



ENVIRONMENTAL
CONSULTING

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21st November 2019

ref: A11216/191025/L1

Jonathan Driver
Havant Borough Council
Public Service Plaza,
Civic Centre Road,
Havant,
PO9 2AX

By Email only: Jonathan.Driver@havant.gov.uk

Dear Jonathan,

RE: Request to Discharge Condition 12 of Planning Permission APP/17/00575 – From Portsmouth Water

Please find attached Omnia Environmental Consulting Report ref: A11216/191025/L1 detailing our responses to queries raised by Portsmouth Water regarding OEC Report A10708/v3.0 submitted for the discharge of Condition 12 of the grant of planning permission.

The points raised by Portsmouth Water are presented as numbered points with OEC's responses provided in *Blue Italicised text*.

We trust that the comments below address your concerns satisfactorily. However, if you have any queries pertaining to this letter in the meantime, please do not hesitate to contact us.

Yours sincerely,
For Omnia Environmental Consulting



Dr Adrian King
Principal Consultant

Attachments:

Attachment 1 - Abbey Pynford Pile Design Report

Attachment 2 – Pile Arisings Laboratory Test Report

"Thank you for contacting Portsmouth Water on the application to discharge Condition 12 of planning permission APP/17/00575 which states:

Condition 12

"Piling or any other foundation designs using penetrative methods shall not be permitted other than with the express written consent of the Local Planning Authority in consultation with Portsmouth Water, which may be given for those parts of the site where it has been demonstrated through:-

- 1) a piling risk assessment undertaken by competent consultants identifying anticipated depths for each pile for the proposed development, with the piling risk assessment being shared with Portsmouth Water for consultation; **A piling risk assessment (A10708v3.0) has been produced for the site with Portsmouth Water stating that they had no concerns with this piling methodology (see Point A1).**
- 2) Associated geotechnical site investigation that confirms the maximum depth of anticipated piles (e.g. 1m below the maximum pile depth) does not enter the Chalk that makes up the principal aquifer; **Maximum Pile Length was reduced to 12.0m bgl thus terminating within the Bognor Sand Member and well above the anticipated Chalk interface (see Attachment 1)**
- 3) Submission, approval and implementation of a piling method statement detailing how potential risks will be minimised.

The development shall be carried out in accordance with the approved details'

Portsmouth have previously reviewed and commented on the documentation submitted to support the discharge of Condition 12 dated 10th October 2017.

- A1) The proposed foundation solution for the site is Continuous Flight Auger (CFA) piles, with pile depths to a maximum depth of 18.0m bgl. Portsmouth Water have no concerns with this piling method. **Piling work was undertaken by Abbey Pynford, the pile design report including all pile lengths are included as Attachment 1.**
- A2) The Piling Risk Assessment by OMNIA Environmental Consulting dated August 2017 aims to address part 1 of Condition 12. Portsmouth Water would welcome the recommendation outlined in Section 6.0 being carried out.
 - a. **OEC were contacted by the appointed piling contractor, Abbey Pynford Piling, who advanced a shallow test pile in the vicinity of WS108.**
 - b. **A visual inspection of pile arisings did not yield any visual or olfactory evidence of contamination.**
 - c. **Soil samples were collected from pile arisings at depths specified by the piling contractor (2.00, 5.00 & 7.00m bgl) and were subjected for additional chemical testing for pH and soluble sulphate to assist with selecting the appropriate concrete grade.**
 - d. **The soil test results were slightly alkaline pH 7.66 – 8.36 with the sample from 2.00m bgl yielding elevated sulphate (1.42g/l) which is consistent with previous findings.**
 - e. **The piling contractor was satisfied that test results were within the parameters for the specified concrete classification. Laboratory test certificates (19-12713-1) are provided within Attachment 2.**

A3) We cannot however recommend the discharge of this part of the condition as previously requested that there has been no attempt to understand the presence and/or continuity of the Bognor Sand Member with nearby aquifers in the report. Based on ground investigation reports the shallow groundwater does appear to be contaminated and therefore piling must not enhance the potential migration into the aquifers beneath and surrounding the site. We would wish to see an assessment of the potential connectivity between the sand lenses and the Principal Chalk Aquifer prior to the discharge of condition 12. The report shows that the Bognor Sand Member lies beneath the London Clay though the boreholes terminate at 14m bgl. There is no indication whether the London Clay appears again prior to the Chalk Interface.

- a. A pile design report for the development has been provided by Abbey Pynford (Attachment 1). A review of the report indicates that shorter piles were required than was previously reported. The attached pile design report indicates that the longest pile length was 12.0m and therefore the piles terminate within the Bognor Sand Member well above the anticipated Chalk interface.
- b. Boreholes advanced during the previous phases of site investigation demonstrated that the Bognor Sand Formation persisted to at least 14.0m bgl.
- c. A review of historical borehole logs in the surrounding area indicate that silt and clay content increases with depth with the deepest boreholes terminating at depths of approximately 24m bgl in a very sandy and silty clay.
- d. The presence of well-rounded black flint gravel within the cable percussive boreholes beneath the site is considered indicative of the basin wide pebble band at the London Clay A3/B1 division boundary of King, 1981. The Bognor Sand Member is indicated at the very top of Division A3 (King, 1981) and is located immediately below this marker layer. The strata encountered within on-site boreholes is consistent the above.
- e. Stratigraphically, the Bognor Sand Member is a sand body within the London Clay Formation and with the top and bottom boundaries marked by transitions to/from the more "Typical" stiff blue-grey clays which are characteristic of the London Clay Formation.
- f. Nearby borehole logs indicate that at depths greater than 14.00m bgl that the lithology becomes a fissured clayey and silty fine sand with zones of very stiff very sandy and silty clay. This is consistent with the stratigraphic logs presented in King (1981).
- g. Furthermore, published data by the BGS indicates that the London Clay Formation is further underlain by the Reading Formation in the local area before the Chalk is encountered.
- h. It is accepted that shallow impacted perched water was encountered within the superficial deposits underlying the site. However, the absence of water strikes and seepages from many of the intrusive locations indicates that this shallow water is highly localised and by its very nature vertically and laterally discontinuous.
- i. A persistent layer of "typical" London Clay Formation approximately 4.00m thick was encountered beneath the site separating superficial deposits from the underlying granular Bognor Sand Member. It is considered that the presence of approximately 4.00m of London Clay, is acting as an aquiclude providing protection to the water body within the underlying Bognor Sand Member. Nearby borehole logs indicate that the silt and clay content within the Bognor Sand Member increases with depth strongly suggesting the presence of further London Clay, attributable to Division A3 beneath the

Bognor Sand as indicated by King (1981) with published BGS data also indicating the presence of the Reading Formation between the London Clay and underlying Chalk in the local area.

We therefore cannot recommend the discharge of Condition 12 until this issue has been addressed.

Catchment Management Team

Portsmouth Water”

Conclusion

The development has been carefully designed to avoid piling through grossly impacted soils and the relict underground brick gasometer bases (which were considered likely to contain impacted material) with the maximum pile depth of 12.00m bgl terminating well above the underlying Chalk, as has been previously accepted by Portsmouth Water.

Site levels will be raised by approximately 1.00m to accommodate a fully sealed SUDS system with water discharging to the foul sewer to prevent future infiltration into the underlying soils.

No concerns have been raised by Portsmouth Water regarding the selected CFA piling methodology (Point A1) and the piling contractor undertook additional testing in the area of previously identified low pH perched water (Point A2) to ensure that the selected concrete specification was suitably resistant to chemical attack.

Shallow water has been demonstrated to be locally perched and vertically and laterally discontinuous with an approximately 4.00m thick layer of London Clay demonstrated to underlie the superficial deposits separating them from the underlying Bognor Sand Member.

Whilst it is accepted that the piles do breach the initial 4.00m thick layer of “typical” London Clay Formation, the piles terminated within the granular Bognor Sand Member and did not penetrate the deeper cohesive London Clay Formation which is considered to be present at depth beneath the Bognor Sand Member. Therefore, following the curing of the concrete we do not consider that the piles will have resulted in preferential pathways being created that will present a significant risk to the deeper groundwater.

The geological succession encountered beneath the site is consistent with published data for the area and therefore it is considered that the Bognor Sand Member will be underlain by further London Clay and Reading Formation before the Chalk is encountered.

Furthermore, further investigation has shown that gasometer structures within the site boundary are intact, have a clay render and are clay lined at the base. The developer is also in the process of removing all impacted materials from Gasholder 1, the oldest gasometer structure, which was considered to present the greatest risk by the Contaminated Land Officer.

Based on the evidence collected and presented above, OEC do not consider that the site presents a significant risk to the Principal Chalk Aquifer or the Havant and Bedhampton Springs.

We trust that the information above addresses your concerns satisfactorily and will enable Condition 12 to be discharged. However, if you have any questions in the meantime, please do not hesitate to contact us.

End of Response

Attachment 1

Abbey Pynford Pile Design Report



ABBEY PYNFORD

DESIGN CALCULATION SHEET

Project
Wessex Yard, 8 New Lane, Havant, Hampshire, P09 2JH

Designer FM

Date Jul-19

Project No AP24292

Checker DRI

Date Jul-19

Sheet No Pile/01

STRUCTURAL ENGINEERING CALCULATIONS

FOR BEARING PILE DESIGN

AT

Wessex Yard

8 New Lane

Havant

Hampshire, P09 2JH

ISSUE	DATE	REVISION DESCRIPTION
V0.00	5/06/2019	First Issue
C0	24/07/2019	C0
C1	26/07/2019	C1
C2	30/07/2019	C2



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DESIGN CALCULATION SHEET

Project	Designer	FM	Date	Jul-19	Project No	AP24292
Wessex Yard, 8 New Lane, Havant, Hampshire, P09 2JH	Checker	DRI	Date	Jul-19	Sheet No	Pile/02

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CADS Bearing Pile Designer output	Pile / 7 - 9
Pile Schedule	Sched / 1
Pile Reinforcement Sketch	Sketch / 1
Appendix A- Ground Investigation Report	App A /



ABBAY PYNFORD

DESIGN CALCULATION SHEET

Project	Designer	FM	Date	Jul-19	Project No	AP24292
Wessex Yard, 8 New Lane, Havant, Hampshire, PO9 2JH	Checker	DRI	Date	Jul-19	Sheet No	Pile/03

Introduction

Abbey Pynford have been commissioned to design and install a Housedeck/Underpin piled raft foundation at the site address above.

The site is located at New Lane Road and within area of both residential and commercial use. Bounded by Eastern Road to the North, School Lane to the West, the site forms roughly a rectangular shape. To the South of the site is the National Railway tracks for the Portsmouth to London railway line. Previously the site was used for Gasworks and has been shown that in the eastern part is a pit possibly infilled with associated gas work waste. The site has been inferred as generally level.

Design Standards and References

The design has been completed as per the standards listed below:

Global Factor of Safety Approach

BS 8004:2015 Code of Practice for Foundations

BS EN 1997-1:2004 + A1:2013 Eurocode 7: Geotechnical Design - Part 1: General Rules

NA+A1:2014 to BS EN 1997-1:2004+A1:2013 UK National Annex to Eurocode 7: Geotechnical Design

Site Investigations

Undertaken By: Soils Limited, Ref. 15295/GIR, Dated January 2016.

Omnia Environmental Consulting, Ref. A10708/2.0, Dated August 2017.

Omnia Environmental Consulting, Ref. A10708/180208/L1, Dated 12th March 2018.

Omnia Environmental Consulting, Ref. A10708/1811606/L1, Dated 7th November 2018.

Site Investigations were undertaken to a maximum depth of 14m; soil testing undertaken to depth.

GEOLOGY

Information on ground conditions were taken from the ground investigation data carried out as per above. This included records of three number cable percussive boreholes carried out to a maximum depth of 14 meters below ground (mBGL) and in addition, eleven number shallower window sample boreholes carried out to a maximum depth of 5mBGL. Borehole records show that there is a varied amount of made ground on site ranging in thicknesses of between 0.5m (WS103) and up to 5.10m (BH102A). Underlying the made ground is a Clayey Sand, and typically this material was encountered overlying a stiff grey Clay and which in turn overlay a very dense Sand (BH103) / Sandstone (BH101).

Reference has been made to the British Geological Survey, 1:50000 series, map, which shows site is underlain by Bognor Formation and located within proximity of a London Clay Boundary, both of Paleogene Age.

It is understood that the finished site level for the proposed blocks will be 12.6mOD. However, no levels are included on the borehole records and it is assumed these were carried out from the approximate finished ground / piling level. Based on the information provided and the relevant boreholes, we have based the design on as single ground model. In the absence of levels, the design assumes Piling Platform Level (PPL) has been taken as existing ground/ borehole level.



ABBAY PYNFORD

DESIGN CALCULATION SHEET

Project	Designer	FM	Date	Jul-19	Project No	AP24292
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Pile Overview

No. of piles = 214 ϕ = 350 mm FoS = 3.0 Concrete CFA Bored Piles
 In addition a partial factor of 1.3 has been applied to the ultimate shaft friction element to control settlements

Design Profile

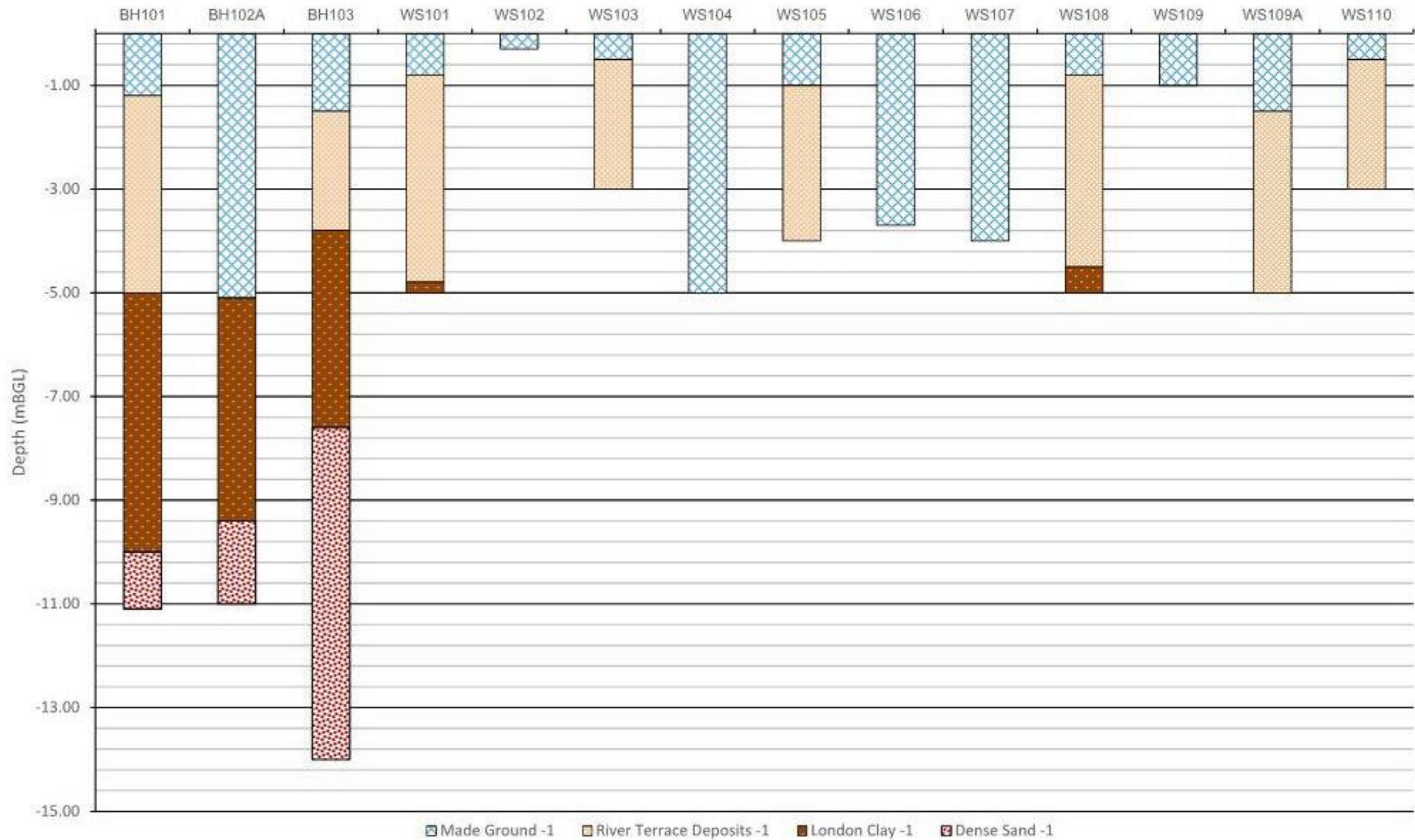
Design profile taken appropriate to relevant boreholes.
 Taken as BH101 for Block A, BH101/103 for Block B and BH103 for Block C.

It should be noted that the design is significantly influenced by the end bearing component, with the design dependant on piles obtaining at least 1m penetration into the Bognor Sand; this will need reviewing and checking during piling operations.

PL	-	2.5	Removed (External Ground Level to Piling Platform Level)
			Discounted for positive skin friction
2.5	-	5.0	Clayey Sand (River Terrace Deposits) $\gamma=19\text{kN/m}^3$ $\phi = 30^\circ$ $N_q=10$
5.0	-		Grey Clay $\gamma=20\text{kN/m}^3$ $C_u = 65\text{kN/m}^2$ $\Delta C_u = 10\text{kN/m}^2$
	-	Depth	Dense Sand $\gamma=20\text{kN/m}^3$ $\phi = 36^\circ$ $N_q=60$
			GW Level = 3.00 m mBGL

The three boreholes show a varied profile. Firstly within the depth of made ground which for BH102 extends to a depth of 5.1m; however this borehole is located in the eastern part of the site away from the location of the proposed Blocks. The two relevant boreholes show significantly less made ground and a typical profile with 2.5m made ground has been taken as applicable to Blocks A, B and C. The depth to the Bognor Sand is also shown to vary and was encountered at depths between 7.4m and 10.0m. A profile applicable to the relevant boreholes has been considered for each Block. With BH101 for Block A, BHs 101 & 103 for Block B and BH103 for Block C. It should be noted that the design is significantly influenced by the end bearing component, with the design dependant on piles obtaining at least 1m penetration into the Bognor Sand this will need reviewing and checking during piling operations.

Borehole Profile



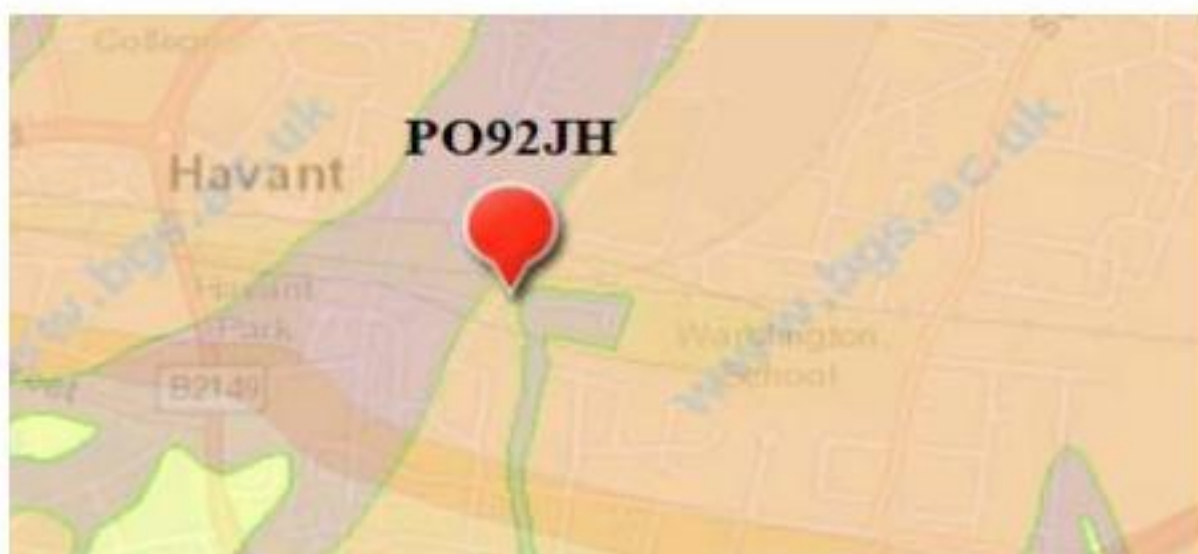


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DESIGN CALCULATION SHEET

Project	Designer	FM	Date	Jul-19	Project No	AP24292
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Geological Map



Superficial deposits

-  ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
-  BEACH AND TIDAL FLAT DEPOSITS
-  (UNDIFFERENTIATED) - CLAY, SILT, SAND AND GRAVEL
-  HEAD - CLAY AND GRAVEL
-  HEAD - CLAY, SILT, SAND AND GRAVEL
-  RAISED MARINE DEPOSITS - SAND AND GRAVEL
-  RAISED STORM BEACH DEPOSITS, 2 - GRAVEL
-  RIVER TERRACE DEPOSITS
-  (UNDIFFERENTIATED) - SAND, SILT AND CLAY

Bedrock geology

-  LONDON CLAY FORMATION - SAND
-  LONDON CLAY FORMATION - CLAY, SILT AND SAND
-  WITTERING FORMATION - SAND
-  WITTERING FORMATION - SAND, SILT AND CLAY
-  BOGNOR SAND MEMBER - SAND



Sheet No: Pile / 10

[illegible]

**ABBAY PYNFORD**

Project

Wessex Yard, 8 New Lane, Havant, Hampshire,
P09 2JH

The Concrete Centre

Abbey Pynford

COLUMN CHART FOR CIRCULAR COLUMNS TO BS 8110:2005

Originated from 'RCC54.xls' v3.1 on CD

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Designer

FM

Date

Jul-19

Page

pile/11

Checker

DRI

Revision

C2

Job No

AP24292

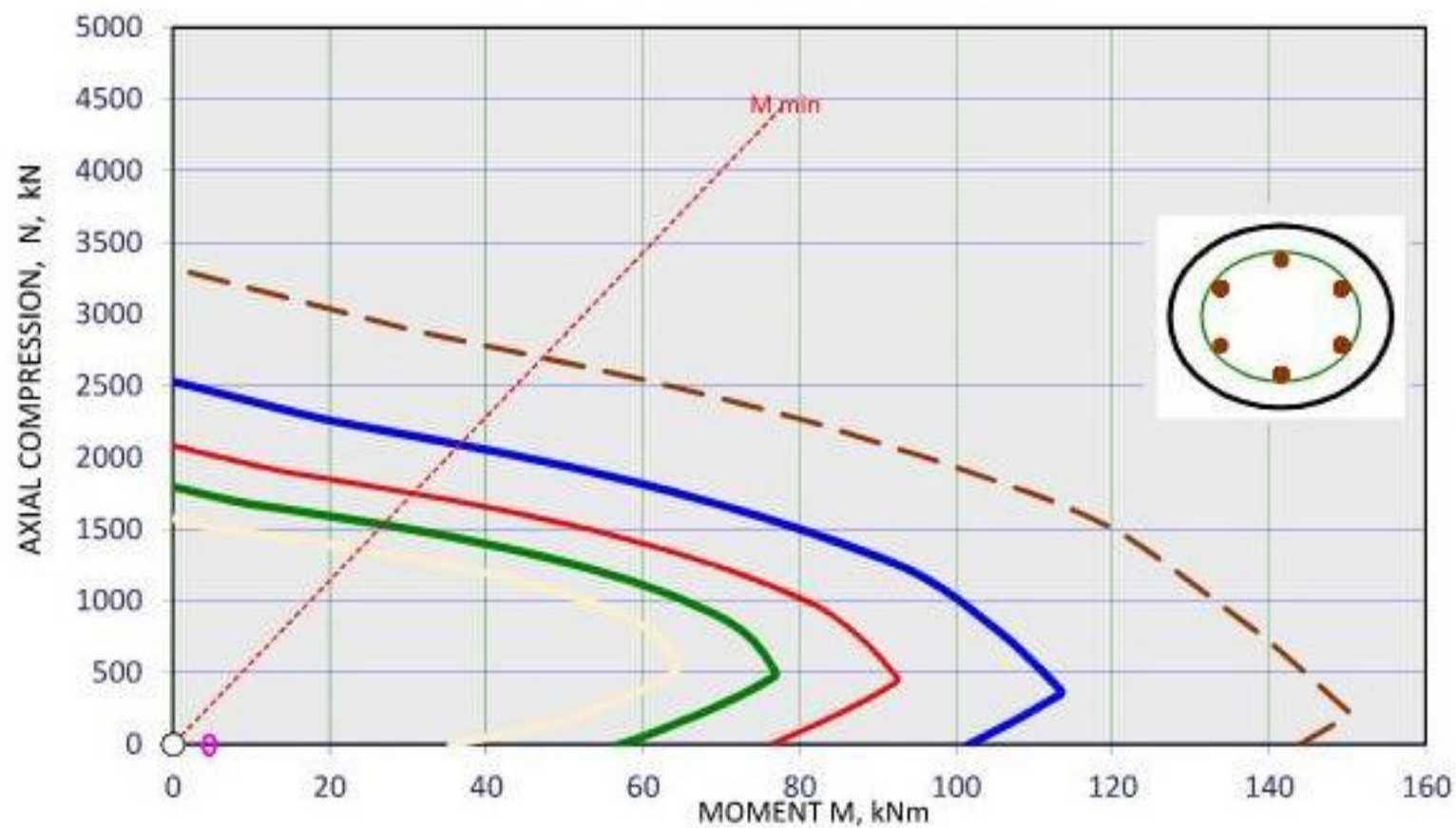
MATERIALS

fcu	<u>30</u>	N/mm ²	γm	<u>1.15</u>	steel	Cover	<u>50</u>	mm
fy	<u>500</u>	N/mm ²	γm	<u>1.5</u>	concrete	h agg	<u>15</u>	mm
steel class	<u>A</u>							

SECTION350 mm with 6 bars**BAR ARRANGEMENTS**

Type	Bar Ø	Asc %	Link Ø	Bar c/c	Nbal (kN)	Nuz (kN)	Checks
H	40	7.84	10	99.5			Asc > 6 %
H	32	5.02	8	105.8	205	3323	ok
H	25	3.06	8	109.4	373	2530	ok
H	20	1.96	6	114.1	457	2084	ok
H	16	1.25	6	116.2	500	1798	ok
H	12	0.71	6	118.3	527	1575	ok

N:M INTERACTION CHART for 350 diameter column,
grade C30, 50 mm cover and 6 bars

**KEY**

6H25

6H20

6H16

6H12

LOADCASES

Load case	N (kN)	M (kNm)	
<u>1</u>	<u>553</u>	<u>0</u>	6H12
<u>2</u>	<u>0</u>	<u>0</u>	6H12
			No Fit

Load case	N (kN)	M (kNm)	
			No Fit
			No Fit
			No Fit



ABBAY PYNFORD

DESIGN CALCULATION SHEET

Project:
Wessex Yard, 8 New Lane, Havant, Hampshire, P09 2JH

Designed: FM

Date: Jul-19

Project No: AP24292

Checked: DRI

Date: Jul-19

Sheet No: PILE / 12

			Factored Loads				
Axial Load (N)	=	395	kN	$\gamma = 1.4$	553	kN	
Shear Load (V)	=	0	kN	$\gamma = 1.4$	0	kN	
Bending Moment (M)	=	0	kNm	$\gamma = 1.4$	0	kNm	
Concrete Strength (f_{cu})	=	30	N/mm ²	Steel Strength (f_{yv})	=	500	N/mm ²
Pile Diameter	=	350	mm	Cover	=	50	mm
No. Longitudinal Reinf.	=	6		Diameter	=	12	mm
Helical Diameter	=	8	mm	Pitch	=	150	mm

r_s	=	111	mm	r_{sv}	=	121	mm
$\sin \alpha$ ($2r_s/\pi r$)	=	0.40		α	=	0.42	Rad
$\sin \beta$ ($2r_{sv}/\pi r_{sv}$)	=	0.58		β	=	0.62	Rad
d ($r^*(1+\sin \alpha)$)	=	246	mm				
A_v ($r^2(\pi/2 + \alpha + \sin \alpha + \cos \alpha)$)	=	72149	mm ²				
v (V/A_v)	=	0.000	N/mm ²	v cannot exceed 4.38N/mm ²			

A_s (half longitudinal steel)	=	339	mm ²				
$100a_s/A_v$	=	0.470					
$(100a_s/A_v)^{0.33333}$	=	0.778					
Fcu correction	=	1.063					
$400/d$	=	1.6		Minimum 1.0			
v_c	=	0.850	N/mm ²				
h ($1.25*d$)	=	307					
v_c^* ($v_c + 0.6(N*V*h/A_c*M)$)	=	0.850	N/mm ²				

$v < 0.5V_c$ Therefore Shear Reinforcement Not Required, Hence Nominal Reinforcement is Provided.

$v - v_c^*$	=	0.40	N/mm ²	Minimum 0.4
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k_s	=	1.4683	
A_{svh} ($k_s * r^2 * p * (v - v_c^*) / (0.95 * f_{yv})$)	=	32.46	mm ²
Area of H8 Helical link	=	50.27	mm ²

Conclusion:

Use H8 Helical Link Shear Reinforcement with 150mm Pitch.

		Pile Schedule - 350mm Diameter Concrete CFA Bored Piles							Page: Sched/1	
Project: Wessex Yard, 8 New Lane, Havant, Hampshire, PO9 2JH		Project No: AP24293 Designer: FM Checker: DRJ		Revision		Description		Date		
				-		First Issue		2019-07-26		
BLOCK A										
P01	0.000	0.000	305	0		350	11.0	1.4	3m 810 U-Bars projecting 0.5m as starters with 388 Hoops evenly spaced	
P02	0.000	0.000	280	0		350	11	1.4	DITTO	
P03	0.000	0.000	275	0		350	11	1.4	DITTO	
P04	0.000	0.000	325	0		350	11.5	1.4	DITTO	
P05	0.000	0.000	390	0		350	12.5	1.6	DITTO	
P06	0.000	0.000	330	0		350	11.5	1.4	DITTO	
P07	0.000	0.000	270	0		350	11	1.4	DITTO	
P08	0.000	0.000	255	0		350	11	1.4	DITTO	
P09	0.000	0.000	305	0		350	11	1.4	DITTO	
P10	0.000	0.000	295	0		350	11	1.4	DITTO	
P11	0.000	0.000	325	0		350	11.5	1.4	DITTO	
P12	0.000	0.000	345	0		350	11.5	1.4	DITTO	
P13	0.000	0.000	320	0		350	11.5	1.4	DITTO	
P14	0.000	0.000	330	0		350	11.5	1.4	DITTO	
P15	0.000	0.000	325	0		350	11.5	1.4	DITTO	
P16	0.000	0.000	305	0		350	11	1.4	DITTO	
P17	0.000	0.000	325	0		350	11.5	1.4	DITTO	
P18	0.000	0.000	275	0		350	11	1.4	DITTO	
P19	0.000	0.000	260	0		350	11	1.4	DITTO	
P20	0.000	0.000	290	0		350	11	1.4	DITTO	
P21	0.000	0.000	305	0		350	11	1.4	DITTO	
P22	0.000	0.000	300	0		350	11	1.4	DITTO	
P23	0.000	0.000	305	0		350	11	1.4	DITTO	
P24	0.000	0.000	340	0		350	11.5	1.4	DITTO	
P25	0.000	0.000	370	0		350	12	1.5	DITTO	
P26	0.000	0.000	350	0		350	12	1.5	DITTO	
P27	0.000	0.000	340	0		350	11.5	1.4	DITTO	
P28	0.000	0.000	345	0		350	11.5	1.4	DITTO	
P29	0.000	0.000	395	0		350	12.5	1.6	DITTO	
P30	0.000	0.000	370	0		350	12	1.5	DITTO	
P31	0.000	0.000	395	0		350	12.5	1.6	DITTO	
P32	0.000	0.000	360	0		350	12	1.5	DITTO	
P33	0.000	0.000	335	0		350	11.5	1.4	DITTO	
P34	0.000	0.000	300	0		350	11	1.4	DITTO	
P35	0.000	0.000	330	0		350	11.5	1.4	DITTO	
P36	0.000	0.000	335	0		350	11.5	1.4	DITTO	
P37	0.000	0.000	380	0		350	12	1.5	DITTO	
P38	0.000	0.000	365	0		350	12	1.5	DITTO	
P39	0.000	0.000	340	0		350	11.5	1.4	DITTO	
P40	0.000	0.000	355	0		350	12	1.5	DITTO	
P41	0.000	0.000	295	0		350	11	1.4	DITTO	
P42	0.000	0.000	285	0		350	11	1.4	DITTO	
P43	0.000	0.000	310	0		350	11	1.4	DITTO	
P44	0.000	0.000	350	0		350	12	1.5	DITTO	
P45	0.000	0.000	325	0		350	11.5	1.4	DITTO	
P46	0.000	0.000	270	0		350	11	1.4	DITTO	
P47	0.000	0.000	295	0		350	11	1.4	DITTO	
P48	0.000	0.000	295	0		350	11	1.4	DITTO	
P49	0.000	0.000	385	0		350	12.5	1.6	DITTO	
P50	0.000	0.000	315	0		350	11.5	1.4	DITTO	
P51	0.000	0.000	375	0		350	12	1.5	DITTO	
P52	0.000	0.000	325	0		350	11.5	1.4	DITTO	
P53	0.000	0.000	365	0		350	12	1.5	DITTO	
P54	0.000	0.000	335	0		350	11.5	1.4	DITTO	
P55	0.000	0.000	350	0		350	12	1.5	DITTO	
P56	0.000	0.000	380	0		350	12	1.5	DITTO	
P57	0.000	0.000	395	0		350	12.5	1.6	DITTO	
P58	0.000	0.000	270	0		350	11	1.4	DITTO	
P59	0.000	0.000	300	0		350	11	1.4	DITTO	
P60	0.000	0.000	395	0		350	12.5	1.6	DITTO	
P61	0.000	0.000	355	0		350	12	1.5	DITTO	
P62	0.000	0.000	280	0		350	11	1.4	DITTO	
P63	0.000	0.000	240	0		350	11	1.4	DITTO	
P64	0.000	0.000	350	0		350	12	1.5	DITTO	
P65	0.000	0.000	280	0		350	11	1.4	DITTO	
P66	0.000	0.000	335	0		350	11.5	1.4	DITTO	
P67	0.000	0.000	295	0		350	11	1.4	DITTO	
P68	0.000	0.000	270	0		350	11	1.4	DITTO	
P69	0.000	0.000	285	0		350	11	1.4	DITTO	
P70	0.000	0.000	305	0		350	11	1.4	DITTO	
P71	0.000	0.000	300	0		350	11	1.4	DITTO	
P72	0.000	0.000	305	0		350	11	1.4	DITTO	
P73	0.000	0.000	300	0		350	11	1.4	DITTO	
P74	0.000	0.000	335	0		350	11.5	1.4	DITTO	
P75	0.000	0.000	295	0		350	11	1.4	DITTO	
P76	0.000	0.000	285	0		350	11	1.4	DITTO	
P77	0.000	0.000	340	0		350	11.5	1.4	DITTO	
P78	0.000	0.000	330	0		350	11.5	1.4	DITTO	
P79	0.000	0.000	305	0		350	11	1.4	DITTO	
P80	0.000	0.000	320	0		350	11.5	1.4	DITTO	
P81	0.000	0.000	330	0		350	11.5	1.4	DITTO	
P82	0.000	0.000	305	0		350	11	1.4	DITTO	
P83	0.000	0.000	340	0		350	11.5	1.4	DITTO	
P84	0.000	0.000	360	0		350	12	1.5	DITTO	
P85	0.000	0.000	305	0		350	11	1.4	DITTO	
P86	0.000	0.000	265	0		350	11	1.4	DITTO	
P87	0.000	0.000	320	0		350	11.5	1.4	DITTO	



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Pile Schedule - 350mm Diameter Concrete CFA Bored Piles

Project:	Project No:	Revision	Description	Date
Wessex Yard, 8 New Lane, Havant, Hampshire, PO9 2JH	AP24293	-	First Issue	2019-07-26
	Designer:			
	Checker:			

Pile	Cutoff Level (m AOD)	PPL (m AOD)	Compression Load (kN)	Tension Load (kN)	Lateral Load (kN)	Diameter (mm)	Pile Length (m)	Concrete Volume (m ³)	Reinforcement	Revision
P88	0.000	0.000	365	0		350	12	1.5	DITTO	
P89	0.000	0.000	370	0		350	12	1.5	DITTO	
P90	0.000	0.000	290	0		350	11	1.4	3m 810 U-Bars projecting 0.5m as starters with 388 Hoops evenly spaced.	
P91	0.000	0.000	295	0		350	11	1.4	DITTO	
P92	0.000	0.000	345	0		350	11.5	1.4	DITTO	
P93	0.000	0.000	295	0		350	11	1.4	DITTO	
P94	0.000	0.000	220	0		350	11	1.4	DITTO	
P95	0.000	0.000	290	0		350	11	1.4	DITTO	
P96	0.000	0.000	275	0		350	11	1.4	DITTO	
P97	0.000	0.000	295	0		350	11	1.4	DITTO	
P98	0.000	0.000	290	0		350	11	1.4	DITTO	
P99	0.000	0.000	290	0		350	11	1.4	DITTO	
P100	0.000	0.000	235	0		350	11	1.4	DITTO	
P101	0.000	0.000	205	0		350	11	1.4	DITTO	
P102	0.000	0.000	215	0		350	11	1.4	DITTO	
P103	0.000	0.000	210	0		350	11	1.4	DITTO	
P104	0.000	0.000	260	0		350	11	1.4	DITTO	
P105	0.000	0.000	285	0		350	11	1.4	DITTO	
P106	0.000	0.000	275	0		350	11	1.4	DITTO	
P107	0.000	0.000	280	0		350	11	1.4	DITTO	
P108	0.000	0.000	310	0		350	11	1.4	DITTO	
P109	0.000	0.000	335	0		350	11.5	1.4	DITTO	
P110	0.000	0.000	205	0		350	11	1.4	DITTO	
P111	0.000	0.000	245	0		350	11	1.4	DITTO	
P112	0.000	0.000	225	0		350	11	1.4	DITTO	
P113	0.000	0.000	240	0		350	11	1.4	DITTO	
P114	0.000	0.000	230	0		350	11	1.4	DITTO	



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Pile Schedule - 350mm Diameter Concrete CFA Bored Piles

Project:	Project No:	Revision	Description	Date
Wessex Yard, 8 New Lane, Havant, Hampshire, PO9 2JH	AP24293	-	First Issue	2019-07-26
	Designer:			
	Checker:			

Pile	Cutoff Level (m AOD)	PPL (m AOD)	Compression Load (kN)	Tension Load (kN)	Lateral Load (kN)	Diameter (mm)	Pile Length (m)	Concrete Volume (m ³)	Reinforcement	Revision
BLOCK B										
P201	0.000	0.000	380	0		350	12	1.5	3m 810 U-Bars projecting 0.5m as starters with 3B8 Hoops evenly spaced	
P202	0.000	0.000	310	0		350	11	1.4	DITTO	
P203	0.000	0.000	290	0		350	10.5	1.3	DITTO	
P204	0.000	0.000	295	0		350	11	1.4	DITTO	
P205	0.000	0.000	250	0		350	10	1.3	DITTO	
P206	0.000	0.000	260	0		350	10	1.3	DITTO	
P207	0.000	0.000	315	0		350	11	1.4	DITTO	
P208	0.000	0.000	305	0		350	11	1.4	DITTO	
P209	0.000	0.000	320	0		350	11	1.4	DITTO	
P210	0.000	0.000	335	0		350	11.5	1.4	DITTO	
P211	0.000	0.000	345	0		350	11.5	1.4	DITTO	
P212	0.000	0.000	340	0		350	11.5	1.4	DITTO	
P213	0.000	0.000	310	0		350	11	1.4	DITTO	
P214	0.000	0.000	325	0		350	11	1.4	DITTO	
P215	0.000	0.000	275	0		350	10.5	1.3	DITTO	
P216	0.000	0.000	250	0		350	10	1.3	DITTO	
P217	0.000	0.000	310	0		350	11	1.4	DITTO	
P218	0.000	0.000	255	0		350	10	1.3	DITTO	
P219	0.000	0.000	185	0		350	10	1.3	DITTO	
P220	0.000	0.000	225	0		350	10	1.3	DITTO	
P221	0.000	0.000	285	0		350	10.5	1.3	DITTO	
P222	0.000	0.000	315	0		350	11	1.4	DITTO	
P223	0.000	0.000	290	0		350	10.5	1.3	DITTO	
P224	0.000	0.000	275	0		350	10.5	1.3	DITTO	
P225	0.000	0.000	265	0		350	10.5	1.3	DITTO	
P226	0.000	0.000	270	0		350	10.5	1.3	DITTO	
P227	0.000	0.000	270	0		350	10.5	1.3	DITTO	
P228	0.000	0.000	270	0		350	10.5	1.3	DITTO	
P229	0.000	0.000	285	0		350	10.5	1.3	DITTO	
P230	0.000	0.000	320	0		350	11	1.4	DITTO	
P231	0.000	0.000	350	0		350	11.5	1.4	DITTO	
P232	0.000	0.000	370	0		350	12	1.5	DITTO	
P233	0.000	0.000	305	0		350	11	1.4	DITTO	
P234	0.000	0.000	375	0		350	12	1.5	DITTO	
P235	0.000	0.000	340	0		350	11.5	1.4	DITTO	
P236	0.000	0.000	265	0		350	10.5	1.3	DITTO	
P237	0.000	0.000	365	0		350	12	1.5	DITTO	
P238	0.000	0.000	325	0		350	11	1.4	DITTO	
P239	0.000	0.000	350	0		350	11.5	1.4	DITTO	
P240	0.000	0.000	260	0		350	10	1.3	DITTO	
P241	0.000	0.000	320	0		350	11	1.4	DITTO	
P242	0.000	0.000	280	0		350	10.5	1.3	DITTO	
P243	0.000	0.000	255	0		350	10	1.3	DITTO	
P244	0.000	0.000	280	0		350	10.5	1.3	DITTO	
P245	0.000	0.000	330	0		350	11.5	1.4	DITTO	
P246	0.000	0.000	330	0		350	11.5	1.4	DITTO	
P247	0.000	0.000	260	0		350	10	1.3	DITTO	
P248	0.000	0.000	280	0		350	10.5	1.3	DITTO	
P249	0.000	0.000	335	0		350	11.5	1.4	DITTO	
P250	0.000	0.000	280	0		350	10.5	1.3	DITTO	
P251	0.000	0.000	360	0		350	11.5	1.4	DITTO	
P252	0.000	0.000	285	0		350	10.5	1.3	DITTO	
P253	0.000	0.000	375	0		350	12	1.5	DITTO	
P254	0.000	0.000	300	0		350	11	1.4	DITTO	
P255	0.000	0.000	380	0		350	12	1.5	DITTO	
P256	0.000	0.000	295	0		350	11	1.4	DITTO	
P257	0.000	0.000	260	0		350	10	1.3	DITTO	
P258	0.000	0.000	275	0		350	10.5	1.3	DITTO	
P259	0.000	0.000	380	0		350	12	1.5	DITTO	
P260	0.000	0.000	325	0		350	11	1.4	DITTO	
P261	0.000	0.000	365	0		350	12	1.5	DITTO	



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Pile Schedule - 350mm Diameter Concrete CFA Bored Piles

Project:	Project No:	Revision	Description	Date
Wessex Yard, 8 New Lane, Havant, Hampshire, PO9 2JH	AP24292	-	First Issue	2019-07-26
	Designer:			
	Checker:			

Pile	Cutoff Level (m AOD)	PPL (m AOD)	Compression Load (kN)	Tension Load (kN)	Lateral Load (kN)	Diameter (mm)	Pile Length (m)	Concrete Volume (m ³)	Reinforcement	Revision
BLOCK C										
P301	0.000	0.000	245	0		350	9.5	1.2	3m 810 U-Bars projecting 0.5m as starters with 388 Hoops evenly spaced	
P302	0.000	0.000	215	0		350	9	1.1	DITTO	
P303	0.000	0.000	265	0		350	10	1.3	DITTO	
P304	0.000	0.000	350	0		350	11.5	1.4	DITTO	
P305	0.000	0.000	320	0		350	11	1.4	DITTO	
P306	0.000	0.000	365	0		350	11.5	1.4	DITTO	
P307	0.000	0.000	335	0		350	11	1.4	DITTO	
P308	0.000	0.000	360	0		350	11.5	1.4	DITTO	
P309	0.000	0.000	360	0		350	11.5	1.4	DITTO	
P310	0.000	0.000	340	0		350	11	1.4	DITTO	
P311	0.000	0.000	310	0		350	11	1.4	DITTO	
P312	0.000	0.000	300	0		350	10.5	1.3	DITTO	
P313	0.000	0.000	325	0		350	11	1.4	DITTO	
P314	0.000	0.000	365	0		350	11.5	1.4	DITTO	
P315	0.000	0.000	370	0		350	11.5	1.4	DITTO	
P316	0.000	0.000	350	0		350	11.5	1.4	DITTO	
P317	0.000	0.000	300	0		350	10.5	1.3	DITTO	
P318	0.000	0.000	285	0		350	10.5	1.3	DITTO	
P319	0.000	0.000	325	0		350	11	1.4	DITTO	
P320	0.000	0.000	340	0		350	11	1.4	DITTO	
P321	0.000	0.000	325	0		350	11	1.4	DITTO	
P322	0.000	0.000	310	0		350	11	1.4	DITTO	
P323	0.000	0.000	280	0		350	10.5	1.3	DITTO	
P324	0.000	0.000	295	0		350	10.5	1.3	DITTO	
P325	0.000	0.000	355	0		350	11.5	1.4	DITTO	
P326	0.000	0.000	365	0		350	11.5	1.4	DITTO	
P327	0.000	0.000	330	0		350	11	1.4	DITTO	
P328	0.000	0.000	300	0		350	10.5	1.3	DITTO	
P329	0.000	0.000	375	0		350	12	1.5	DITTO	
P330	0.000	0.000	372	0		350	11.5	1.4	DITTO	
P331	0.000	0.000	310	0		350	11	1.4	DITTO	
P332	0.000	0.000	380	0		350	12	1.5	DITTO	
P333	0.000	0.000	320	0		350	11	1.4	DITTO	
P334	0.000	0.000	345	0		350	11.5	1.4	DITTO	
P335	0.000	0.000	360	0		350	11.5	1.4	DITTO	
P336	0.000	0.000	310	0		350	11	1.4	DITTO	
P337	0.000	0.000	275	0		350	10	1.3	DITTO	
P338	0.000	0.000	290	0		350	10.5	1.3	DITTO	
P339	0.000	0.000	295	0		350	10.5	1.3	DITTO	

Piling Summary

Pile Length	0-5m	5-10m	10-15m	15-20m	20-25m	25m+	Overall
Number	0	14	200	0	0	0	214
Total Linear Metres	0	138.5	2249	0	0	0	2387.5

Piling Specification

Cover to reinforcement to be 50mm.
Concrete grade to be FND2 in line with design sulphate class recommended within SI.
Refer to the following page for pile reinforcement details.



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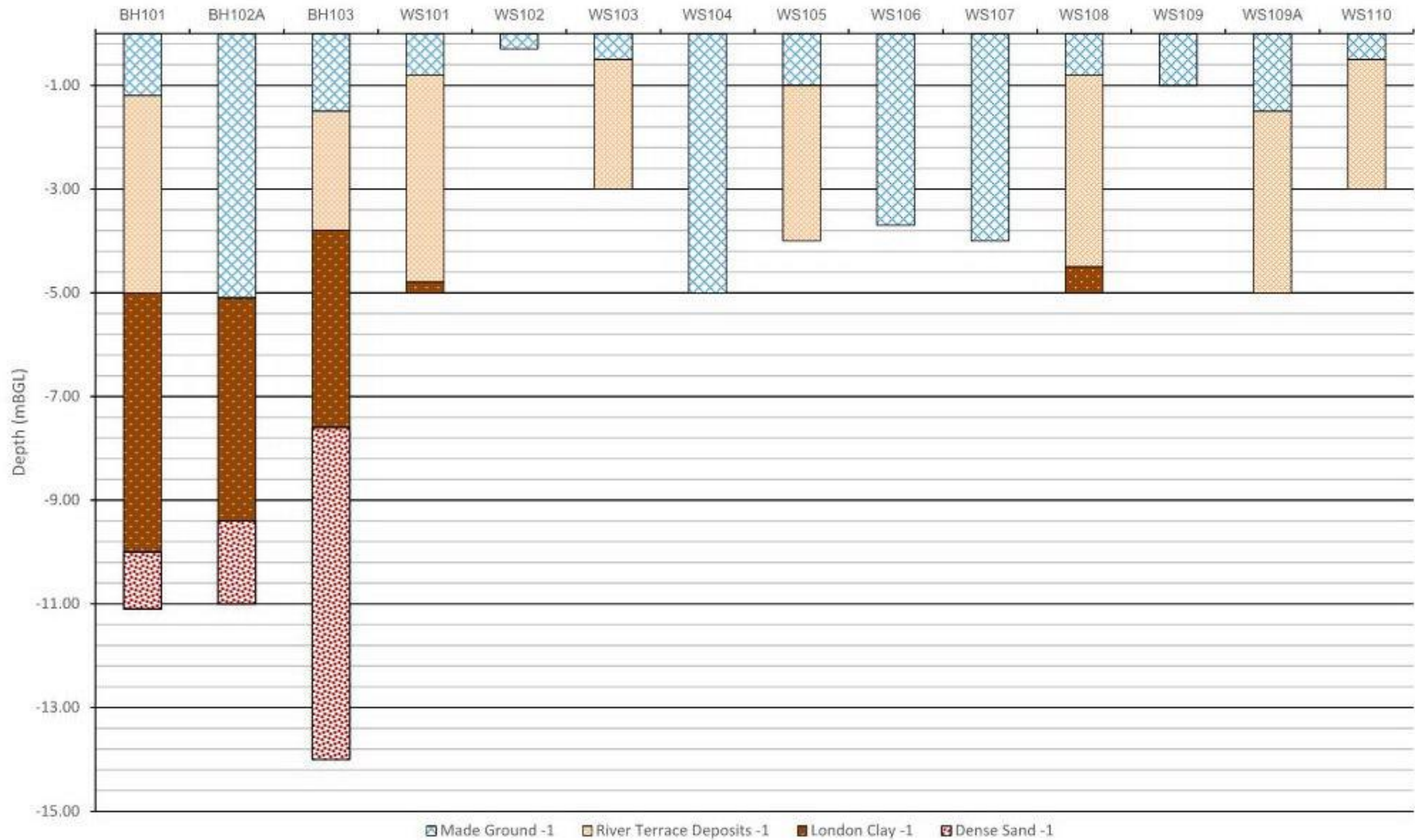
DESIGN CALCULATION SHEET

Project	Designer	FM	Date	Jul-19	Project No	AP24292
Wessex Yard, 8 New Lane, Havant, Hampshire, P09 2JH	Checker	DRI	Date	Jul-19	Sheet No	Pile/AppA

APPENDIX A

Soils Profile

Borehole Profile





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DESIGN CALCULATION SHEET

Project
Wessex Yard, 8 New Lane, Havant, Hampshire, P09 2JH

Designer FM

Date Jul-19

Project No AP24292

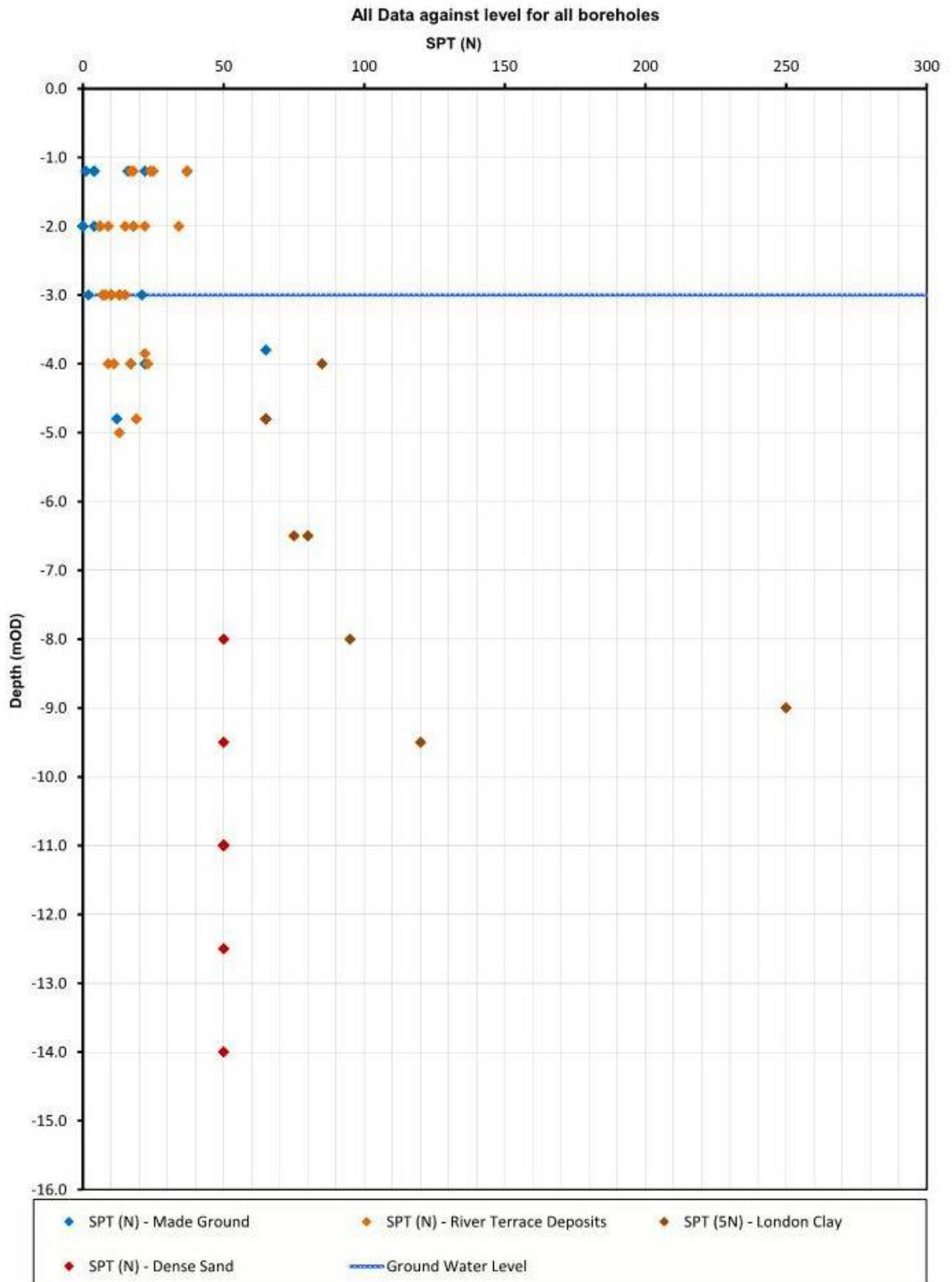
Checker DRI

Date Jul-19

Sheet No Pile/App8

APPENDIX B

Shear Strength (kN/m²) v Depth (m)





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DESIGN CALCULATION SHEET

Project
Wessex Yard, 8 New Lane, Havant, Hampshire, P09 2JH

Designer FM

Date Jul-19

Project No AP24292

Checker DRI

Date Jul-19

Sheet No Pile/AppC

APPENDIX C

Oasys PILE

 PILEDESIGNS GEOTECHNICAL EXPERTISE Havant - Wessex Yard, 8 New Lane, PO9 2JH 350mm diameter auger piles Vertical Capacity, FOS= 3.0	Job No.	Sheet No.	Rev.
	22259		
	Drg. Ref.		
	Made by FM	Date	Checked

Notes

Profile as Borehole BH101 - taken as applicable to Block A

Analysis Options

Design method	Working load
Are compression calculations enabled?	Yes
Is global FoS criterion for compression active?	Yes
Global factor on ultimate bearing capacity Fg	3.0000
Is partial FoS criterion for compression active?	No
Is shaft FoS criterion for compression active?	Yes
Factor applied to ultimate skin friction Fs2	1.3000
Is pile limiting stress criterion for compression active?	Yes
Limiting pile material stress at working load	8750.0 kPa
Are tension calculations enabled?	No
Datum type	Depth based
Effective stress profile	Calculated

Pile Properties

Pile type	Solid
Pile cross-section	Circular
Under-ream	No
Calculation profile	Range
Minimum pile length	6.0000 m
Maximum pile length	13.000 m
Increment size	0.50000

Cross-section	Number of cross sections	Top Diameter [m]	Second Diameter location [m]	Second Diameter [m]	Third Diameter location [m]	Third Diameter [m]
Cross-section 1	1	0.35000				

Undrained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Cu material factor	Top Cu [kPa]	Base Cu [kPa]
1	Discounted Soil	18.000	NA	0.0	0.0
2	Grey Clay (LC)	20.000	NA	65.000	115.00

Undrained Materials - Skin Friction Data

No.	Material description	Skin friction computation	Alpha	qs Top [kPa]	qs Base [kPa]	qs,lim Spec. Value [kPa]
1	Discounted Soil	Alpha specified	0.0	NA	NA	No NA
2	Grey Clay (LC)	Alpha specified	0.50000	NA	NA	No NA

Undrained Materials - End Bearing Data

No.	Material description	End bearing computation	Nc	qb Top [kPa]	qb Base [kPa]	qb,lim Spec. Value [kPa]
1	Discounted Soil	Nc specified	0.0	NA	NA	No NA
2	Grey Clay (LC)	Nc specified	9.0000	NA	NA	No NA

Drained Materials - General Data

 PILEDESIGNS GEOTECHNICAL EXPERTISE Havant - Wessex Yard, 8 New Lane, PO9 2JH 350mm diameter auger piles Vertical Capacity, FOS= 3.0	Job No.	Sheet No.	Rev.
	22259		
	Drg. Ref.		
Made by FM	Date	Checked	

No.	Material description	End bearing computation	Nc	qb	qb,lim
				Top [kPa]	Base Spec. Value [kPa]

No.	Material description	Bulk unit weight [kN/m³]	Tan(δ) material factor
1	Clayey Sand	19.000	NA
2	Dense Sand	20.000	NA

Drained Materials - Friction Data

No.	Material description	Skin friction computation	Beta	Delta (δ) [deg]	Coefficient of earth pressure K	qs	qs,lim
						Top [kPa]	Base Spec. Value [kPa]
1	Clayey Sand	Earth pressure	NA	30.000	0.80000	NA	NA No NA
2	Dense Sand	Earth pressure	NA	36.000	0.80000	NA	NA No NA

Drained Materials - End Bearing Data

No.	Material description	End bearing computation	Nq	Phi' [deg]	PhiD [deg]	Phicv' [deg]	Ir	qb	qb,lim	Nq-Phi curves
								Top [kPa]	Base Spec. Value [kPa]	
1	Clayey Sand	Nq specified	10.000	NA	NA	NA	NA	NA	NA No NA	NA
2	Dense Sand	Nq specified	60.000	NA	NA	NA	NA	NA	NA Yes 10000.	NA

STAGE SPECIFIC DATA

Stage 0 : Initial Stage

Groundwater

No.	Level [m]	Pressure [kPa]	Unit weight of water [kN/m³]
1	3.0000	0.0	9.8100

Soil Profiles

Soil Profile 1: Soil Profile 1

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Discounted Soil	No
2	2.5000	Clayey Sand	No
3	5.0000	Grey Clay (LC)	No
4	10.000	Dense Sand	No

Soil Profile - Groundwater Map

No.	Soil Profile	Groundwater
1	Soil Profile 1	Groundwater Profile 1

CAPACITY RESULTS

Stress Profiles

Soil Profile 1: Soil Profile 1

Havant - Wessex Yard, 8 New Lane, PO9 2JH
 350mm diameter auger piles
 Vertical Capacity, FOS= 3.0

Job No.	Sheet No.	Rev.
22259		
Drg. Ref.		
Made by FM	Date	Checked

Depth	Density	Undrained Cohesion	Nq	Total vertical stress	Porewater pressure	Effective vertical stress	Effective horizontal stress*	Cumulative skin friction per unit perimeter
[m]	[kN/m³]	[kPa]		[kPa]	[kPa]	[kPa]	[kPa]	[kN/m]
0.0	18.000	0.0	N.A.	0.0	0.0	0.0	NA	0.0
2.5000	18.000	0.0	N.A.	45.000	0.0	45.000	NA	0.0
2.5000	19.000	0.0	10.000	45.000	0.0	45.000	36.000	0.0
3.0000	19.000	0.0	10.000	54.500	0.0	54.500	43.600	11.489
5.0000	19.000	0.0	10.000	92.500	19.620	72.880	58.304	70.324
5.0000	20.000	65.000	N.A.	92.500	19.620	72.880	NA	70.324
6.0000	20.000	75.000	N.A.	112.50	29.430	83.070	NA	105.32
6.5000	20.000	80.000	N.A.	122.50	34.335	88.165	NA	124.70
7.0000	20.000	85.000	N.A.	132.50	39.240	93.260	NA	145.32
7.5000	20.000	90.000	N.A.	142.50	44.145	98.355	NA	167.20
8.0000	20.000	95.000	N.A.	152.50	49.050	103.45	NA	190.32
8.5000	20.000	100.00	N.A.	162.50	53.955	108.54	NA	214.70
9.0000	20.000	105.00	N.A.	172.50	58.860	113.64	NA	240.32
9.5000	20.000	110.00	N.A.	182.50	63.765	118.74	NA	267.20
10.000	20.000	115.00	N.A.	192.50	68.670	123.83	NA	295.32
10.000	20.000	0.0	60.000	192.50	68.670	123.83	99.064	295.32
10.500	20.000	0.0	60.000	202.50	73.575	128.93	103.14	332.05
11.000	20.000	0.0	60.000	212.50	78.480	134.02	107.22	370.26
11.500	20.000	0.0	60.000	222.50	83.385	139.12	111.29	409.95
12.000	20.000	0.0	60.000	232.50	88.290	144.21	115.37	451.12
12.500	20.000	0.0	60.000	242.50	93.195	149.30	119.44	493.77
13.000	20.000	0.0	60.000	252.50	98.100	154.40	123.52	537.90

* Effective horizontal stress not calculated for "Total Stress" materials and for Beta Method.

Cross-section 1 results:

Uniform pile with top shaft diameter = 0.35 m

Results - Compression

Soil Profile 1: Soil Profile 1

Depth	Pile length	Ultimate base capacity	Cumulative external Friction	Negative skin friction	Ultimate capacity	Allowable capacity	Limiting criterion
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]	#
6.0000	6.0000	64.943	115.81	0.0	180.75	60.251	1
6.5000	6.5000	69.272	137.11	0.0	206.39	68.795	1
7.0000	7.0000	73.602	159.79	0.0	233.39	77.798	1
7.5000	7.5000	77.931	183.84	0.0	261.78	87.259	1
8.0000	8.0000	82.261	209.27	0.0	291.53	97.177	1
8.5000	8.5000	86.590	236.07	0.0	322.66	107.55	1
9.0000	9.0000	90.920	264.25	0.0	355.17	118.39	1
9.5000	9.5000	95.249	293.80	0.0	389.05	129.68	1
10.000	10.000	99.579	324.73	0.0	424.30	141.43	1
10.000	10.000	714.83	324.73	0.0	1039.6	249.79	3
10.500	10.500	744.24	365.11	0.0	1109.4	280.85	3
11.000	11.000	773.65	407.12	0.0	1180.8	313.17	3
11.500	11.500	803.07	450.76	0.0	1253.8	346.74	3
12.000	12.000	832.48	496.03	0.0	1328.5	381.56	3
12.500	12.500	861.89	542.93	0.0	1404.8	417.64	3
13.000	13.000	891.30	591.45	0.0	1482.8	454.96	3

Limiting criteria :

- 1: Global factor of safety
- 2: Shaft and base factors of safety
- 3: Shaft factor of safety
- 4: Pile material limiting stress [Compression]

Nq Calculation Details

Soil Profile 1: Soil Profile 1

There are no pile toe levels in any drained material (with Berezhantzev/Bolton option) in the given soil profile.

 PILEDESIGNS GEOTECHNICAL EXPERTISE Havant - Wessex Yard, 8 New Lane, PO9 2JH 350mm diameter auger piles Vertical Capacity, FOS= 3.0	Job No.	Sheet No.	Rev.
	22259		
	Drg. Ref.		
	Made by FM	Date	Checked

Notes

Profile as Borehole BH101/ BH103
for Block B

Analysis Options

Design method	Working load
Are compression calculations enabled?	Yes
Is global FoS criterion for compression active?	Yes
Global factor on ultimate bearing capacity Fg	3.0000
Is partial FoS criterion for compression active?	No
Is shaft FoS criterion for compression active?	Yes
Factor applied to ultimate skin friction Fs2	1.3000
Is pile limiting stress criterion for compression active?	Yes
Limiting pile material stress at working load	8750.0 kPa
Are tension calculations enabled?	No
Datum type	Depth based
Effective stress profile	Calculated

Pile Properties

Pile type	Solid
Pile cross-section	Circular
Under-ream	No
Calculation profile	Range
Minimum pile length	6.0000 m
Maximum pile length	13.000 m
Increment size	0.50000

Cross-section	Number of cross sections	Top Diameter [m]	Second Diameter location [m]	Second Diameter [m]	Third Diameter location [m]	Third Diameter [m]
Cross-section 1	1	0.35000				

Undrained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Cu material factor	Top Cu [kPa]	Base Cu [kPa]
1	Discounted Soil	18.000	NA	0.0	0.0
2	Grey Clay (LC)	20.000	NA	65.000	103.00

Undrained Materials - Skin Friction Data

No.	Material description	Skin friction computation	Alpha	qs Top [kPa]	qs,lim Base [kPa]	Spec. Value [kPa]
1	Discounted Soil	Alpha specified	0.0	NA	NA	No NA
2	Grey Clay (LC)	Alpha specified	0.50000	NA	NA	No NA

Undrained Materials - End Bearing Data

No.	Material description	End bearing computation	Nc	qb Top [kPa]	qb,lim Base [kPa]	Spec. Value [kPa]
1	Discounted Soil	Nc specified	0.0	NA	NA	No NA
2	Grey Clay (LC)	Nc specified	9.0000	NA	NA	No NA

 PILEDESIGNS GEOTECHNICAL EXPERTISE Havant - Wessex Yard, 8 New Lane, PO9 2JH 350mm diameter auger piles Vertical Capacity, FOS= 3.0	Job No.	Sheet No.	Rev.
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No.	Material description	End bearing computation	Nc	q _b	q _{b,lim}
				Top [kPa]	Base Spec. Value [kPa]

Drained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Tan (δ) material factor
1	Clayey Sand	19.000	NA
2	Dense Sand	20.000	NA

Drained Materials - Friction Data

No.	Material description	Skin friction computation	Beta	Delta (δ) [deg]	Coefficient of earth pressure K	q _s	q _{s,lim}
						Top [kPa]	Base Spec. Value [kPa]
1	Clayey Sand	Earth pressure	NA	30.000	0.80000	NA	NA No NA
2	Dense Sand	Earth pressure	NA	36.000	0.80000	NA	NA No NA

Drained Materials - End Bearing Data

No.	Material description	End bearing computation	Nq	Phi' [deg]	PhiD [deg]	Phicv' [deg]	Ir	q _b	q _{b,lim}	Nq-Phi curves
								Top [kPa]	Base Spec. Value [kPa]	
1	Clayey Sand	Nq specified	10.000	NA	NA	NA	NA	NA	NA No NA	NA NA
2	Dense Sand	Nq specified	60.000	NA	NA	NA	NA	NA	NA Yes 10000.	NA

STAGE SPECIFIC DATA

Stage 0 : Initial Stage

Groundwater

No.	Level [m]	Pressure [kPa]	Unit weight of water [kN/m³]
1	3.0000	0.0	9.8100

Soil Profiles

Soil Profile 1: Soil Profile 1

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Discounted Soil	No
2	2.5000	Clayey Sand	No
3	5.0000	Grey Clay (LC)	No
4	8.8000	Dense Sand	No

Soil Profile - Groundwater Map

No.	Soil Profile	Groundwater
1	Soil Profile 1	Groundwater Profile 1

CAPACITY RESULTS

Stress Profiles

Soil Profile 1: Soil Profile 1

Havant - Wessex Yard, 8 New Lane, PO9 2JH
 350mm diameter auger piles
 Vertical Capacity, FOS= 3.0

Job No.	Sheet No.	Rev.
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Made by FM	Date	Checked

No.	Soil Profile		Groundwater					
Depth	Density	Undrained Cohesion	Nq	Total vertical stress	Porewater pressure	Effective vertical stress	Effective horizontal stress*	Cumulative skin friction per unit perimeter
[m]	[kN/m ³]	[kPa]		[kPa]	[kPa]	[kPa]	[kPa]	[kN/m]
0.0	18.000	0.0	N.A.	0.0	0.0	0.0	NA	0.0
2.5000	18.000	0.0	N.A.	45.000	0.0	45.000	NA	0.0
2.5000	19.000	0.0	10.000	45.000	0.0	45.000	36.000	0.0
3.0000	19.000	0.0	10.000	54.500	0.0	54.500	43.600	11.489
5.0000	19.000	0.0	10.000	92.500	19.620	72.880	58.304	70.324
5.0000	20.000	65.000	N.A.	92.500	19.620	72.880	NA	70.324
6.0000	20.000	75.000	N.A.	112.50	29.430	83.070	NA	105.32
6.5000	20.000	80.000	N.A.	122.50	34.335	88.165	NA	124.70
7.0000	20.000	85.000	N.A.	132.50	39.240	93.260	NA	145.32
7.5000	20.000	90.000	N.A.	142.50	44.145	98.355	NA	167.20
8.0000	20.000	95.000	N.A.	152.50	49.050	103.45	NA	190.32
8.5000	20.000	100.00	N.A.	162.50	53.955	108.54	NA	214.70
8.8000	20.000	103.00	N.A.	168.50	56.898	111.60	NA	229.92
8.8000	20.000	0.0	60.000	168.50	56.898	111.60	89.282	229.92
9.0000	20.000	0.0	60.000	172.50	58.860	113.64	90.912	243.02
9.5000	20.000	0.0	60.000	182.50	63.765	118.74	94.988	276.78
10.000	20.000	0.0	60.000	192.50	68.670	123.83	99.064	312.03
10.500	20.000	0.0	60.000	202.50	73.575	128.93	103.14	348.76
11.000	20.000	0.0	60.000	212.50	78.480	134.02	107.22	386.96
11.500	20.000	0.0	60.000	222.50	83.385	139.12	111.29	426.65
12.000	20.000	0.0	60.000	232.50	88.290	144.21	115.37	467.82
12.500	20.000	0.0	60.000	242.50	93.195	149.30	119.44	510.47
13.000	20.000	0.0	60.000	252.50	98.100	154.40	123.52	554.60

* Effective horizontal stress not calculated for "Total Stress" materials and for Beta Method.

Cross-section 1 results:

Uniform pile with top shaft diameter = 0.35 m

Results - Compression

Soil Profile 1: Soil Profile 1

Depth	Pile length	Ultimate base capacity	Cumulative external Friction	Negative skin friction	Ultimate capacity	Allowable capacity	Limiting criterion
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]	#
6.0000	6.0000	64.943	115.81	0.0	180.75	60.251	1
6.5000	6.5000	69.272	137.11	0.0	206.39	68.795	1
7.0000	7.0000	73.602	159.79	0.0	233.39	77.798	1
7.5000	7.5000	77.931	183.84	0.0	261.78	87.259	1
8.0000	8.0000	82.261	209.27	0.0	291.53	97.177	1
8.5000	8.5000	86.590	236.07	0.0	322.66	107.55	1
9.0000	9.0000	656.01	267.21	0.0	923.22	205.55	3
9.5000	9.5000	685.42	304.34	0.0	989.76	234.11	3
10.000	10.000	714.83	343.09	0.0	1057.9	263.92	3
10.500	10.500	744.24	383.48	0.0	1127.7	294.98	3
11.000	11.000	773.65	425.49	0.0	1199.1	327.30	3
11.500	11.500	803.07	469.13	0.0	1272.2	360.87	3
12.000	12.000	832.48	514.40	0.0	1346.9	395.69	3
12.500	12.500	861.89	561.29	0.0	1423.2	431.76	3
13.000	13.000	891.30	609.82	0.0	1501.1	469.09	3

Limiting criteria :

- 1: Global factor of safety
- 2: Shaft and base factors of safety
- 3: Shaft factor of safety
- 4: Pile material limiting stress [Compression]

Nq Calculation Details

Soil Profile 1: Soil Profile 1

 PILEDESIGNS GEOTECHNICAL EXPERTISE Havant - Wessex Yard, 8 New Lane, PO9 2JH 350mm diameter auger piles Vertical Capacity, FOS= 3.0	Job No.		Sheet No.	Rev.
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Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Negative skin friction (Q_{nsf})	Ultimate capacity	Allowable capacity	Limiting criterion #
There are no pile toe levels in any drained material (with Berezantzev/Bolton option) in the given soil profile.							

 PILEDESIGNS GEOTECHNICAL EXPERTISE Havant - Wessex Yard, 8 New Lane, PO9 2JH 350mm diameter auger piles Vertical Capacity, FOS= 3.0	Job No.	Sheet No.	Rev.
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	Drg. Ref.		
	Made by FM	Date	Checked

Notes

Profile as Borehole BH103
for Block C

Analysis Options

Design method	Working load
Are compression calculations enabled?	Yes
Is global FoS criterion for compression active?	Yes
Global factor on ultimate bearing capacity Fg	3.0000
Is partial FoS criterion for compression active?	No
Is shaft FoS criterion for compression active?	Yes
Factor applied to ultimate skin friction Fs2	1.3000
Is pile limiting stress criterion for compression active?	Yes
Limiting pile material stress at working load	8750.0 kPa
Are tension calculations enabled?	No
Datum type	Depth based
Effective stress profile	Calculated

Pile Properties

Pile type	Solid
Pile cross-section	Circular
Under-ream	No
Calculation profile	Range
Minimum pile length	6.0000 m
Maximum pile length	13.000 m
Increment size	0.50000

Cross-section	Number of cross sections	Top Diameter [m]	Second Diameter location [m]	Second Diameter [m]	Third Diameter location [m]	Third Diameter [m]
Cross-section 1	1	0.35000				

Undrained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Cu material factor	Top Cu [kPa]	Base Cu [kPa]
1	Discounted Soil	18.000	NA	0.0	0.0
2	Grey Clay (LC)	20.000	NA	65.000	91.000

Undrained Materials - Skin Friction Data

No.	Material description	Skin friction computation	Alpha	qs Top [kPa]	qs,lim Base [kPa]	Spec. Value [kPa]
1	Discounted Soil	Alpha specified	0.0	NA	NA	No NA
2	Grey Clay (LC)	Alpha specified	0.50000	NA	NA	No NA

Undrained Materials - End Bearing Data

No.	Material description	End bearing computation	Nc	qb Top [kPa]	qb,lim Base [kPa]	Spec. Value [kPa]
1	Discounted Soil	Nc specified	0.0	NA	NA	No NA
2	Grey Clay (LC)	Nc specified	9.0000	NA	NA	No NA

 PILEDESIGNS GEOTECHNICAL EXPERTISE Havant - Wessex Yard, 8 New Lane, PO9 2JH 350mm diameter auger piles Vertical Capacity, FOS= 3.0	Job No.	Sheet No.	Rev.
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Made by FM	Date	Checked	

No.	Material description	End bearing computation	Nc	q _b	q _{b,lim}
				Top [kPa]	Base Spec. Value [kPa]

Drained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Tan (δ) material factor
1	Clayey Sand	19.000	NA
2	Dense Sand	20.000	NA

Drained Materials - Friction Data

No.	Material description	Skin friction computation	Beta	Delta (δ) [deg]	Coefficient of earth pressure K	q _s	q _{s,lim}
						Top [kPa]	Base Spec. Value [kPa]
1	Clayey Sand	Earth pressure	NA	30.000	0.80000	NA	NA No NA
2	Dense Sand	Earth pressure	NA	36.000	0.80000	NA	NA No NA

Drained Materials - End Bearing Data

No.	Material description	End bearing computation	Nq	Phi' [deg]	PhiD [deg]	Phicv' [deg]	Ir	q _b	q _{b,lim}	Nq-Phi curves
								Top [kPa]	Base Spec. Value [kPa]	
1	Clayey Sand	Nq specified	10.000	NA	NA	NA	NA	NA	NA No NA	NA NA
2	Dense Sand	Nq specified	60.000	NA	NA	NA	NA	NA	NA Yes 10000.	NA

STAGE SPECIFIC DATA

Stage 0 : Initial Stage

Groundwater

No.	Level [m]	Pressure [kPa]	Unit weight of water [kN/m³]
1	3.0000	0.0	9.8100

Soil Profiles

Soil Profile 1: Soil Profile 1

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Discounted Soil	No
2	2.5000	Clayey Sand	No
3	5.0000	Grey Clay (LC)	No
4	7.6000	Dense Sand	No

Soil Profile - Groundwater Map

No.	Soil Profile	Groundwater
1	Soil Profile 1	Groundwater Profile 1

CAPACITY RESULTS

Stress Profiles

Soil Profile 1: Soil Profile 1

Havant - Wessex Yard, 8 New Lane, PO9 2JH
 350mm diameter auger piles
 Vertical Capacity, FOS= 3.0

Job No.	Sheet No.	Rev.
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Drg. Ref.		
Made by FM	Date	Checked

No.	Soil Profile		Groundwater					
Depth	Density	Undrained Cohesion	Nq	Total vertical stress	Porewater pressure	Effective vertical stress	Effective horizontal stress*	Cumulative skin friction per unit perimeter
[m]	[kN/m ³]	[kPa]		[kPa]	[kPa]	[kPa]	[kPa]	[kN/m]
0.0	18.000	0.0	N.A.	0.0	0.0	0.0	NA	0.0
2.5000	18.000	0.0	N.A.	45.000	0.0	45.000	NA	0.0
2.5000	19.000	0.0	10.000	45.000	0.0	45.000	36.000	0.0
3.0000	19.000	0.0	10.000	54.500	0.0	54.500	43.600	11.489
5.0000	19.000	0.0	10.000	92.500	19.620	72.880	58.304	70.324
5.0000	20.000	65.000	N.A.	92.500	19.620	72.880	NA	70.324
6.0000	20.000	75.000	N.A.	112.50	29.430	83.070	NA	105.32
6.5000	20.000	80.000	N.A.	122.50	34.335	88.165	NA	124.70
7.0000	20.000	85.000	N.A.	132.50	39.240	93.260	NA	145.32
7.5000	20.000	90.000	N.A.	142.50	44.145	98.355	NA	167.20
7.6000	20.000	91.000	N.A.	144.50	45.126	99.374	NA	171.72
7.6000	20.000	0.0	60.000	144.50	45.126	99.374	79.499	171.72
8.0000	20.000	0.0	60.000	152.50	49.050	103.45	82.760	195.30
8.5000	20.000	0.0	60.000	162.50	53.955	108.54	86.836	226.11
9.0000	20.000	0.0	60.000	172.50	58.860	113.64	90.912	258.39
9.5000	20.000	0.0	60.000	182.50	63.765	118.74	94.988	292.16
10.000	20.000	0.0	60.000	192.50	68.670	123.83	99.064	327.40
10.500	20.000	0.0	60.000	202.50	73.575	128.93	103.14	364.13
11.000	20.000	0.0	60.000	212.50	78.480	134.02	107.22	402.34
11.500	20.000	0.0	60.000	222.50	83.385	139.12	111.29	442.03
12.000	20.000	0.0	60.000	232.50	88.290	144.21	115.37	483.20
12.500	20.000	0.0	60.000	242.50	93.195	149.30	119.44	525.85
13.000	20.000	0.0	60.000	252.50	98.100	154.40	123.52	569.98

* Effective horizontal stress not calculated for "Total Stress" materials and for Beta Method.

Cross-section 1 results:

Uniform pile with top shaft diameter = 0.35 m

Results - Compression

Soil Profile 1: Soil Profile 1

Depth	Pile length	Ultimate base capacity	Cumulative external Friction	Negative skin friction	Ultimate capacity	Allowable capacity	Limiting criterion
		(Q _b)	(Q _s)	(Q _{nsf})			#
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]	
6.0000	6.0000	64.943	115.81	0.0	180.75	60.251	1
6.5000	6.5000	69.272	137.11	0.0	206.39	68.795	1
7.0000	7.0000	73.602	159.79	0.0	233.39	77.798	1
7.5000	7.5000	77.931	183.84	0.0	261.78	87.259	1
8.0000	8.0000	597.18	214.74	0.0	811.93	165.19	3
8.5000	8.5000	626.60	248.62	0.0	875.21	191.24	3
9.0000	9.0000	656.01	284.12	0.0	940.12	218.55	3
9.5000	9.5000	685.42	321.24	0.0	1006.7	247.11	3
10.000	10.000	714.83	360.00	0.0	1074.8	276.92	3
10.500	10.500	744.24	400.38	0.0	1144.6	307.99	3
11.000	11.000	773.65	442.40	0.0	1216.0	340.30	3
11.500	11.500	803.07	486.04	0.0	1289.1	373.87	3
12.000	12.000	832.48	531.30	0.0	1363.8	408.70	3
12.500	12.500	861.89	578.20	0.0	1440.1	444.77	3
13.000	13.000	891.30	626.72	0.0	1518.0	482.10	3

Limiting criteria :

- 1: Global factor of safety
- 2: Shaft and base factors of safety
- 3: Shaft factor of safety
- 4: Pile material limiting stress [Compression]

Nq Calculation Details

Soil Profile 1: Soil Profile 1

 PILEDESIGNS GEOTECHNICAL EXPERTISE Havant - Wessex Yard, 8 New Lane, PO9 2JH 350mm diameter auger piles Vertical Capacity, FOS= 3.0	Job No.		Sheet No.	Rev.
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Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Negative skin friction (Q_{nsf})	Ultimate capacity	Allowable capacity	Limiting criterion #
There are no pile toe levels in any drained material (with Berezantzev/Bolton option) in the given soil profile.							

Attachment 2

Pile Arisings Test Certificates

Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP



Attention :	Grace Larcombe
Date :	9th August, 2019
Your reference :	A10708
Our reference :	Test Report 19/12713 Batch 1
Location :	
Date samples received :	7th August, 2019
Status :	Final report
Issue :	1

Three samples were received for analysis on 7th August, 2019 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Lucas Halliwell
Project Co-ordinator

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Omnia
Reference: A10708
Location:
Contact: Grace Larcombe
EMT Job No: 19/12713

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

[illegible]

Client Name: Omnia

Reference: A10708

Location:

Contact: Grace Larcombe

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 19/12713

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory.

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

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REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 19/12713

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No