No.**

CPRCB11 Rotary Dando 3000 200mm to 4.50m 150mm to 20.10m 200mm to 4.50m Equipment Knebel

Rnebel
Polymer GS550
S Purvis/M McKinney
Start 24/09/2012
End 03/10/2012 Drill Fluid Crew/Vessel Dates Drilled Approved by BC 14/11/2012 Logged by Compiled by AH clm 26/09/2012 27/09/2012

Coordinates (National Grid) Ground Level 502324 E 102178 N 3.29 m OD

		End	03/10/2012			26/	09/201	L2 27/0	9/2012 14/11/2012			
Doto	Cocina	Water Depth	Sample/Co	re Rec	overy		SPT Blows	Result		Depth		
Date & Time	Casing Depth (m)	(m) (Flush Return)	Depth (m)	Type TCR		RQD	/N	or Fracture	Description of Strata	(Thick- ness)	Level	Legend
Tille	(111)	Return) %	From To	%	%	ב אלא אלא	Size (mm)	Index		(m)		
								NI		ł –		
			-							ţ		
			- 10.22-10.35 -	C	16				Between 10.35m and 10.50m: Assumed zone	<u> </u>		
								AZCL	of core loss.	‡		
			<u></u>							F		
			-							(8.50)		
		(50)	10.35-11.10	80	32	32				(8.30)		1,1,1,1,
								>25		Ŧ.		
			<u>-</u>							<u> </u>		
			-	1			_		Between 11.10m and 11.35m: Assumed zone of core loss.	‡		
	4.50	GL	11.10-11.55	i			S47	AZCL		E		
										‡		
		(60)	_ _ 11.10-11.85	67	40	40				‡		
		(60)	11.10-11.65 [40	40				F		
								>25	Between 11.65m and 11.85m: Recovered as gravelly comminuted chalk.	Ŧ.		
			- -		1				Between 11.85m and 12.10m: Assumed zone	<u> </u>		
			-						of core loss.	‡		
			<u></u>					AZCL		F		
			-							‡		
		(50)	11.85-12.60	60	13	13			Between 12.27m and 12.35m: Recovered as	‡		
			12.35-12.45	С	17			>25	very angular to subangular fine to coarse gravel sized fragments of dark brown	Ē		
			<u>-</u>						flint.	L		
			-	1					Between 12.60m and 12.80m: Assumed zone of core loss.	‡		
								AZCL	Between 12.80m and 12.86m; Dark brown	E		
									flint nodule.	E		
			- -						Detrocan 12 OFm and 12 Ofm, Degeneral of	‡		
									Between 13.05m and 13.09m: Recovered as very angular and angular fine to coarse	F		
									gravel sized fragments of flint.	Ŧ.		
			-							‡		
		(40)	12.60-14.10	87	30	30		NI	Between 13.46m and 13.50m: Dark brown	‡		
			_						flint nodule.	F		
			• • •							ţ		
			- -							‡		
			• •							Ŧ		
			<u>-</u>							L		
02/10	4.50	6.80	-	1					Between 14.10m and 14.30m: Assumed zone of core loss.	ţ		
03/10	4.50 4.50	2.60 GL	14.10-14.34				S50/ 91	AZCL		‡		
	1.50	GII	- -					-		E		
										ţ		
			_ 14.45-14.56	C	18					F		
			-						Between 14.69m and 14.76m: Recovered as	‡		
			- -						angular and very angular fine to coarse gravel sized fragments of brown flint.	F		
		(70)	14.10-15.60	87	47	47				14.90	-11 . 61	
			-						Weak low to medium density brown white		11.01	1111111
					Щ				and locally black speckled CHALK.	<u> </u>		

Remarks (See notes & keysheets)

Scale 1:25

Tugro	Project LITTLEHAMPTON ARUN TIDAL DEFENCES	Contract No.	G120043U	
		Figure No.	FR8 (3 of 6)	304/03

Drilling Method Cable Percussion and

Rotary Dando 3000 Equipment Knebel

Drill Fluid

Polymer GS550 S Purvis/M McKinney Crew/Vessel Dates Drilled Start 24/09/2012 End 03/10/2012

Borehole Diameter 200mm to 4.50m 150mm to 20.10m **Casing Diameter** 200mm to 4.50m

BOREHOLE No.

CPRCB11

Coordinates (National Grid) Ground Level 502324 **E** 102178 N 3.29 m OD

Logged by AH Compiled by Approved by

26/09/2012 27/09/2012 14/11/2	mi	CIM	DC
	26/09/2012	27/09/2012	14/11/20

		Liiu		LUIL			0,	05/203		5/2012 14/11/2012								
		Water	San	nple/Co	re Rec	overy		ŞPT	Danult		Depth							
ate &	Casing Depth	Depth (m) (Flush	Depth	(m)	Туре	No.		Blows /N Core	Result or Fracture	Description of Strata	(Thick- ness)	Level	Legen					
Time	(m)	Return)		То	TCR %	SCR %	RQD %	Size (mm)	Index		(m)							
		2						,	25	Fractures are closely to medium spaced (60/100/400) subhorizontal to subvertical planar smooth closed predominantly clean surfaces locally stained orange brown and brown speckled with rare striations. (B3/A3 to B2/A2) Between 15.11m and 15.25m: Recovered as subangular fine to coarse gravel sized	(33)							
			15.76-	-15.90	С	19				fragments of weak chalk and dark brown flint.								
		(60)		-17.10	100	100	100		6	Between 16.18m and 16.22m: Recovered as very angular fine to coarse gravel sized fragments of dark brown flint. Between 16.29m and 16.37m: Cobble sized dark brown flint fragment.								
			- - - - - -							Between 16.84m and 16.86m: Dark brown flint nodule.								
4.50	4.50	GL	17.10-	-17.53				s50/ 275		Between 17.10m and 17.25m: Recovered as subangular coarse gravel sized fragments of weak chalk and dark brown flint.	<u>-</u>							
		(70)	17.65- 17.10-	-17.80 -18.60		20	80		7	Between 17.80m and 17.81m: Possible thin mudstone parting.	_(5.20)							
										At 18.13m: Possible flint nodule. Between 18.22m and 18.30m: Recovered as angular coarse gravel sized fragments of weak chalk and dark brown flint. Between 18.30m and 18.60m: Assumed zone								
														AZCL	of core loss.			
		(60)	- - - - - - - - - - - - - - - - - - -	-20.10 -19.57		95 21	95		8	Between 19.00m and 19.12m: Recovered as subangular fine to coarse gravel sized fragments of weak chalk and dark brown black flint. Between 19.31m and 19.42m: Recovered as very angular to subangular fine to coarse gravel sized fragments of dark brown flint and occasional weak chalk.								
			- - - -						NI	Between 19.81m and 19.87m: 2No dark brown flint nodules.	<u> </u>							
									7		-							

Remarks

(See notes & keysheets)

Scale 1:25



Project

LITTLEHAMPTON ARUN TIDAL DEFENCES

Contract No.

G120043U

Figure No.

FR8 (4 of 6)

Drilling Method Cable Percussion and **Borehole Diameter Casing Diameter BOREHOLE No.** CPRCB11 Rotary 200mm to 4.50m 200mm to 4.50m Equipment Dando 3000 Coordinates (National Grid) Ground Level 150mm to 20.10m 502324 E Knebel 102178 N 3.29 m OD **Drill Fluid** Polymer GS550 Crew/Vessel S Purvis/M McKinney Logged by Compiled by Approved by **Dates Drilled** Start 24/09/2012 clm 26/09/2012 End 03/10/2012 27/09/2012 14/11/2012 Water SPT Blows /N Sample/Core Recovery Depth Depth (m) Result Date Casing (Thick-ness) Туре No. Level Legend or & Depth **Description of Strata** Depth (m) (Flush Return) % Core Size (mm) Fracture TCR % SCR % Time (m) RQD % Index То From (m) 20.10-20.46 s50/ 210 03/10 4.50 4.10 11,11 20.10 -16.81 4.50 End of Borehole Remarks (See notes & keysheets) Scale 1:25 **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No. FR8 (5 of 6) 304/03

Drilling Method Cable Percussion and **BOREHOLE No. Borehole Diameter** CPRCB11 200mm to 4.50m 150mm to 20.10m Rotary Dando 3000 Coordinates (National Grid) Ground Level Equipment 502324 E Knebel 102178 N 3.29 m OD Polymer GS550 Crew/Vessel S Purvis/M McKinney Compiled by Logged by Approved by BC **Dates Drilled** 24/09/2012 Start 26/09/2012 27/09/2012 14/11/2012 End 03/10/2012 Installation Water Strata Level **Installation Details** Strata Details Depth (m) m OD Strikes Depth (m) Concrete MADE GROUND Instrumentation: 0.50 2.79 50mm slotted Bentonite Seal section (SL) from 16.60 to 1.20 19.60m Sandy gravelly CLAY Clayey gravelly SAND 3.00 CHALK \mathbf{v}_{∇} 16.10 -12.81 Gravel Filter SL=16.60-19.60m 20.10 -16.81 20.10 Base of Hole Remarks (See notes & keysheets) Water Strike **▼** Water Rise Flush lockable stopcock box cover. Pipe diameter 50mm to 19.60m, installed on 03/10/2012. **Project** Contract No. G120043U LITTLEHAMPTON ARUN TIDAL DEFENCES Figure No. FR8 (6 of 6)

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