

Woking Football Club

JOMAS ASSOCIATES LTD

6-9 The Square Stockley Park Uxbridge UB11 1FW

Tel: 0843-289-2187 Fax: 0872-115-4505

www.jomasassociates.com info@jomasassociates.com

P1381J1460/PSw/v1.1

02/07/2019

WOKING FOOTBALL CLUB, KINGFIELD ROAD, WOKING, SURREY, GU22 9AA: SOIL INFILTRATION TESTING

Jomas attended the above-mentioned site under instruction by Woking Football Club on 21st June 2019 to carry out falling head permeability tests within the boreholes previously installed on the site.

A full list of previous reports undertaken for the site by Jomas are detailed in Table 1 below:

Table 1: Previous Reports - Jomas

Title	Author	Reference	Date
Desk Study / Preliminary Risk Assessment Report For Woking Football Club, Laithwaite Community Stadium, Kingfield Road, Kingfield, Woking, GU22 9AA	Jomas Associates Ltd	P1381J1460/AM Final V1.0	17 August 2018
Woking Football Club, Laithwaite Community Stadium, Kingfield Road, Woking, GU22 9AA Geo-Environmental Scoping Letter	Jomas Associates Ltd	P1381j1460/Amm	18 April 2019
Geo-Environmental & Geotechnical Assessment (Ground Investigation) Report, Woking Football Club, Laithwaite Community Stadium, Kingfield Road, Woking, GU22 9AA	Jomas Associates Ltd	P1381J1460/AMM Final V1.0	30 April 2019

This phase of work did not involve any further intrusive investigation works.

Ground Conditions

Full logs of the ground conditions observed on site are included in Appendix 2 of the ground investigation report, however, a summary of the ground conditions is provided below:



Stratum and Description	Encountered from (m bgl)	Base of strata (m bgl)	Thickness range (m)
Asphalt. (MADE GROUND)	0.0	0.05 – 0.20	0.05 – 0.20
Brown sandy gravelly clay with rootlets. Sand is fine. Gravel consists of flint, concrete, brick and asphalt fragments. (MADE GROUND – Topsoil) Encountered in WS4 and WS5 only	0.0	0.30 – 0.50	0.30 - 0.50
Black to brown slightly clayey sandy gravel. Sand is fine to medium. Gravel consists of flint, brick, concrete, asphalt, glass and ceramic fragments. (MADE GROUND)	0.05 – 0.30	0.30 - 1.10	0.18 - 1.15
Black to brown clayey gravelly sand. Sand is medium. Gravel consists of fine to coarse flint and asphalt fragments. (MADE GROUND)	0.30 - 1.10	0.70 - 1.40	0.25 – 0.90
Loose to very dense orange to grey silty clayey very gravelly SAND. Sand is fine. Gravel consists of flint. (KEMPTON PARK GRAVEL)	0.30 - 1.40	2.00 - 4.15	0.70 – 3.20
Medium to very dense grey silty SAND. Sand is medium to coarse. (BAGSHOT FORMATION)	2.00 - 3.60	3.75 – 25.00	0.85 – 22.30

Falling Head Permeability Tests

The determination of permeability of the underlying ground was undertaken by carrying out insitu falling head tests. These were carried out to conform with the methodology for falling head permeability test formerly outlined in BS: 5930 (1999) and recently in BS EN ISO 22282-2.

Copies of the results and calculations are appended to this letter.

Falling head permeability tests were carried out in 2no. historically installed boreholes. Jomas has not been provided with details of these installs. It is assumed that the hole had been drilled with 150mm casing. Similarly, the installation is assumed to be 1m of plain pipe with slotted to the base of the well at 4.3m (HBH2) and 5.9m (HBH4)

1No test lasting for approximately 1hour was undertaken in each location, the results of these tests are summarised below with the full calculation and result sheets appended to this letter.



Hole ID	Calculated Permeability (m/s)	Indicative Permeability*	Indicative Drainage Conditions*
HBH2	4.05 x 10 ⁻⁵	Low	Good
HBH4	2.15 x 10 ⁻⁴	Medium	Good
WS2	2.66 x 10 ⁻⁶	Low	Poor
WS7	6.11 x 10 ⁻⁷	Very Low	Poor
WS10	9.84 x 10 ⁻⁷	Very Low	Poor
BH2	9.31 x 10 ⁻⁷	Very Low	Poor
BH3	1.32 x 10 ⁻⁵	Low	Good

*After Casagrande and Fadum (1940)

We trust that this is satisfactory for your current needs, however please do not hesitate to contact the udnersigned if we can be of further assistance on either this or any other project.

Yours sincerely,

Peter Swettenham BSc (Hons) MSc PgCert CEnv MIEnvSc

Principal Geotechnical Engineer

Enc.

Appendix 1 – Figures

Appendix 2 – Infiltration Rates – Results and Calculations



WE LISTEN, WE PLAN, WE DELIVER

Geotechnical Engineering and Environmental Services across the UK.

APPENDIX 1 – FIGURES



JOMAS ASSOCIATES LTD T: 0843 289 2187

Project Name	Kingfield Road, Woking	Client	Woking Football Club
Project No.	P1381J1460	Date	16/08/2018
Title	Site Location Plan	Prepared By	AM



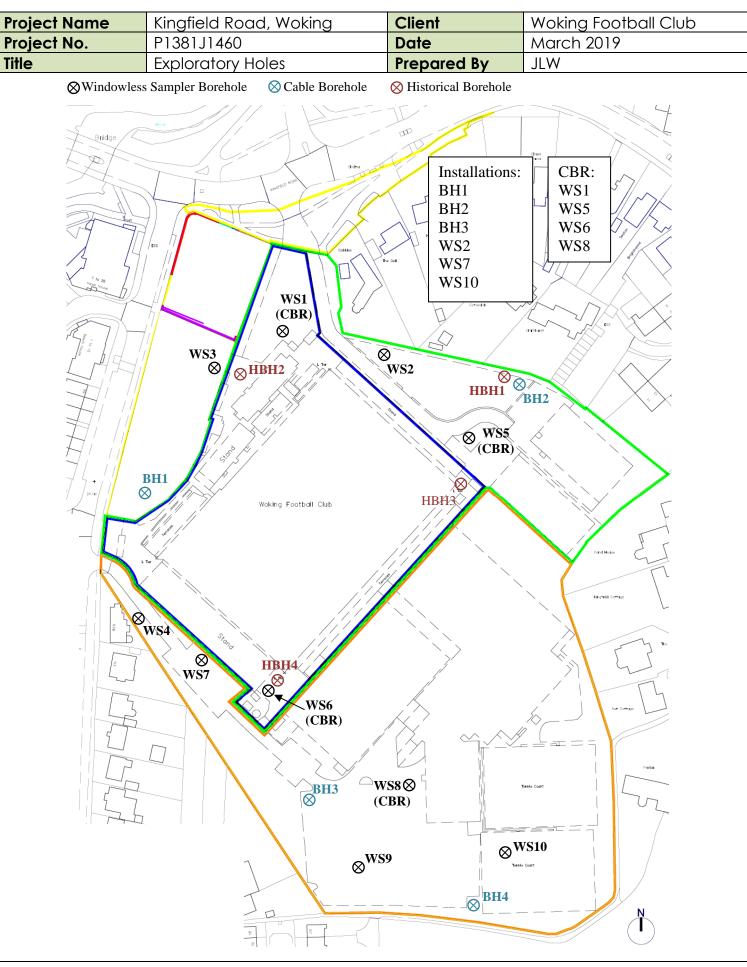
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APPENDIX 2 – INFILTRATION RATES – RESULTS AND CALCULATIONS

JOMAS ASSOCIATES LTD 6-9 The Square, Stockley Park, Uxbridge, UB11 1FW www.jomasassociates.com 0843-289-2187 info@jomasassociates.com Jomas Associates Ltd Registered in England and Wales No. 7095350.

			FALLING H	IEAD TEST R	ECORD					
				Ground Level			Ho	ole Nr	HBH2	CIOMAS
Site	Kingsfield Road, Wokin	g		Nat Grid Co-ordin	ates			oject Nr	P1381J1460	
Date	21/06/2019	9.				JPB		0,000111	1 100101 100	
	21/06/2019									
Borehole Dimensions			Well Installation	Details (mbgl)			Gr	ound Condi	tions	
Borehole Diameter (m)										
Standpipe Diameter (m)	0.1			ve been drilled with 2						
Length of Slotted Pipe (m)	3.3		Installation assume	d to be 1m of plain pi	pe with slotted to the ba	ase of the well at 4.3m				
F (Intake Factor)		Type D								
	6.55									
A (Cross-sectional Area)	0.03	177								
							Sta	anding Water	Level (mbgl):	2.28
	TES			EST 2		ST 3				
Elapsed time	Depth to Water	Head	Depth to Water	Head	Depth to Water	Head				
secs	mbgl	m	mbgl	m	(Dw) mbgl	(Dg) m				
0	1.00	1.28	_							
30	1.58	0.70	-		+		-			
45	1.82	0.46	+							
60	1.98	0.30		+					Fall	ing Head Tests
90	2.12	0.16	-				1.40			
120 150	2.18 2.21	0.10					1.40			
150	2.21	0.07								
240	2.25	0.03								
300	2.25	0.03					1.20	1		
360	2.20	0.02								
420	2.20	0.02								
480	2.26	0.02					1.00			
540	2.27	0.01								
600	2.27	0.01								
900	2.27	0.01					- 0.80			
1200	2.27	0.01					08.0 (mpgl)			
1800	2.27	0.01					1 (n			
2400	2.27	0.01					eac			
3000	2.27	0.01					I 0.60			
3600	2.27	0.01								
			_				0.40	++		
			-							
			-							
							0.20	<u> </u>		
							0.00			
								0 50	0 1000	1500 2000 2500 3000 3500 4000
								0 50	1000	
										Time Elapsed (secs)
	TES	Т1	Т	EST 2	TES	ST 3				
t1 (sec)	3	0								
t2 (sec)	24									
	21		1		1					
t2-t1 (sec)			+		+					
h1 (m)	0.									
h2 (m)	0.0	03								
Permeability -k - (m/sec)	4.05	E-05								
Permeability -k - (m/sec)										
					Remarks:					
					Approved By:	PSw				

			FALLING H	IEAD TEST F	RECORD					1 123	
				Ground Level			Н	lole Nr	HBH4	CIOMAS	
Site	Kingsfield Road, Wokir	ng		Nat Grid Co-ordi	nates			roject Nr	P1381J1460		
Date	02/11/2015	0		Engineer		JPB					
Borehole Dimensions Borehole Diameter (m) Standpipe Diameter (m) Length of Slotted Pipe (m) F (Intake Factor) A (Cross-sectional Area)	0.1 6. Тур 3.00 0.0:	00 be A JE-01		Details (mbgl) ave been drilled with			'n	iround Condi tanding Wate	r Level (mbgl):	2.02	
		ST 1		EST 2		ST 3					
Elapsed time	Depth to Water	Head	Depth to Water	Head	Depth to Water	Head					
secs	mbgl	m	mbgl	m	(Dw) mbgl	(Dg) m					
0	0.63	1.39									
30	0.90	1.12									
60 117	0.99	1.03			+				F- 11:	ng Llood Tosta	
117	1.16	0.86							Falli	ng Head Tests	
130	1.57	0.45					1.60				
210	1.61	0.41									
240	1.64	0.38									
270	1.67	0.35					1.40				
300	1.69	0.33									
360	1.72	0.30					1.20	-			
420	1.75	0.27						1			
480	1.77	0.25					1.00	1			
540	1.80	0.22					= 1.00				
600	1.80	0.22					gqt				
1080	1.87	0.15					는 0.80				
1200 1800	1.89 1.94	0.13 0.08					Head (mbgl)				
2400	1.94	0.08					± 0.60				
3000	1.95	0.08					0.00				
3600	1.96	0.06									
							0.40				
							0.20				
							0.00		1000	F00 2000 2500 2000	2500 4000
								0 50	00 1000 1	500 2000 2500 3000	3500 4000
										Time Elapsed (secs)	
				-							
										TEST 1	
	TES	T 1	т	EST 2	TES	ST 3					
t1 (sec)	3					-					
t2 (sec)	42										
t2 (sec)	39				1						
			+		+						
h1 (m)	1.		-								
h2 (m)	0.2	27									
Permeability -k - (m/sec)	2.15	E-04									
					- ·						
					Remarks:						
					Approved By:	PSw					

			FALLING H	IEAD TEST R	ECORD		(10)1129
							Hole Nr WS2 Project Nr P1381J1460
Site	Kingsfield Road, Wokir	ng		Ground Level Nat Grid Co-ordin	ates		Project Nr P1381J1460
Date	21/06/2019	.0		Engineer		JPB	
Borehole Dimensions	21,00,2015		Well Installation				Ground Conditions
Borehole Diameter (m)			weninstanation	Details (mbgi)			Ground Conditions
	0.1	00	0 1m Disin sins w				
Standpipe Diameter (m)	0.1			ith bentonite surrour	ia		
Length of Slotted Pipe (m)	2.0 Тур		1m - 3m slotted wi 3.0m - 4.45m back				
F (Intake Factor)	4.138		5.011 - 4.4511 back	ineu with anisisings			
A (Cross-sectional Area)	0.00						
A (closs-sectional Area)	0.00	575					
							Standing Water Level (mbgl): 2.87
	TES	T1	т	EST 2	TES	5T 3	
Elapsed time	Depth to Water	Head	Depth to Water	Head	Depth to Water	Head	
secs	mbgl	m	mbgl	m	(Dw) mbgi	(Dg) m	
0	0.65	2.22					
30	0.77	2.10					
60	0.94	1.93					
90	1.13	1.74					Falling Head Tests
120	1.25	1.62					
150	1.36	1.51					2.50
180	1.47	1.40					
240	1.63	1.24					
270 300	1.70	1.17					
300	1.78 1.88	0.99					2.00
420	1.88	0.99					
420	2.02	0.85					
540	2.08	0.79					
600	2.13	0.74					
900	2.32	0.55					1.50
1200	2.46	0.41					
1800	2.63	0.24					
2400	2.72	0.15					
3000	2.77	0.11					
3600	2.79	0.08					1.00
			-				
				-			
							0.50
							0.00
							0 500 1000 1500 2000 2500 3000 3500 4000
							Time Elapsed (secs)
	TES		Ť	EST 2		ST 3	Time Etapseu (Secs)
t1 (sec)	3	0			12	20	
t2 (sec)	12	00					
t2-t1 (sec)	11	70					
h1 (m)	2.	1					
h2 (m)	0.4	41					
Permeability -k - (m/sec)	2.66	E-06					
					Remarks:		
						DC	
					Approved By:	PSw	

			FALLING H	IEAD TEST R	ECORD					(10)1120
				Ground Level			li	Hole Nr	WS7	CIOMAS
Site	Kingsfield Road, Woki	ng		Nat Grid Co-ordin	nates			Project Nr	P1381J1460	
Date	21/06/2019	15		Engineer		IPB		Tojectini	1150151400	
	21/00/2019			-	J	irb				
Borehole Dimensions			Well Installation	Details (mbgl)			C C C C C C C C C C C C C C C C C C C	Ground Cond	itions	
Borehole Diameter (m)										
Standpipe Diameter (m)	0.1			ith bentonite surrour						
Length of Slotted Pipe (m)	3.		1m - 4.15m slotted	with gravel surround	1					
F (Intake Factor)	Тур									
	5.66									
A (Cross-sectional Area)	0.0	079								
							S	Standing Wate	er Level (mbgl):	2.12
	TES			EST 2	TEST					
Elapsed time	Depth to Water	Head	Depth to Water	Head	Depth to Water	Head				
secs	mbgl	m	mbgl	m	(Dw) mbgl	(Dg) m				
0	0.24	1.88					4			
30	0.42	1.70								
60	0.44	1.68					41			
90	0.46	1.66					41		Falli	ng Head Tests
120	0.47	1.65	-	-	+ +		2.00	۱		-
150	0.48	1.64					2.00	,		
180	0.49	1.63		-			1.80			
210 240	0.50	1.62					1.00	,		
270	0.66	1.56					1.60			
300	0.66	1.40					1.00	,		
360	0.72	1.38					1.40			
420	0.74	1.36					1.40	,		
480	0.78	1.34					1.20			
600	0.80	1.32					1.20 бар 1.00 н ад 1.00 н ад)		
900	0.95	1.17					1			
1200	1.12	1.00					P 1.00			
1800	1.31	0.81					Hei A			
2400	1.52	0.60					0.80			
3000	1.66	0.46					0.60			
3600	1.76	0.36					0.60			
							0.40			
							0.40			
				_			0.20			
							0.20	,		
							0.00			
							- 0.00		00 1000 1	500 2000 2500 3000 3500 4000
								0 50	1000 1	
										Time Elapsed (secs)
				1						
	TES	T 1	т	EST 2	TES	Г 3				
t1 (sec)	3				-					
	30									
t2 (sec)			+		+		4			
t2-t1 (sec)	29						4			
h1 (m)	1				_		4			
h2 (m)	0.4	46								
Permeability -k - (m/sec)	6.11	E-07								
							-			
					Remarks:					
					Approved By:	PSw				

			FALLING H	IEAD TEST F	RECORD		(131133
			Ground Level			Hole Nr WS10 Project Nr P1381J1460	
Site	Kingsfield Road, Wokir	ng		Nat Grid Co-ordi	nates		Project Nr P1381J1460
Date	21/06/2019	0		Engineer		JPB	
Borehole Dimensions Borehole Diameter (m)	21,00,2015		Well Installation	-			Ground Conditions
Standpipe Diameter (m)	0.1			ith bentonite surrou			
Length of Slotted Pipe (m)	Тур		1m - 3.95m siotted	with gravel surround	a		
F (Intake Factor)	5.40						
A (Cross-sectional Area)	0.00						
							Standing Water Level (mbgl): 1.98
	TES	T 1		EST 2	TE	5T 3	-
Elapsed time	Depth to Water	Head	Depth to Water	Head	Depth to Water	Head	
secs	mbgl	m	mbgl	m	(Dw) mbgl	(Dg) m	—
0	0.28	1.70			(511)	(58/	
30	0.34	1.64					—
60	0.43	1.55					
90	0.50	1.48					Falling Head Tests
120	0.56	1.42					
150	0.60	1.38					1.80
180	0.63	1.35					
210	0.67	1.31	-	-	_		1.60
240	0.69	1.29	_				
270 300	0.72	1.26					1.40
360	0.80	1.23					
420	0.84	1.14					1.20
480	0.87	1.11					
600	0.95	1.03					
900	1.15	0.83					Ē
1200	1.34	0.64					
1800	1.61	0.37					¥ 000
2400	1.68	0.30	-	-	_		0.60
3000 3600	1.76 1.82	0.22	_				0.00
3600	1.82	0.16					
							0.40
							0.20
							0.00
							0 500 1000 1500 2000 2500 3000 3500 4000
			-	-	_		Time Elapsed (secs)
			_				
	TES	T 1	Т	EST 2	TES	ST 3	
t1 (sec)	3						
t2 (sec)	30						
t2-t1 (sec)	29						
							—
h1 (m) h2 (m)	1.		+				-
	9.84						
Permeability -k - (m/sec)							
					Remarks:		
					Approved By:	PSw	

			FALLING H	IEAD TEST R	ECORD					6101130
				Ground Level			Но	ole Nr	BH2	CIOMAS
Site	Kingsfield Road, Wokir	ng		Nat Grid Co-ordin	ates			oject Nr	P1381J1460	
Date	21/06/2019	.0		Engineer		JPB		-,		
Borehole Dimensions	21/00/2015		Well Installation			510	C-	round Condit	lana	
Borehole Diameter (m)			weirinstanation	Details (mbgi)			Gr	round Condit	lions	
	0.1	50	0 1m Diain airea							
Standpipe Diameter (m)	0.1			ith bentonite surrour	nd					
Length of Slotted Pipe (m)	5.0 Typ		1m - 6m slotted wit 6.0m - 25m backfill							
F (Intake Factor)	8.78		0.0111 - 25111 Dackini	eu with ansistigs						
A (Cross-sectional Area)	0.03									
A (Cross-sectional Area)	0.0.	.,,								
							St-	anding Water	Level (mbgl):	2.29
							51	anang water	Level (mogi).	2.23
	TES	Т1	т	EST 2	TES	ST 3	٦			
Elapsed time	Depth to Water	Head	Depth to Water	Head	Depth to Water	Head				
secs	mbgl	m	mbgi	m	(Dw) mbgi	(Dg) m				
0	0.65	1.64								
30	0.71	1.58								
60	0.83	1.46								
90	0.92	1.37					4		Falli	ng Head Tests
120	1.00	1.29					1.80			5
150	1.07	1.22	-				1.80			
180	1.11	1.18					-1			
210 240	1.17 1.21	1.12					1.60	1		
240	1.21	1.08					-	1		
300	1.24	1.03					1.40	++		
360	1.33	0.96								
420	1.38	0.91					1.20	<u> </u>		
480	1.42	0.87								
600	1.48	0.81					0.80 Head			
900	1.59	0.70					<u> </u>			
1200	1.67	0.62					oo ad			
1800	1.76	0.53					9 0.80 E			
2400	1.84	0.45								
3000	1.89	0.40					0.60			
3600	1.94	0.35								
							0.40			
							-1			
							0.20			
							0.00		1	
								0 500	0 1000 1	500 2000 2500 3000 3500 4000
										Time Elapsed (secs)
							4			TEST 1
							4			IE31 1
	TES		T	EST 2	TES	ST 3				
t1 (sec)	3	0								
t2 (sec)	30	00								
t2-t1 (sec)	29	70								
h1 (m)	1.5	58								
h2 (m)	0.4						1			
Permeability -k - (m/sec)	9.31	E-07								
					Remarks:					
					1 .					
					Approved By:	PSw				

			FALLING H	IEAD TEST F	ECORD					(10)	
				Ground Level				Hole Nr	BH3	CIOMAS	
Site	Kingsfield Road, Wokir	Ig		Nat Grid Co-ordin	ates			Project Nr	P1381J1460		
Date	21/06/2019	15		Engineer		JPB		Tojectini	1 130131400		
	21/06/2019			-		JAR					
Borehole Dimensions			Well Installation	Details (mbgl)				Ground Con	ditions		
Borehole Diameter (m)											
Standpipe Diameter (m)	0.1	50	0 - 1m Plain pipe w	ith bentonite surrou	nd						
Length of Slotted Pipe (m)	4.0	00	1m - 5m slotted wi	th gravel surround							
F (Intake Factor)	Тур	e D	5.0m - 25m backfil								
F (Intake Factor)	7.498	E+00									
A (Cross-sectional Area)	0.01	177									
(,											
							5	Standing Wat	ter Level (mbgl):	1.7	
								stanuing wa	ter Lever (mbgi).	1.7	
	TES			EST 2	Tr	5T 3	7				
							-				
Elapsed time	Depth to Water	Head	Depth to Water	Head	Depth to Water	Head	-				
secs	mbgl	m	mbgi	m	(Dw) mbgi	(Dg) m	_				
0	0.24	1.46					_				
30	0.62	1.08									
60	0.81	0.89					41				
90	0.97	0.73	1				1		Falli	ng Head Tests	
120	1.08	0.62								•	
150	1.17	0.53					1.60	,			
180	1.25	0.45									
210	1.32	0.38					1.40				
240	1.37	0.33					1.40	,			
270	1.42	0.28									
300	1.47	0.23					1.20) <u> </u>			
360	1.53	0.17									
420	1.58	0.12									
480	1.61	0.09					1.00)			
600	1.66	0.04					Head (mbgl)				
900	1.69	0.01					Ĕ				
1200	1.70	0.00					 P	, 1			
1800	1.70	0.00					Hei				
2400	1.70	0.00					0.60	o ↓ ↓			
3000	1.70	0.00									
3600	1.70	0.00									
							0.40) 			
							0.20				
							0.20	' \			
							0.00) ————————————————————————————————————			
								0	500 1000 1	500 2000 2500 3000 3500 4000	
										Time Elapsed (secs)	
									TEST 1	 t2/h2 (Test 2) t2/h2 (Test 3) 	
	TES	T 1	т	EST 2	TES	ST 3					
14 ()	30		-								
t1 (sec)											
t2 (sec)	36						4				
t2-t1 (sec)	33	0									
h1 (m)	1.0	08									
h2 (m)	0.1	17									
							1				
Permeability -k - (m/sec)	1.32	E-05									
							-				
					Remarks:						
1											
1					Approved By:	PSw					