

Appendix 8 – Borehole Scans

SUB SOIL SURVEYS LTD.
MANCHESTER

British Geological Survey

BOREHOLE No. **8**

Ref: _____

EXPLORATORY BORING RECORD

SITE Liverpool Docks Site Ref: 81/61

Boring Method Shell Ground Level 7.18m

Date	Depth of Casing Below G.L. (m)	Water Level Morning & Evening	Depth of Strata Below G.L.	STRATA APPROX. SCALE	No. of Samp	Type of Samp	Penetration of Sampler or Core Barrel (metres)		No. of Blow
							From	To	
17.6.81			0.1	Road Setts	1	D	1.0		
			0.4	Concrete					
			1.2	Sandstone - MADE GROUND					
				Red SANDSTONE with ash, brick, and coal, etc. - MADE GROUND	1A	X	1.35	1.65	4
			2.2		2	X	2.2	2.27	50
				Red SANDSTONE with concrete - MADE GROUND	3	D	2.8		
					4	X	3.4	3.45	50
17.6.81			4.1		5	D	3.8		
					6	X	4.35	4.65	33
17.6.81			4.65	Dense orange SAND with traces of clay - POSSIBLE MADE GROUND					
18.6.81				Orange and yellow SANDSTONE - POSSIBLE MADE GROUND or BEDROCK	7	X	5.45	5.75	40

Con

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bul				Water Level in Cased/Uncased Borehole on Completion		
Water Observed at the Following Depths * - overnight seepage	Depth of Casing when Sealed (N.B. - Not Sealed)	Estimated Seepage	Water Added at Following Depths to Assist Boring	Date	Water Level	Depth
1. 7.6	NS	Slow				
2.						
3.						
4.			DIA: OF CASING 150			
5.			m m. to depth of 4.5			
6.			m m. to depth of			

REMARKS:

1. Breaking out and excavating with compressor - 3½ hrs.
2. No initial penetration for SPT samples 2, 4 and 9

SUB SOIL SURVEYS LTD.
MANCHESTER

British Geological Survey

BOREHOLE No. **10**

Ref: _____

EXPLORATORY BORING RECORD

SITE Liverpool Docks Site Ref: 81/61

Boring Method Shell Ground Level 2.72m

Date	Depth of Casing Below G.L. (m)	Water Level Morning & Evening	Depth of Strata Below G.L.	STRATA APPROX. SCALE	No. of Samp	Type of Samp	Penetration of Sampler or Core Barrel (metres)		No. of Blows
							From	To	
1.8.81				Very soft dark grey organic very silty CLAY/clayey SILT - oily/tarry smell	1	B	1.0		
					2	B	2.0		
					3	B	3.5		
					4	B	4.5		
					5	B	6.0		
1.8.81	5.9		6.0				6.0		Cont

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk

Water Observed at the Following Depths * - overnight seepage	Depth of Casing when Sealed (N.B. - Not Sealed)	Estimated Seepage	Water Added at Following Depths to Assist Boring	Water Level in Cased/Uncased Borehole on Completion		
				Date	Water Level	Depth
1.						
2.						
3.						
4.						
5.						
6.						

DIA. OF CASING 150 m m. to depth of 9.6 m
 m m. to depth of m
 m m. to depth of m

REMARKS:

No initial penetration for
SPT sample No's 8 and 9

SUB SOIL SURVEYS LTD.
MANCHESTER

British Geological Survey

BOREHOLE No. 20

Ref: _____

EXPLORATORY BORING RECORD

SITE South Docks - Liverpool

Site Ref: 85/147

Boring Method Light Cable Percussion

Ground Level _____

Date	Depth of Casing Below G.L. (m)	Water Level Morning & Evening	Depth of Strata Below G.L.	STRATA APPROX. SCALE	No. of Samp	Type of Samp	Penetration of Sampler or Core Barrel (metres)		No. of Blows	
							From	To		
10.8.85			1.4	Ashes and peices of brick - MADE GROUND	1	D	0.5			
				Ashes, sand, stone, pieces of brick - MADE GROUND	2	X	1.65	1.95	7	
					3	B	2.0			
					4	X	3.15	3.45	7	
					5	B	3.5			
			4.5							
				5.0	Very soft grey silty sandy CLAY with sand lenses	6	X	4.65	4.95	35
			7.0		Dense brown SAND with numerous pieces of sandstone	7	B	4.8		
				8		X	6.15	6.25	50	
				9		W	6.0			
				10		B	6.5			
				11		D	6.8			
				12		B	7.3			

Contd

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk				Water Level in Cased/Uncased Borehole on Completion		
Water Observed at the Following Depths * - overnight seepage	Depth of Casing when Sealed (N.S. - Not Sealed)	Estimated Seepage	Water Added at Following Depths to Assist Boring	Date	Water Level	Depth
1. 6.0	8.0	Slow				
2.						
3.						
4.						
5.						
6.						

DIA: OF CASING 150 m m. to depth of 8.0 met
 _____ m m. to depth of _____ met
 _____ m m. to depth of _____ met

REMARKS:

Water entry at 6.0m - no rise after 20 mins
 Excavating by hand - 1 hour
 No initial penetration for SPT sample No. 15

Waiting water level rise - 20
 Time spent chseilling - 2½ ho

SUB SOIL SURVEYS LTD.
MANCHESTER

British Geological Survey

BOREHOLE No. 8

Ref: _____

EXPLORATORY BORING RECORDSITE Liverpool Docks Site Ref: 81/6Boring Method Shell Ground Level 7.18

Date	Depth of Casing Below G.L. (m)	Water Level Morning & Evening	Depth of Strata Below G.L.	STRATA APPROX. SCALE	No. of Samp	Type of Samp	Penetration of Sampler or Core Barrel (metres)		No. of Blo
							From	To	
17.6.81			0.1	Road Setts	1	D	1.0		
			0.4	Concrete					
			1.2	Sandstone - MADE GROUND					
				Red SANDSTONE with ash, brick, and coal, etc. - MADE GROUND	1A	X	1.35	1.65	
			2.2		2	X	2.2	2.27	50
				Red SANDSTONE with concrete - MADE GROUND	3	D	2.8		
					4	X	3.4	3.45	50
17.6.81			4.1		5	D	3.8		
					6	X	4.35	4.65	33
17.6.81			4.65	Dense orange SAND with traces of clay - POSSIBLE MADE GROUND					
18.6.81				Orange and yellow SANDSTONE - POSSIBLE MADE GROUND or BEDROCK	7	X	5.45	5.75	40

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bu

Water Observed at the Following Depths - overnight seepage	Depth of Casing when Sealed (N.B. - Not Sealed)	Estimated Seepage	Water Added at Following Depths to Assist Boring	Water Level in Cased/Uncased Borehole on Completion		
				Date	Water Level	Depth
1. 7.6	NS	Slow				
2.						
3.						
4.			DIA: OF CASING 150	m m. to depth of	4.5	m
5.				m m. to depth of		m
6.				m m. to depth of		m

REMARKS:

1. Breaking out and excavating with compressor - 3½ hrs.
2. No initial penetration for SPT samples 2, 4 and 9

British Geological Survey

**SUB SOIL SURVEYS LTD.
MANCHESTER**

British Geological Survey

 BOREHOLE No. 8A

Ref: _____

EXPLORATORY BORING RECORD

SITE Liverpool DocksSite Ref: 81/6Boring Method ShellGround Level 7.15

Date	Depth of Casing Below G.L. (m)	Water Level Morning & Evening	Depth of Strata Below G.L.	STRATA APPROX. SCALE	No. of Samp	Type of Samp	Penetration of Sampler or Core Barrel (metres)		No. of Blow
							From	To	
9.7.81			0.2	Road Setts	1	D	0.5		
			0.4	Concrete					
				Sand, brick, ash and wood, etc. MADE GROUND					
					2	X	1.5	1.52	50
					3	D	1.6		
			2.5						
				Compact brown, yellow and black SAND with traces of wood - POSSIBLE MADE OR DISTURBED GROUND	4	X	2.65	2.95	27
			3.0						
				Very dense dark grey and brown SAND with lenses of silty clay and sandstone fragments	5	X	3.75	4.05	90
					6	X	5.15	5.45	144

Cor

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bu

Water Observed at the Following Depths * - overnight seepage	Depth of Casing when Sealed (N.B. - Not Sealed)	Estimated Seepage	Water Added at Following Depths to Assist Boring	Water Level in Cased/Uncased Borehole on Completion		
				Date	Water Level	Depth
1. NONE						
2.						
3.						
4.						
5.						
6.						

DIA: OF CASING 150 m m. to depth of 6.2 m

_____ m m. to depth of _____ m

_____ m m. to depth of _____ m

REMARKS:

No initial penetration for SPT samples 2 and 3

British Geological Survey

British Geological Survey

British Geological Survey

TRIAL PIT RECORDS

STRATA SURVEYS LTD.,

HOLMES CHAPEL ROAD,
MIDDLEWICH, CHESHIRE.

Telephone: Middlewich (STD 0606 84) 4637

British Geological Survey

British Geological Survey

Job No: 3488Location: QUEENS AVENUE, SOUTH DOCKS, LIVERPOOL.Scale 1:50Client: MERSEYSIDE DEVELOPMENT CORPORATION.T.P. No. 2

Description of Strata

Ground Level

Reduced Level

Legend

Thick-
ness

Depth

Samples

from

to

Type

NMC

Apparent
Cohesion
kN/m²

φ degrees

Daily Progress
Water Levels
Remarks

TARMAC.

COBBLE SETS.

CONCRETE.

BRICK RUBBLE AND SAND FILL.

MEDIUM DENSE, BROWN, FINE
TO MEDIUM SAND WITH GRAVEL
AND COBBLES OF SANDSTONE
AND OCCASIONAL BRICK.

British Geological Survey

MADE GROUND.

British Geological Survey

British Geological Survey

3/11/86

TRIAL PIT REMAINS
DRY AND STABLE.

British Geological Survey

TRIAL PIT COMPLETE AT 3.50M.

British Geological Survey

British Geological Survey

1 HR BREAKING
OUT OBSTRUCTIONST.P. No. 3

Description of Strata

Ground Level

Reduced Level

Legend

Thick-
ness

Depth

Samples

from

to

Type

NMC

Apparent
Cohesion
kN/m²

φ degrees

Daily Progress
Water Levels
Remarks

TARMAC

COBBLE SETS

CONCRETE

LOOSE, GREY/BROWN, SOILY
SAND WITH GRAVEL & COBBLES
OF SANDSTONE. MADE GROUND.

LARGE SANDSTONE BLOCKS.

UNABLE TO EXCAVATE BELOW 1.30M.

TRIAL PIT ABANDONED.

SKETCH PLAN.

BRICK WALL

SANDSTONE
BLOCKS.BRICK
WALL.N
↑

British Geological Survey

British Geological Survey

3/11/86

TRIAL PIT REMAINS
DRY.
UNSTABLE.

1 HOUR BREAKING
OUT OBSTRUCTIONS

British Geological Survey

U - undisturbed D - disturbed B - bulk W - groundwater P - standard penetration CP - cone penetration V - vane test

British Geological Survey

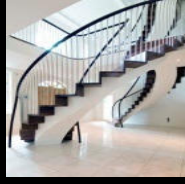
British Geological Survey

British Geological Survey

BOREHOLE RECORD SHEET

STRATA SURVEYS LTD., HOLMES CHAPEL ROAD. MIDDLEWICH, CHESHIRE. Telephone: Middlewich (STD 0606 84) 4637											BORE No. Q6	
Job No.: <u>2900</u> Location: <u>QUEENS DOCK AQUARIUM, LIVERPOOL</u>											Sheet 1	
Client: <u>MERSEYSIDE DEVELOPMENT CORPORATION.</u>											Scale: 1:1 Diam. & B 150mm	
Description of Strata	Reduced Level	Legend	Thick- ness (m)	Depth (m)	Samples			N Value	Apparent Cohesion kN/m ²	D degrees	Daily Water Rer	
					from	to	Type					
Ground Level	2.10											
Very soft, black, very clayey, slightly sandy SILT.		X X X X X X X X X X X X X X X		8.70	8.70 (D.B.)		D ₁				(7/2)	
	1.10	X X X X X X X X X	1.00	9.70	9.20	9.65	P				Move on	
Red, fresh SANDSTONE.	0.80	· · · · ·	(6.30)	10.00	9.70	9.80	P ₂	50			Chiselling 1000m =	
Borehole complete at 10.00m											D.B. = Doc	
											D.B. was	
											below	
											in dock	

Appendix 9 – Flood Risk Assessment Extract



Exhibition Centre Liverpool, Queens Wharf, Liverpool

Flood Risk Assessment

project number: 2593

date: 22.02.2013

revision: 2

scott hughes design

the flint glass works

64 jersey street

manchester

m4 6jw

Document Control Sheet

Client: ISG Construction Ltd

Project No.: 2593

Project Title: Exhibition Centre Liverpool, Queens Wharf, Liverpool

Report Title: Flood Risk Assessment

Version: 1

Status: Final

Control Date: 22nd February 2013

Document Revision Record:

Version	Status	Author	Approved	Date
1	Draft	Paul Graveney	Ian Scott	23/01/13
1	Final	Paul Graveney	Ian Scott	22/03/13

Document Distribution Record:

Version	Organisation	Quantity
1	ISG / BK / DCM	1
1	ISG / BK / DCM / TY / AMEC	1

This Flood Risk Assessment report is the property of Scott Hughes Design and is confidential to the client designated in the report. Whilst it may be shown to their professional advisers, the contents are not to be disclosed to, or made use of, by any third party, without our express written consent. Without such consent we can accept no responsibility to any third party.

Scott Hughes Design certify that they have carried out the work contained herein with due skill, care and diligence to their best belief and knowledge based on the time and information available.

This report is made on behalf of Scott Hughes Design. By receiving it and acting on it, the client – or any third party relying on it – accepts that no individual is personally liable in contract, tort or breach of statutory duty or otherwise (including negligence).

Scott Hughes Design

6.0 Outline Drainage Strategy

6.1 Overview

- 6.1.1 As part of this study, United Utilities (UU) as the sewage undertaker for the district, the Environment Agency and Liverpool City Council have been consulted.

6.2 External Consultation

6.2.1 United Utilities

As discussed in Section 3, the UU sewer records have been reviewed and confirm that there are foul and surface water sewers within Kings Parade to the west of the site. Both foul and surface water private drains pass within and adjacent the development site and outfall to the respective public sewers. UU have confirmed (refer to section 2.6) that a free discharge of foul and surface water will be acceptable in principle.

6.2.2 Environment Agency

The Environment Agency (EA) has been consulted. They have confirmed that a free discharge to the public sewer is acceptable if UU agree. Testing would need to be carried out to consider flood impact for the 30yr and 100yr events. Any flooding that does occur should be retained on the site and directed away from buildings.

6.2.3 Liverpool City Council

Contact was made with Liverpool Council. However SHD were advised that the engineer who carried out the design of the drainage around the area had left and that all the information was now archived.

6.3 Existing Surface Water Runoff

- 6.3.1 The existing site was historically a number of docks with peripheral quay sides and warehousing. Over time these have been infilled to form the current tarmac parking areas. Therefore in terms of runoff characteristics the site can be considered as 'Brownfield'.
- 6.3.2 No specific runoff rates have been defined due to the number of connections from the existing site. However drawing 2593-FRA-001 in Appendix E clearly indicates the extent of the existing drainage, the impermeable areas and the connections from the site to the surrounding drainage infrastructure. The site is approximately 84% impermeable.

6.4 Outline Surface Water Drainage Strategy

- 6.4.1 The post development impermeable area footprint will increase from 84% to 88%. However, as noted in section 2.6 and 6.2, discussions with UU and the EA have confirmed that post development a free discharge of surface water flows to the surrounding drains that ultimately outfall into the public sewer and then immediately down stream to the Mersey Estuary is acceptable.
- 6.4.2 The general principal of the surface water drainage strategy is to collect the runoff from the roof and external pedestrian and yard areas, and direct to a series of new below ground surface water drainage networks connecting to the existing large diameter stubs that then pass out of the site. The exact drainage layout and position of the final connections will be confirmed as part of the detailed design.
- 6.4.3 The future private drainage layout for the new development site will be designed in accordance with BS EN 752: 2008 and Building Regulations part H guidance and if necessary in line with Sewers for Adoption (current edition). In both cases this is to provide no flooding up to the 30 year storm return period criterion.
- 6.4.4 Flooding can occur on a local scale beyond the 30yr criterion due to runoff exceeding the capacity of the minor system during extreme events and it can only be addressed on a site specific basis. Sewers for Adoption (SfA) 7th Edition (WRc, 2006) states that properties should be protected against flooding from extreme events (1 in 30 year) and that flood pathways are identified when the drainage system is exceeded.
- 6.4.5 In the case of this development, exceedance flows will be all those over and above the 30 year design criterion set by Building Regulations and SfA guidance. Using above ground storage within the lower lying eastern external yard areas would be achievable and would direct flood water away from the new building with flows directed back into the surface water drainage network as the water levels in the drainage networks recede. As connection is ultimately to the public sewer, exceedance flooding of these could occur in parallel with the drainage from the development site. However, as the external Kings Parade holds a lower ground level any flooding would occur at this location and not within the development site. During the detailed drainage design of the development, consideration will also be made to a surcharged outfall from a high tide scenario.
- 6.4.6 All future drainage calculations carried out for the development layouts themselves must include the appropriate increase in rainfall to satisfy the future Climate change allowances.

6.5 Pollution Control

- 6.5.1 Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps, french drains with silt traps or by the use of Sustainable Drainage techniques. If appropriate, oil separators in line with Pollution Prevention Guidance 3 criteria will be provided.