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QTS Environmental Ltd
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QTS Environmental Report No: 16-50918

Site Reference:	Stag Brewery, Lower Richmond Road, Mortlake, London
Project / Job Ref:	10022/JW
Order No:	None Supplied
Sample Receipt Date:	26/10/2016
Sample Scheduled Date:	26/10/2016
Report Issue Number:	1
Reporting Date:	01/11/2016

Authorised by:

Russell Jarvis
Associate Director of Client Services

Authorised by:

Ela Mysiara
Inorganics & ICP Section Head

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4480

Soil Analysis Certificate						
QTS Environmental Report No: 16-50918	**Date Sampled**	15/10/16	15/10/16	15/10/16	15/10/16	15/10/16
Soil Consultants Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stag Brewery, Lower Richmond Road, Mortlake, London	**TP / BH No**	WS2	WS4	WS9A	WS10A	BH1
Project / Job Ref: 10022/JW	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	**Depth (m)**	2.00	4.70	3.90	4.50	1.55
Reporting Date: 01/11/2016	**QTSE Sample No**	235212	235213	235214	235215	235216

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	8.6	7.4	7.7	8.3	8.2
Total Sulphate as SO_4	mg/kg	< 200	NONE	< 200	< 200	1002	856	206
Total Sulphate as SO_4	%	< 0.02	NONE	< 0.02	< 0.02	0.10	0.09	0.02
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	23	< 10	166	161	26
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.02	< 0.01	0.17	0.16	0.03
Total Sulphur	%	< 0.02	NONE	< 0.02	< 0.02	1.19	0.42	0.02

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C
Analysis carried out on the dried sample is corrected for the stone content
Subcontracted analysis $^{(S)}$

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Soil Analysis Certificate						
QTS Environmental Report No: 16-50918	**Date Sampled**	15/10/16	15/10/16	15/10/16	15/10/16	15/10/16
Soil Consultants Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stag Brewery, Lower Richmond Road, Mortlake, London	**TP / BH No**	BH1	BH1	BH2B	BH2B	BH2B
Project / Job Ref: 10022/JW	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	**Depth (m)**	6.55	12.55	17.05	23.05	29.55
Reporting Date: 01/11/2016	**QTSE Sample No**	235217	235218	235219	235220	235221

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	8.1	8.8	9.1	8.9	9.3
Total Sulphate as SO_4	mg/kg	< 200	NONE	971	1737	952	685	670
Total Sulphate as SO_4	%	< 0.02	NONE	0.10	0.17	0.10	0.07	0.07
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	197	251	178	105	90
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.20	0.25	0.18	0.11	0.09
Total Sulphur	%	< 0.02	NONE	0.57	2.56	0.63	0.72	0.61

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C
Analysis carried out on the dried sample is corrected for the stone content
Subcontracted analysis $^{(S)}$

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Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 16-50918	
Soil Consultants Ltd	
Site Reference: Stag Brewery, Lower Richmond Road, Mortlake, London	
Project / Job Ref: 10022/JW	
Order No: None Supplied	
Reporting Date: 01/11/2016	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
$ 235212	WS2	None Supplied	2.00	7.1	Light brown sand
$ 235213	WS4	None Supplied	4.70	12.4	Light brown sand
$ 235214	WS9A	None Supplied	3.90	21.9	Brown clay
$ 235215	WS10A	None Supplied	4.50	21.7	Brown clay
$ 235216	BH1	None Supplied	1.55	8.5	Light brown sandy clay with stones
$ 235217	BH1	None Supplied	6.55	19.1	Brown clay
$ 235218	BH1	None Supplied	12.55	16.1	Light grey clay
$ 235219	BH2B	None Supplied	17.05	17	Brown clay
$ 235220	BH2B	None Supplied	23.05	16.7	Brown clay
$ 235221	BH2B	None Supplied	29.55	16.9	Brown clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

$ samples exceeded recommended holding times

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Soil Analysis Certificate - Methodology & Miscellaneous Information

QTS Environmental Report No: 16-50918

Soil Consultants Ltd

Site Reference: Stag Brewery, Lower Richmond Road, Mortlake, London

Project / Job Ref: 10022/JW

Order No: None Supplied

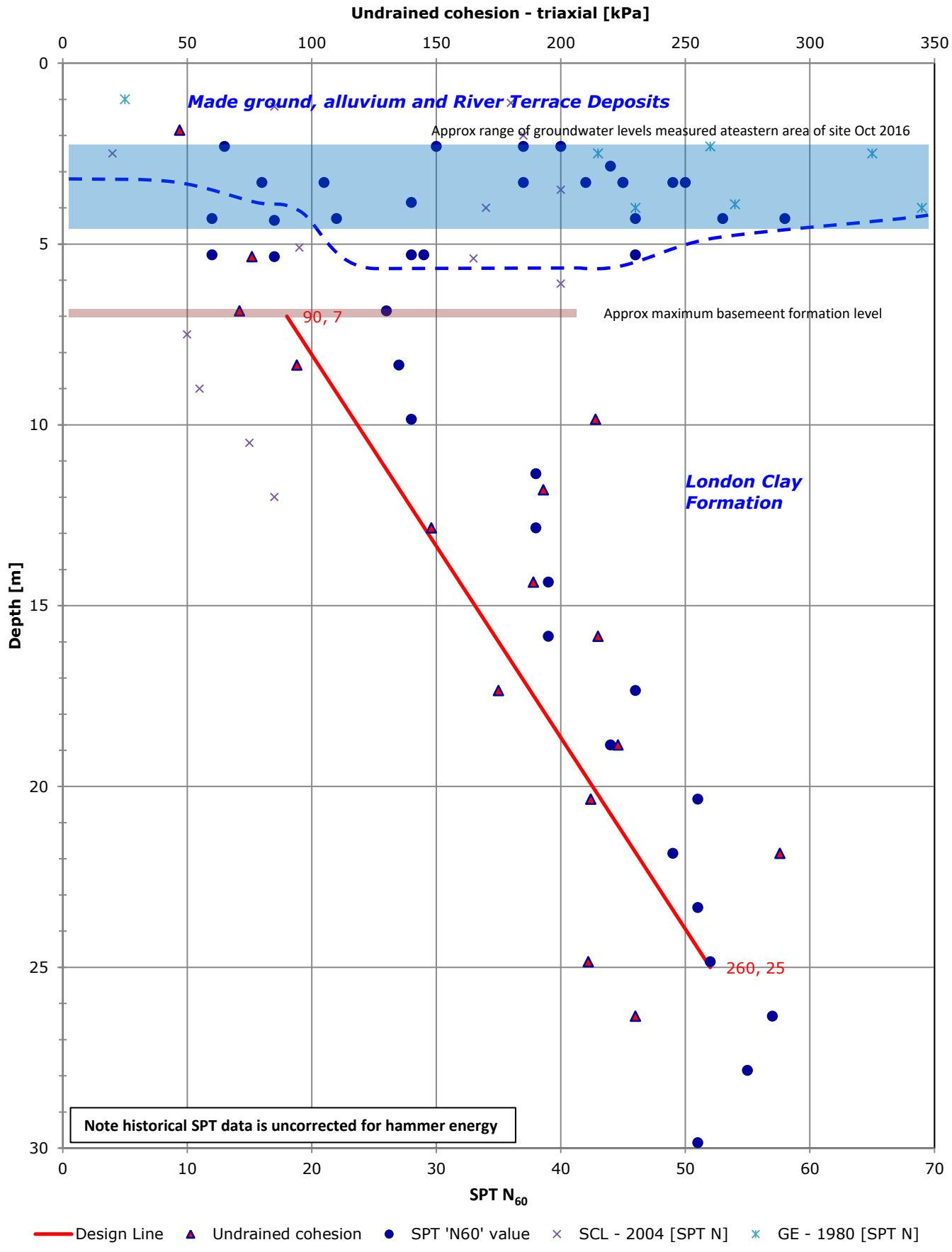
Reporting Date: 01/11/2016

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Site & Location	**Stag Brewery, Lower Richmond Road, Mortlake, London SW14 7ET**	Report No:	**10022/OT**

Undrained cohesion and SPT [N60] vs depth



Design Line Δcu = 9.44kPa/m

Note: this plot may incorporate extrapolated results, generally where 'N' >50 - these are indicative only and should be used with caution

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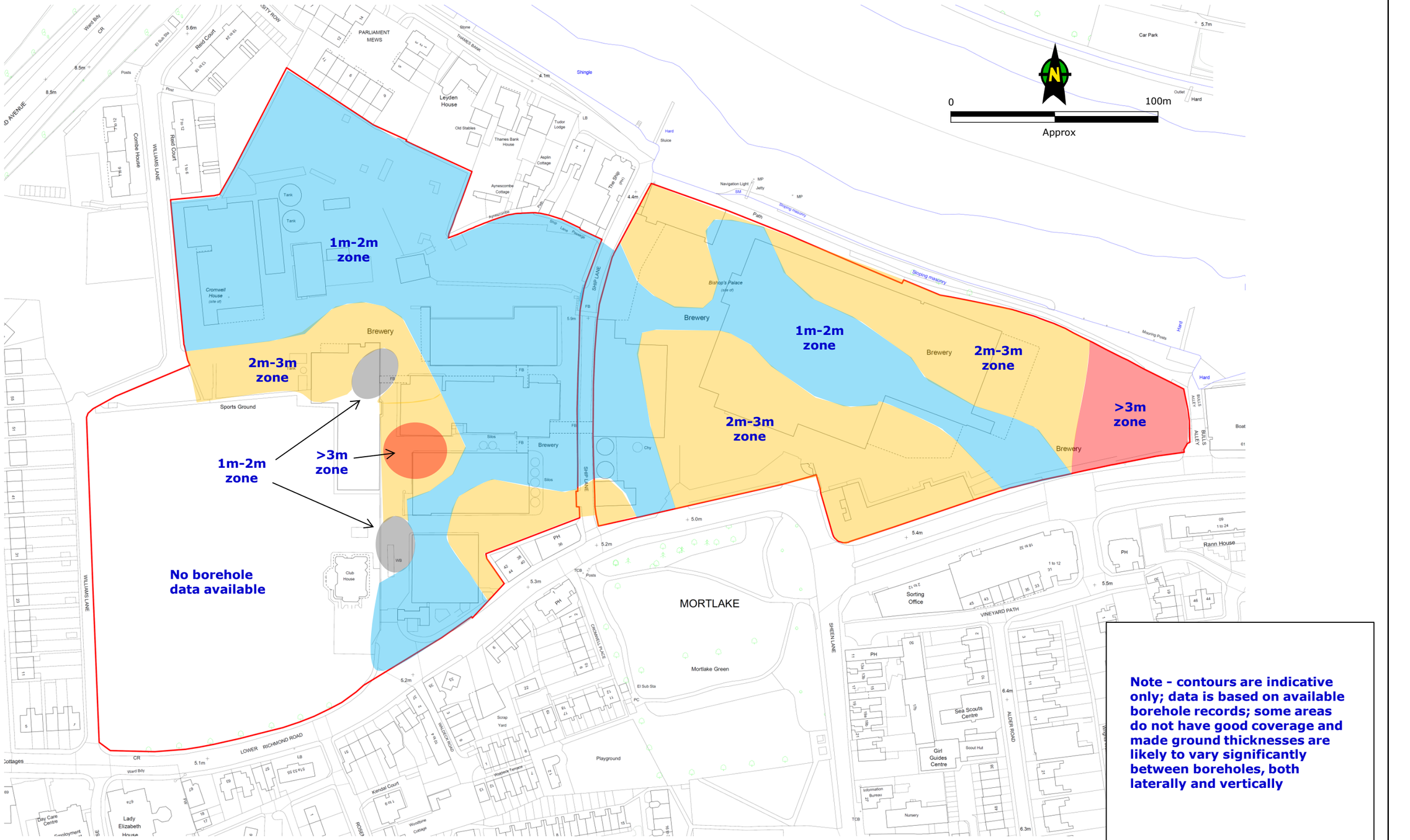
Site Location	Stag Brewery, Lower Richmond Road, Mortlake, London SW14 7ET	Report No: 10022/OT

Depth to top - River Terrace Deposits



Note - contours are indicative only; data is based on available borehole records; some areas do not have good coverage and made ground thicknesses are likely to vary significantly between boreholes, both laterally and vertically

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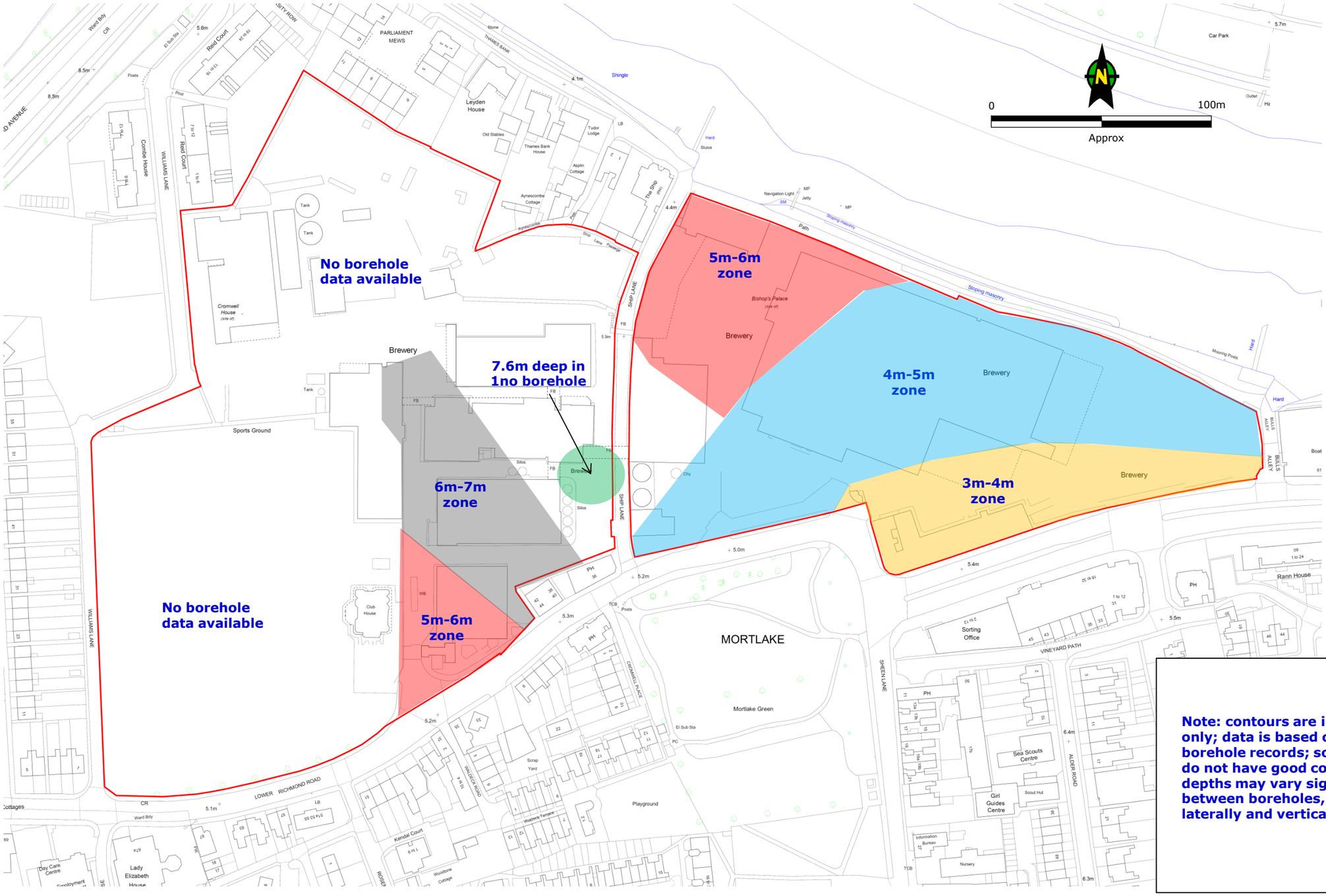
Site Location	Stag Brewery, Lower Richmond Road, Mortlake, London SW14 7ET	Report No: 10022/OT

Depth to top – London Clay Formation



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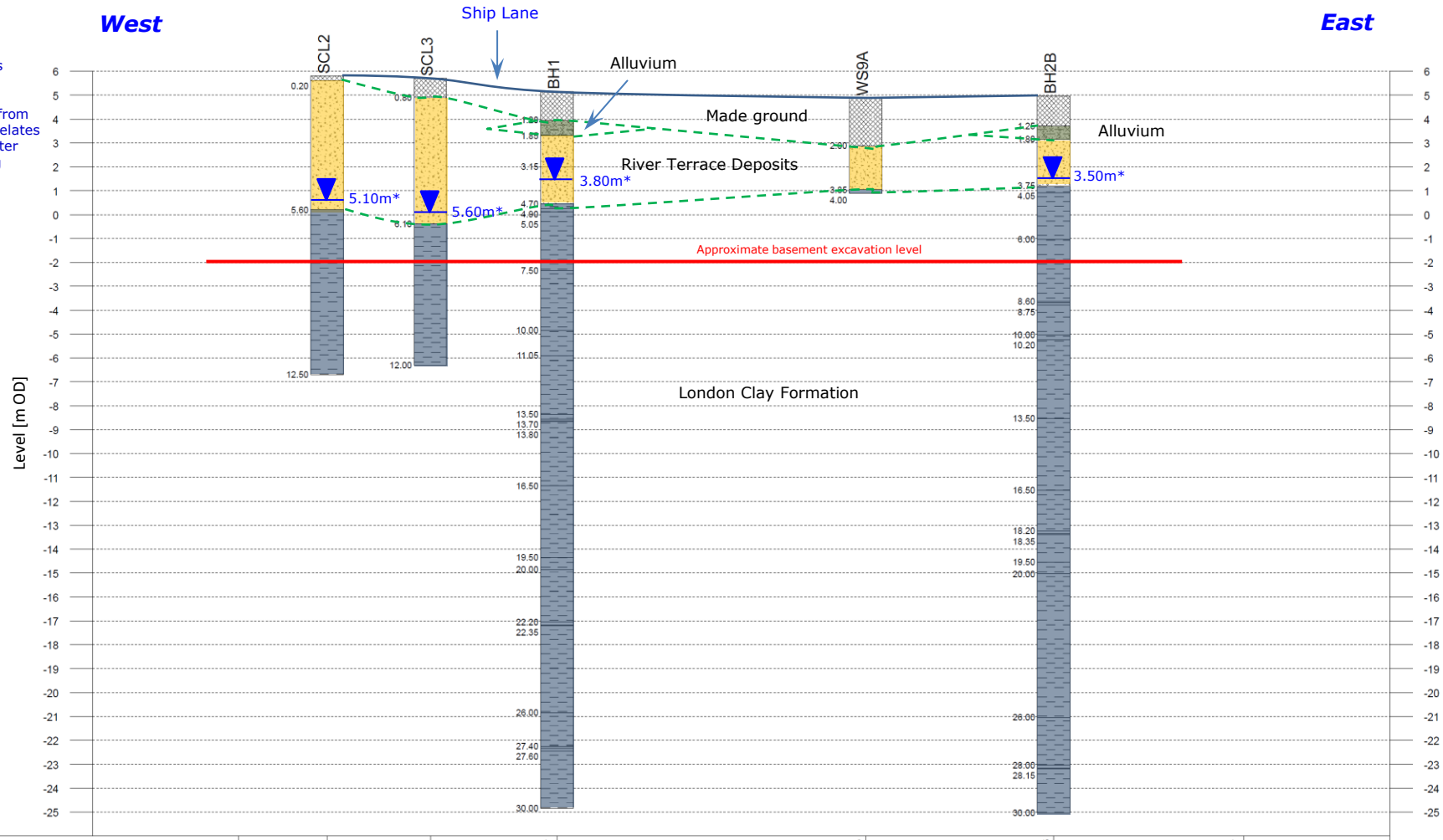
Project Id: 10022/OT
Project Title: Stag Brewery,
Location: Lower Richmond Road, Mortlake, London SW14 7ET
Client: Reselton Properties Ltd

Section AA

Soil Consultants

Notes:

* Groundwater levels shown are highest recorded at time of writing; information from historical boreholes relates to information on water strikes during drilling



Chainage (m)	0.00	38.42	83.28	138.27	272.35	353.96	436.57
Offset (m)		1.91	6.04	2.48	3.71	4.81	
Elevation (mAOD)		5.80	5.70	5.15	4.89	4.96	

STRATA BOUNDARIES BEETWEEN BOREHOLES INDICATIVE ONLY; VARIATIONS BETWEEN BOREHOLES SHOULD BE ANTICIPATED

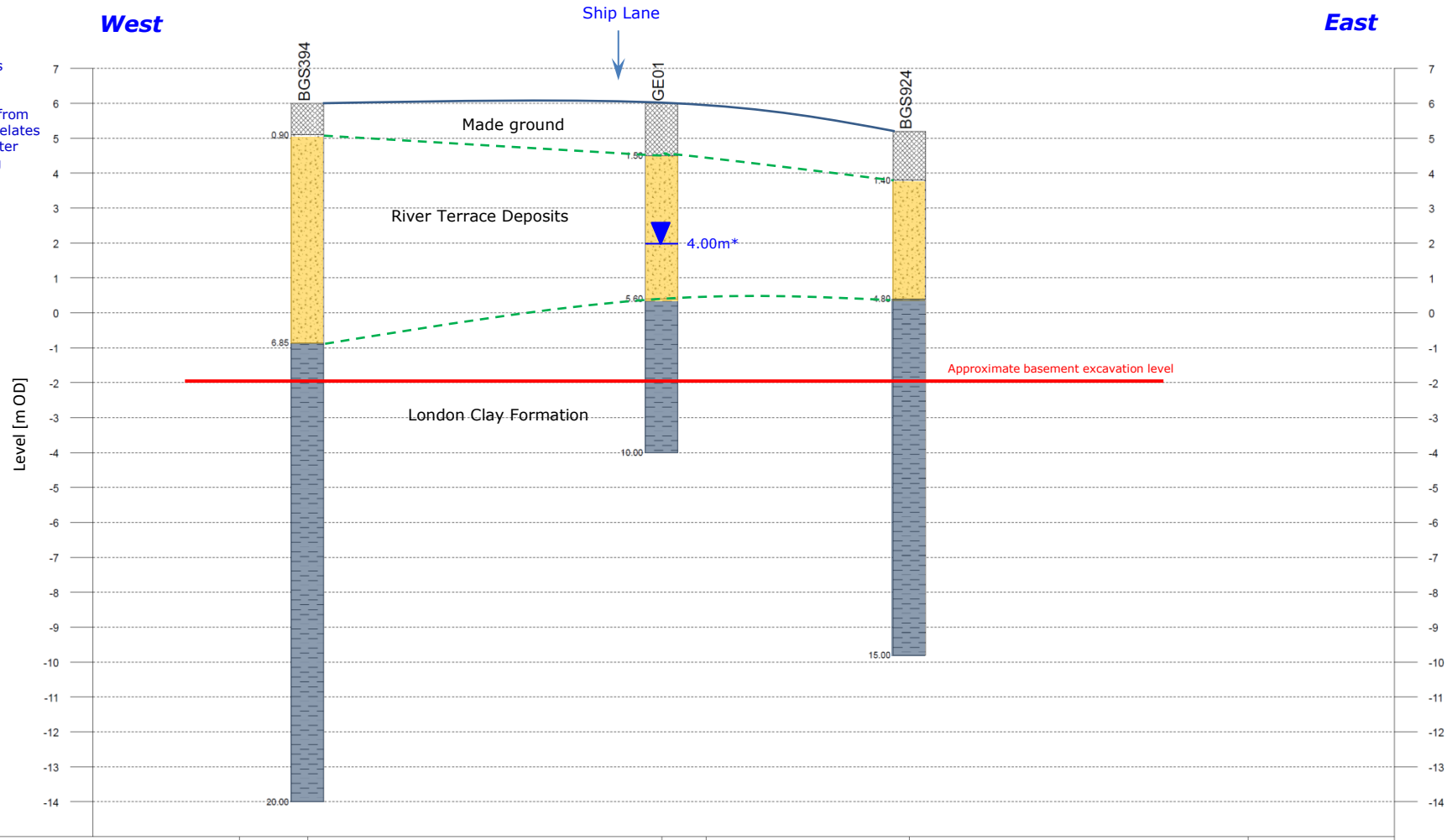
Project Id: 10022/OT
Project Title: Stag Brewery,
Location: Lower Richmond Road, Mortlake, London SW14 7ET
Client: Reselton Properties Ltd

Section BB

Soil Consultants

Notes:

* Groundwater levels shown are highest recorded at time of writing; information from historical boreholes relates to information on water strikes during drilling



-15.00

Chainage (m)	0.00	23.46		145.63	161.05		231.07		347.94			
Offset (m)	3.63			12.41	4.39		10.13					
Elevation (mAOD)	6.00			6.00	6.08		5.20					

NOTES:

DO NOT SCALE FROM THIS DRAWING. ALL DIMENSIONS TO BE CHECKED ON SITE. ALL OMISSIONS AND DISCREPANCIES TO BE REPORTED TO THE ARCHITECT IMMEDIATELY.

- + 5.10m
- + 6.03m
- + 6.33m
- + 7.03m
- ramped area
- stepped area

Revision description	Date	Check	Rev

SQUIRE & PARTNERS

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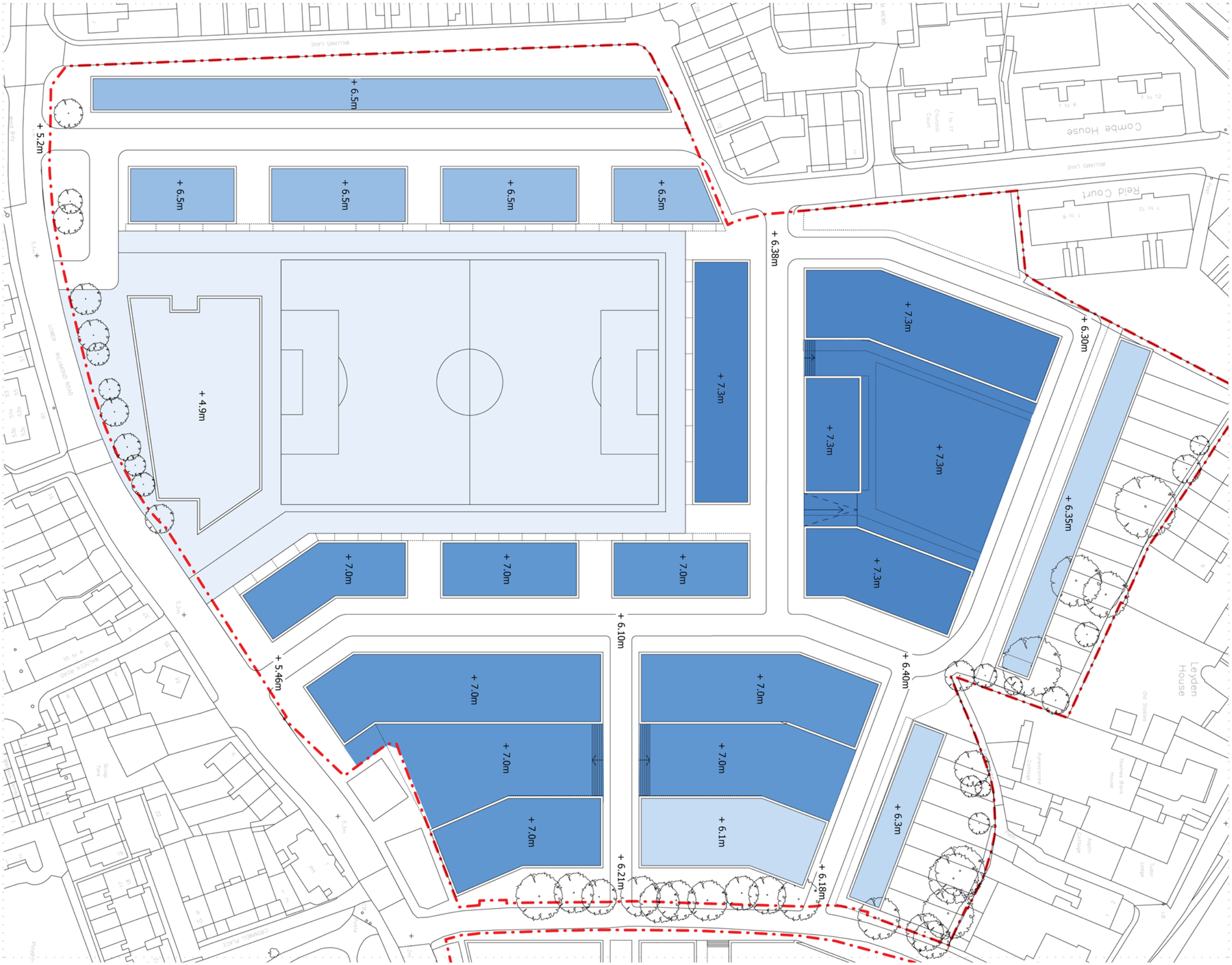
Project
Stag Brewery
Richmond

Drawing
Levels

Drawn	Date	Scale
JDa	08/16/16	1 : 500 @ A1 @ A3

Job Number	Drawing number	Revision
16019	G100_P_L	



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Revision description	Date	Check	Rev

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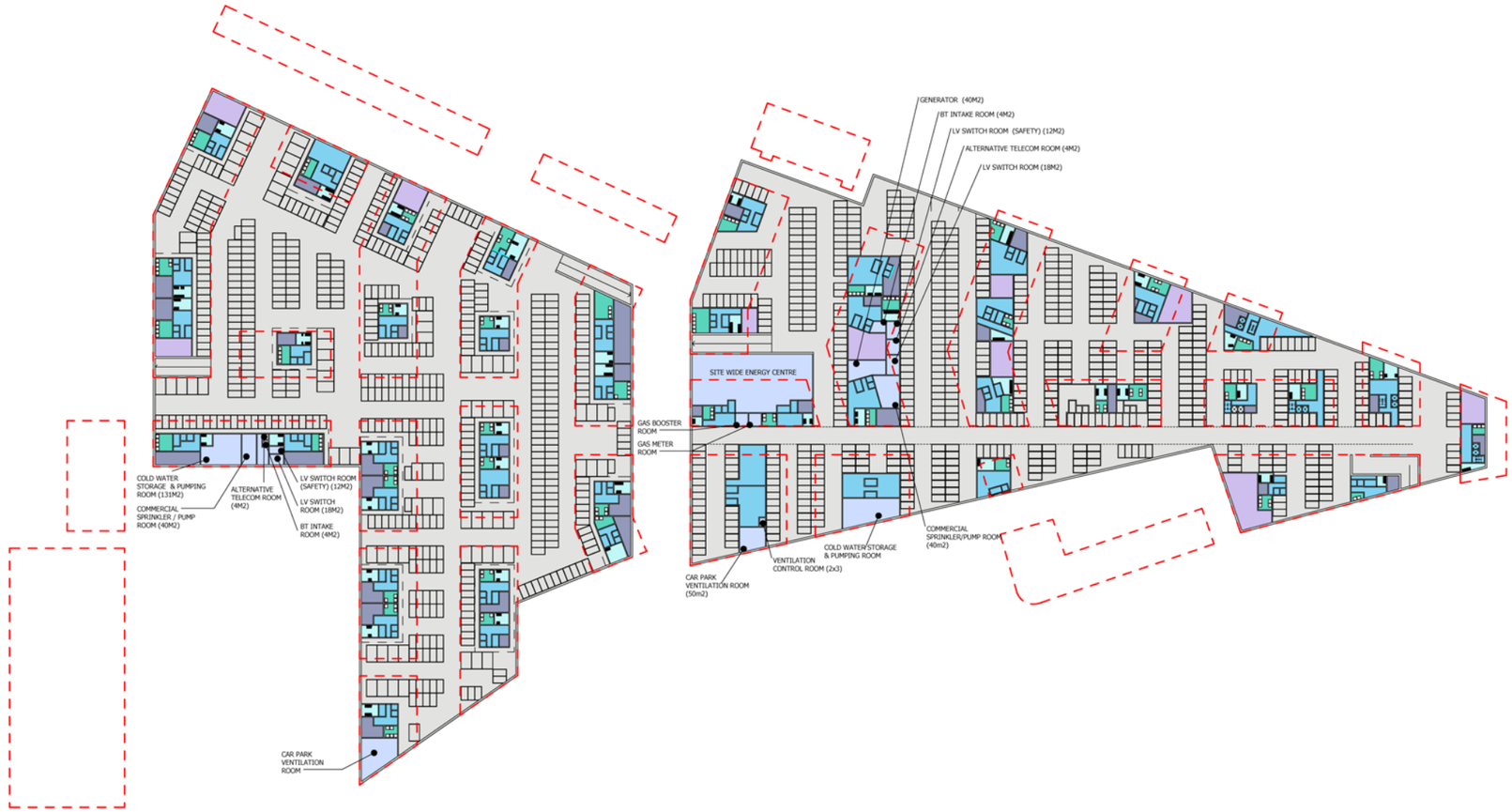
Project
Stag Brewery
Richmond

Drawing
Levels Phase 02

Drawn	Date	Scale
RKL	08/16/16	1 : 500 @ A1 @ A3

Job Number	Drawing number	Revision
16019	G100_P_L_02	



NOTES:

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- Car Parking
- Bike Store
- Core
- Refuse Store
- Store
- Allocated Plant Space
- Un-allocated Space

Phase 1a

451 units

600 parking spaces

361 required to meet 80% of units

Phase 2

521 units

576 parking spaces

417 required to meet 80% of units

Revision description	Date	Check	Rev

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Project

Stag Brewery
Richmond

Drawing

Basement Plan

Drawn	Date	Scale
RKL	10/13/16	1 : 1000 @ A1 1 : 2000 @ A3
Job Number	Drawing number	Revision
16019	G100_P_B_001	

NOTES:

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- 1 Bed
- 2 Bed
- 3 Bed
- 4 Bed
- House
- Hotel
- Residential Lobby
- Retail/Restaurant
- Office
- Cinema/Gym
- Community
- School
- Health Centre

Revision description	Date	Check	Rev

SQUIRE & PARTNERS

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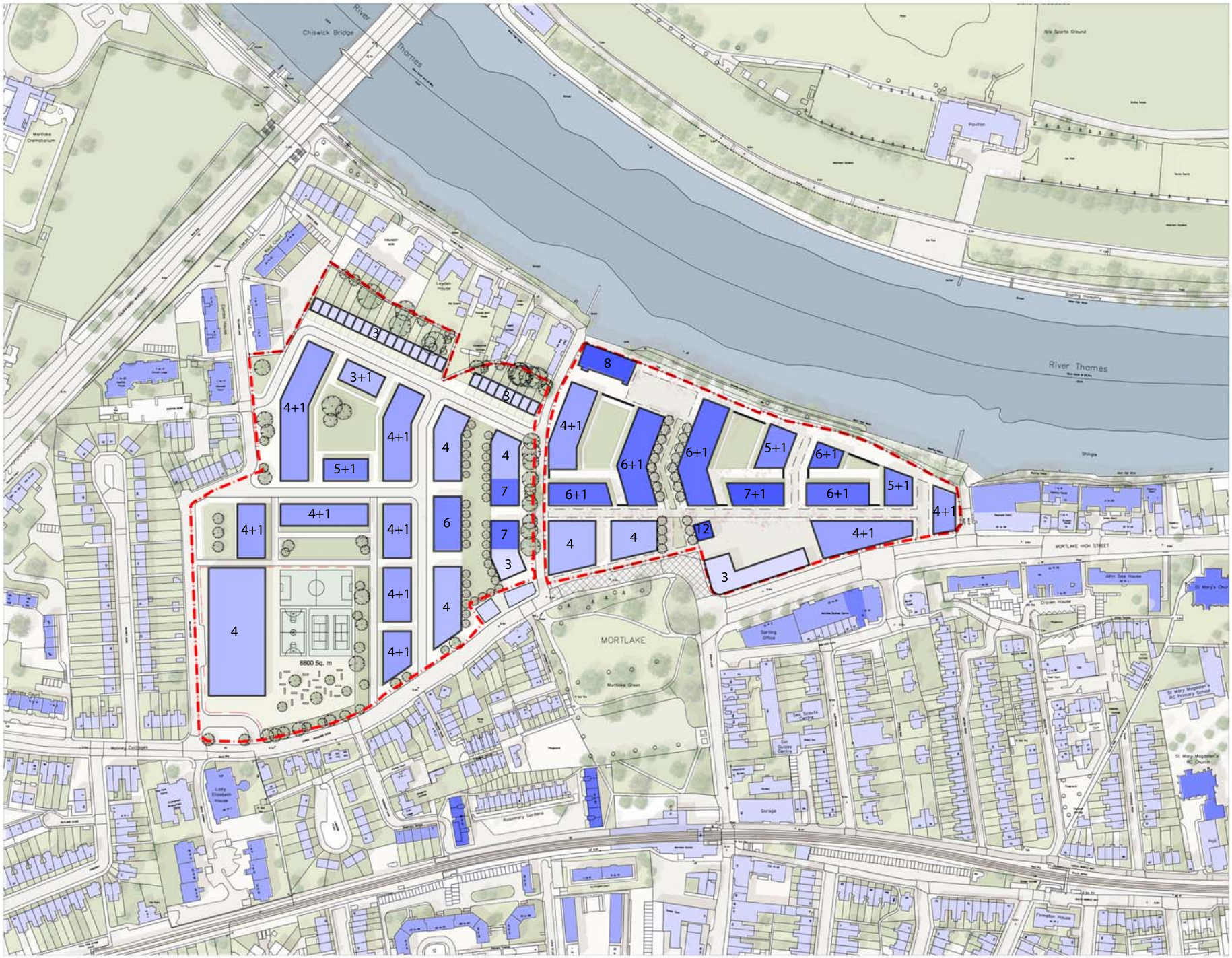
Project
Stag Brewery
Richmond

Drawing
Site plan
Ground

Drawn	Date	Scale
JB	06/08/16	1 : 1250 @ A1 1 : 2500 @ A3

Job Number	Drawing number	Revision
16019	G100_P_00_001	



NOTES:

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Revision description	Date	Check	Rev

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info@squireandpartners.com
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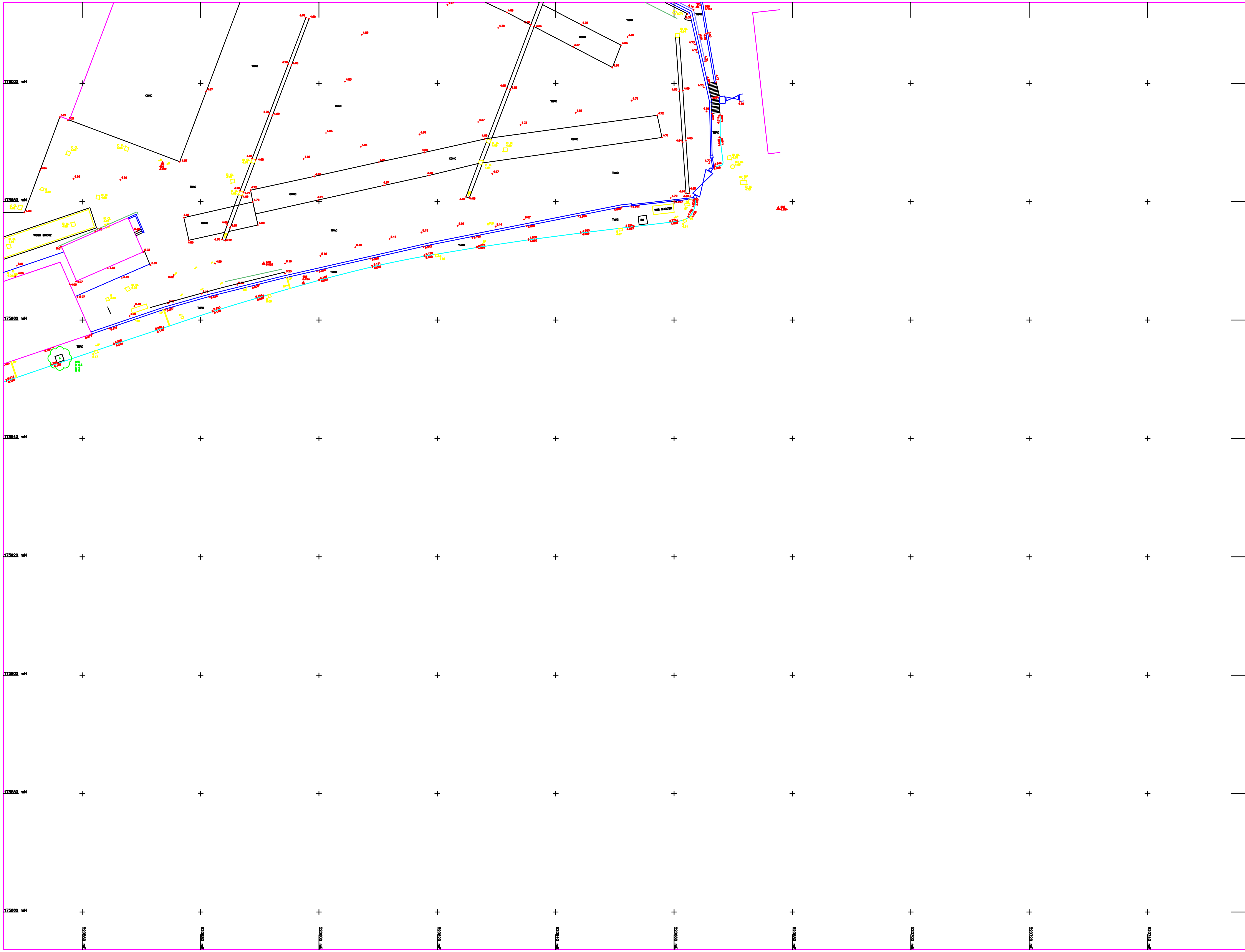
Project
The Stag Brewery
Lower Richmond Road
London, SW14 7ET

Drawing
Ground Floor Plan

Drawn	Date	Scale
RKL	04/10/16	1: 1250@A1 1: 2500@A3
Job number	Drawing number	Revision
16019	G100_P_00_002	-



ABBREVIATIONS

AB	Air Brick	DH	Duct Height	PRF	Post & Rail Fence
B	Bollard or Bottom Height	DP	Down Pipe	PWF	Post & Wire Fence
BB	Belisha Beacon	ECB	Electricity Control Box	R	Render
BD	Back Drop	ELEC	Electricity	RAD	Radiator
BH	Borehole or Beam Height	EP	Electricity Pole	RE	Rodding Eye
BL	Bed Level	FB	Flower Bed	RG	Rough Ground
BP	Brick Pavior	FH	Fire Hydrant	RS	Road Sign
BRW	Brick Retaining Wall	FL	Floor Level	RSJ	Rolled Steel Joist
BS	Bus Stop	G	Gully	RWP	Rain Water Pipe
BT	British Telecom	GV	Gas Valve	S	Spread or Stone
BTCB	BT Control Box	H	Height in Metres	SC	Stop Cock
BW	Brick Wall	H	Window Head Height	SL	Soffit Level or Skylight
BWF	Barbed Wire Fence	HT	Height	SP	Arch Springer Height
C	Window Cill Height	IC	Inspection Cover	SPS	Stone Paving Slabs
CB	Control Box	IL	Invert Level	SW	Stone Wall
CBF	Close Boarded Fence	IRF	Iron Railing Fence	TCSU	Traffic Control
CBW	Concrete Block Wall	IWF	Interwoven Fence	T	Top Heights
CCB	Cable TV Control Box	KO	Kerb Outlet	TL	Traffic Light
CIF	Corrugated Iron Fence	L	Light	TP	Telephone Pole
CL	Cover Level	LP	Lamp Post	TPS	Tactile Paving Slabs
CLF	Chain Link Fence	MH	Manhole	UTL	Unable To Lift
CLSF	Chain Link Security Fence	MKR	Marker	V	Vent
CPF	Concrete Panel Fence	OV	Over Flow Pipe	VP	Vent Pipe
CPS	Concrete Paving Slabs	O/H	Overhead	W	Window
CR	Arch Crown Height	P	Post	WL	Water Level
CRW	Concrete Retaining Wall	PALF	Palisade Fence	WM	Water Meter
CSU	Ceiling Slopes Up	PF	Picket Fence	WMF	Wire Mesh Fence
CTV	Cable Television	PIT	Trial Pit	WPF	Wooden Panel Fence
CW	Concrete Wall	PL	Pavement Light	WV	Water Valve
D	Diameter or Doors	PM	Parking Meter	ø	Diameter

Top / Bottom — Banks
Drop Kerbs
Overhead Detail
Change in Elevation
Fences
Overhead Cables
Change in Surface
Edge of Vegetation
3.28 — Floor to Ceiling Height
3.28 F — False Ceiling Height
Gate
Survey Station
Foul Water Sewer
Surface Water Sewer
Combined Sewer

LEVEL NOTE.

ALL CO-ORDINATES RELATE TO THE ORDNANCE SURVEY GRID AND DATUM VIA GPS OBSERVATIONS.

COORDINATE SCHEDULE

STN.	EASTINGS	NORTHINGS	LEVEL
201	520279.981	175984.234	5.843
202	520321.005	175988.056	5.345
203	520360.387	175941.525	5.298
204	520368.464	175957.753	5.546
205	520368.096	176012.623	6.280
206	520379.989	176056.686	5.986
208	520351.138	176070.282	6.096
209	520303.983	176070.610	6.145
210	520287.205	176089.537	6.389
211	520259.686	176115.078	6.372
212	520218.785	176134.053	6.143
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Client
GERALD EVE LLP

Dwg. Title
LAND SURVEY

Project Title
STAG BREWERY,
MORTLAKE

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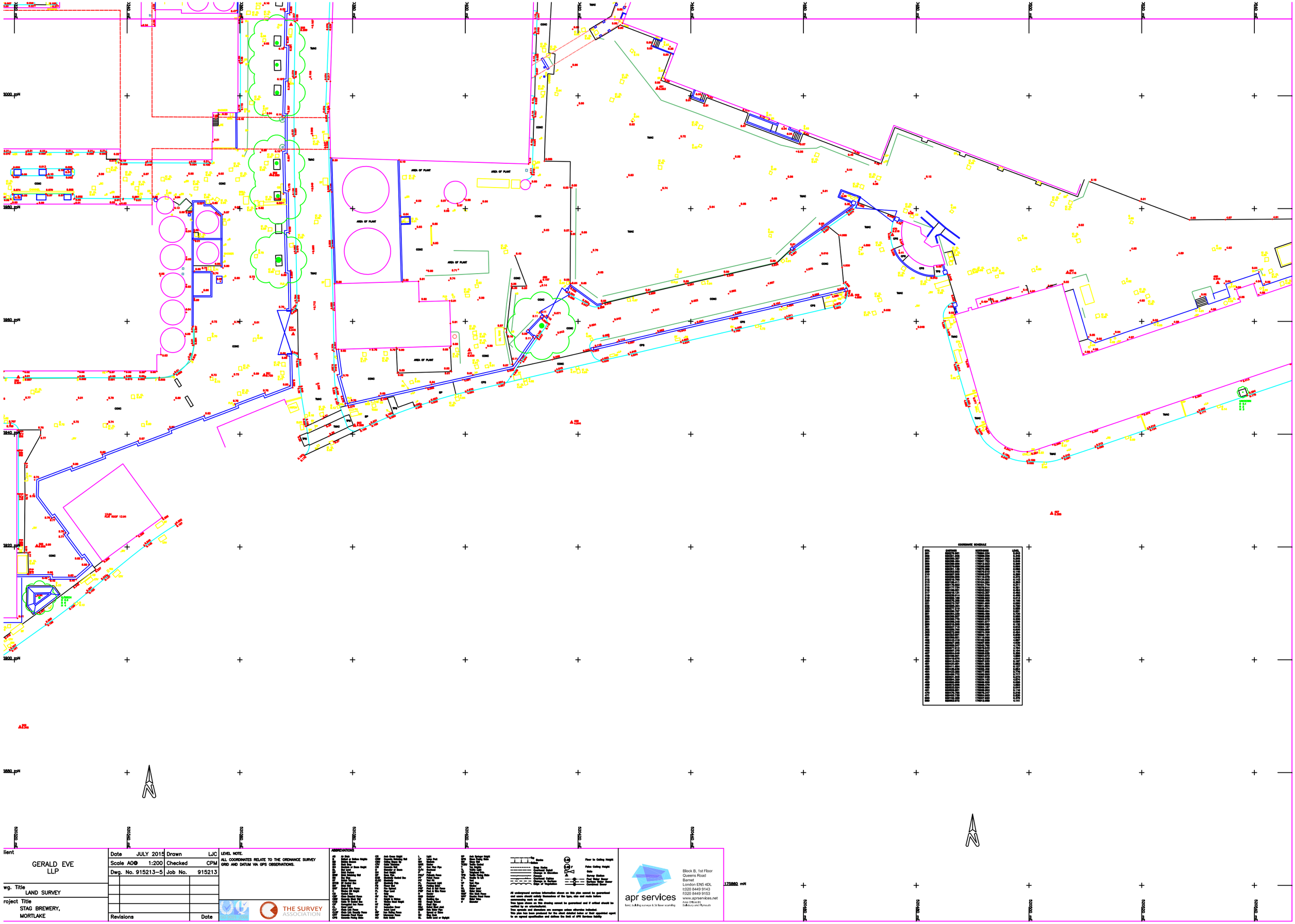

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		Dwg. No. 915213-5	Job No. 915213
wg. Title	LAND SURVEY		
roject Title	STAG BREWERY, MORTLAKE		
		Revisions	Date

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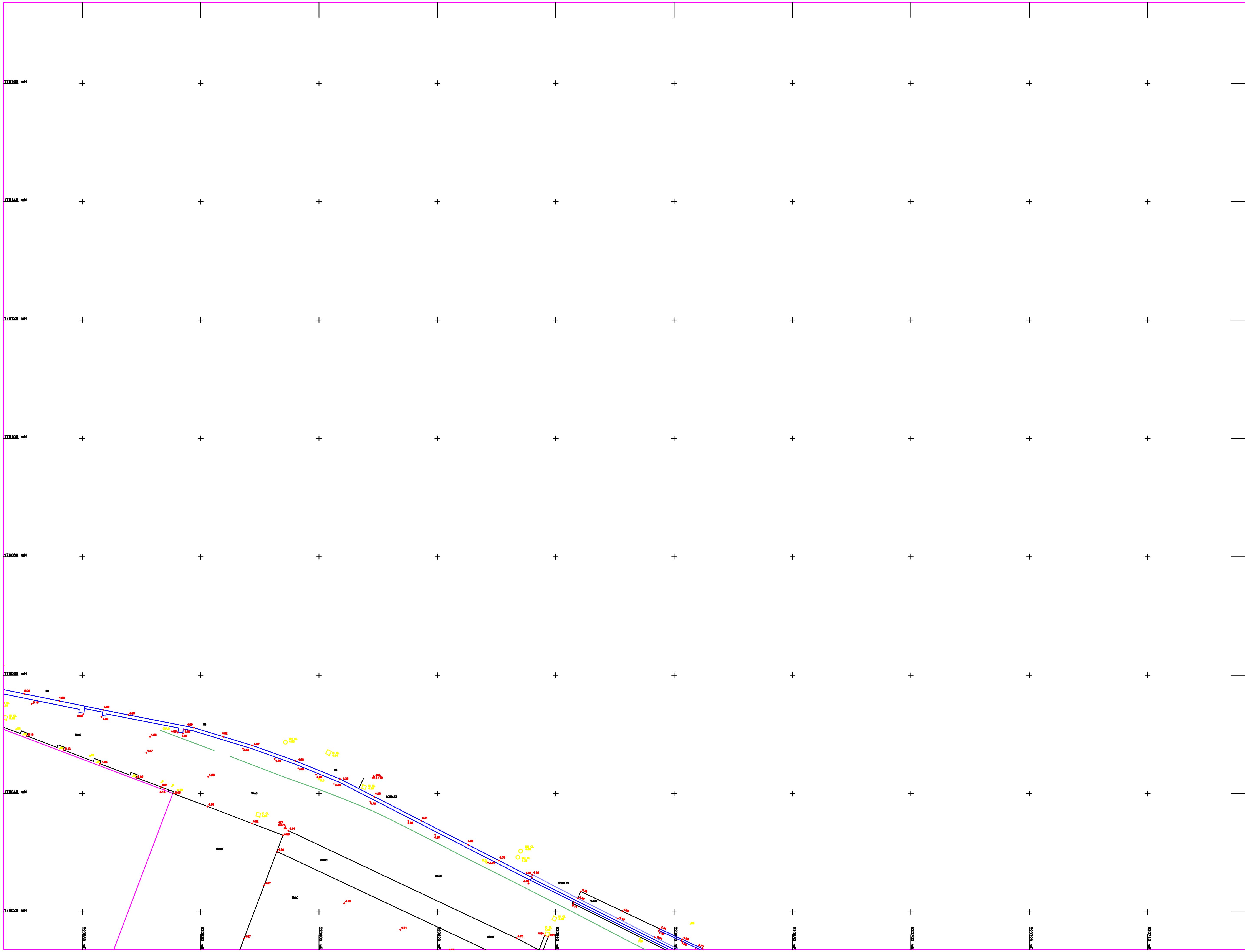

ABBREVIATIONS

AB	Air Brick	DH	Duct Height	PRF	Post & Rail Fence
B	Bollard or Bottom Height	DP	Down Pipe	PWF	Post & Wire Fence
BB	Belisha Beacon	ECB	Electricity Control Box	R	Render
BD	Back Drop	ELEC	Electricity	RAD	Radiator
BH	Borehole or Beam Height	EP	Electricity Pole	RE	Rodding Eye
BL	Bed Level	FB	Flower Bed	RG	Rough Ground
BP	Brick Pavers	FH	Fire Hydrant	RS	Road Sign
BRW	Brick Retaining Wall	FL	Floor Level	RSJ	Rolled Steel Joist
BS	Bus Stop	G	Gully	RWP	Rain Water Pipe
BT	British Telecom	GV	Gas Valve	S	Spread or Stone
BTCB	BT Control Box	H	Height in Metres	SC	Stop Cock
BW	Brick Wall	H	Window Head Height	SL	Soffit Level or Skylight
BWF	Barbed Wire Fence	HT	Height	SP	Arch Springer Height
C	Window Cill Height	IC	Inspection Cover	SPS	Stone Paving Slabs
CB	Control Box	IL	Invert Level	SW	Stone Wall
CBF	Close Boarded Fence	IRF	Iron Railing Fence	TCSU	Traffic Control
CBW	Concrete Block Wall	IWF	Interwoven Fence	T	Top Height
CCB	Cable TV Control Box	KO	Kerb Outlet	TL	Traffic Light
CIF	Corrugated Iron Fence	L	Light	TP	Telephone Pole
CL	Cover Level	LP	Lamp Post	TPS	Tactile Paving Slabs
CLF	Chain Link Fence	MH	Manhole	UTL	Unable To Lift
CLSF	Chain Link Security Fence	MKR	Marker	V	Vent
CPF	Concrete Panel Fence	OV	Over Flow Pipe	VP	Vent Pipe
CPS	Concrete Paving Slabs	O/H	Overhead	W	Window
CR	Arch Crown Height	P	Post	WL	Water Level
CRW	Concrete Retaining Wall	PALF	Palisade Fence	WM	Water Meter
CSU	Ceiling Slopes Up	PF	Picket Fence	WMF	Wire Mesh Fence
CTV	Cable Television	PIT	Trial Pit	WPF	Wooden Panel Fence
CW	Concrete Wall	PL	Pavement Light	WV	Water Valve
D	Diameter or Doors	PM	Parking Meter	ø	Diameter

Top / Bottom — Banks
3.26 — Floor to Ceiling Height
3.26 F — False Ceiling Height
Drop Kerbs
Overhead Detail
Change in Elevation
Fences
Overhead Cables
Change in Surface
Edge of Vegetation
Gate
Survey Station
Foul Water Sewer
Surface Water Sewer
Combined Sewer

LEVEL NOTE.

ALL CO-ORDINATES RELATE TO THE ORDNANCE SURVEY GRID AND DATUM VIA GPS OBSERVATIONS.

COORDINATE SCHEDULE

STN.	EASTINGS	NORTHINGS	LEVEL
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203	520360.387	175941.525	5.298
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214	520175.923	176101.770	6.311
215	520177.734	176078.914	6.321
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Client

GERALD EVE LLP

Dwg. Title
LAND SURVEY

Project Title
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Dwg. Title: LAND SURVEY	Revisions		Date
Project Title: STAG BREWERY, MORTLAKE			

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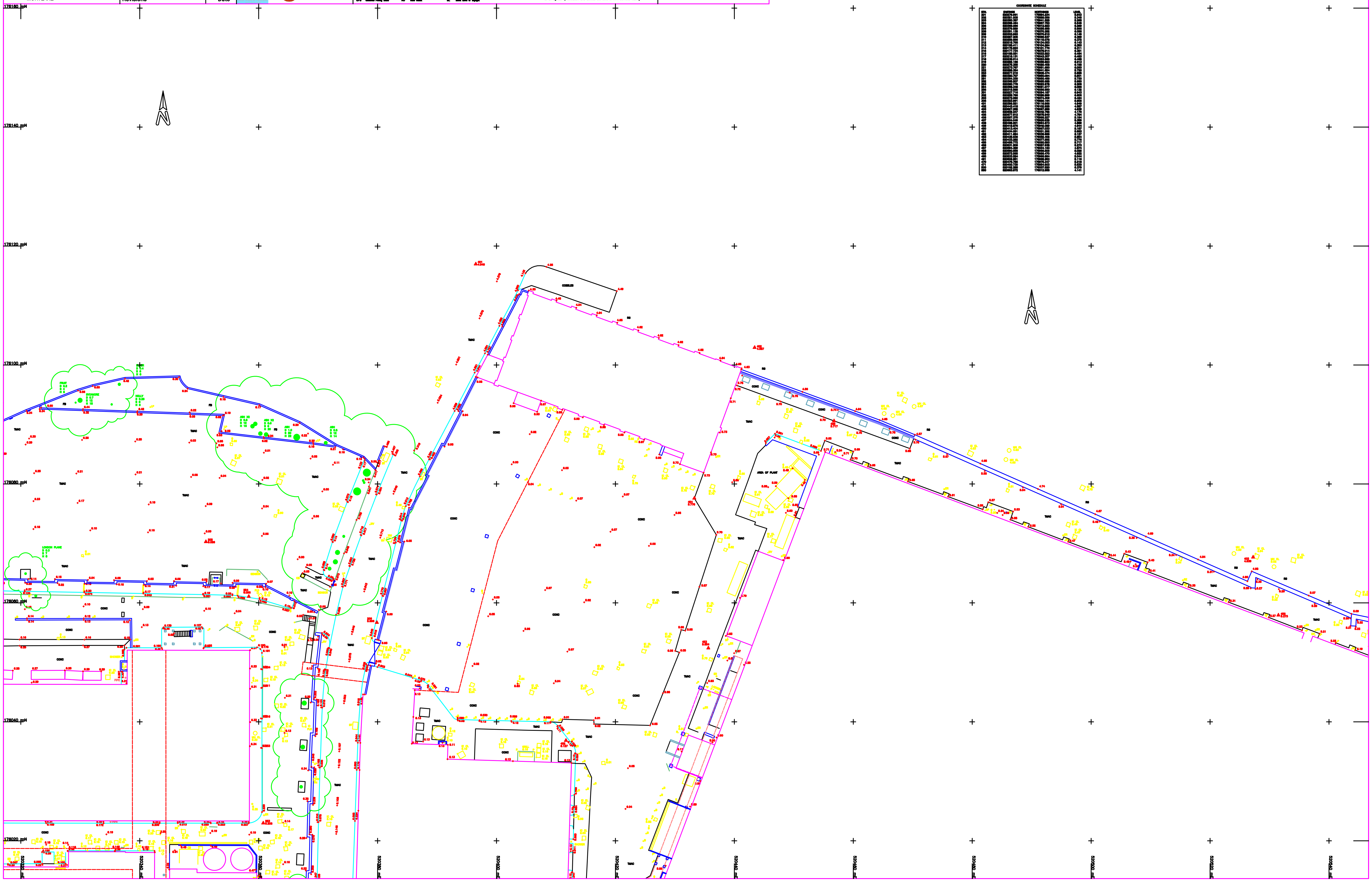

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STN.	EASTINGS	NORTHINGS	LEVEL
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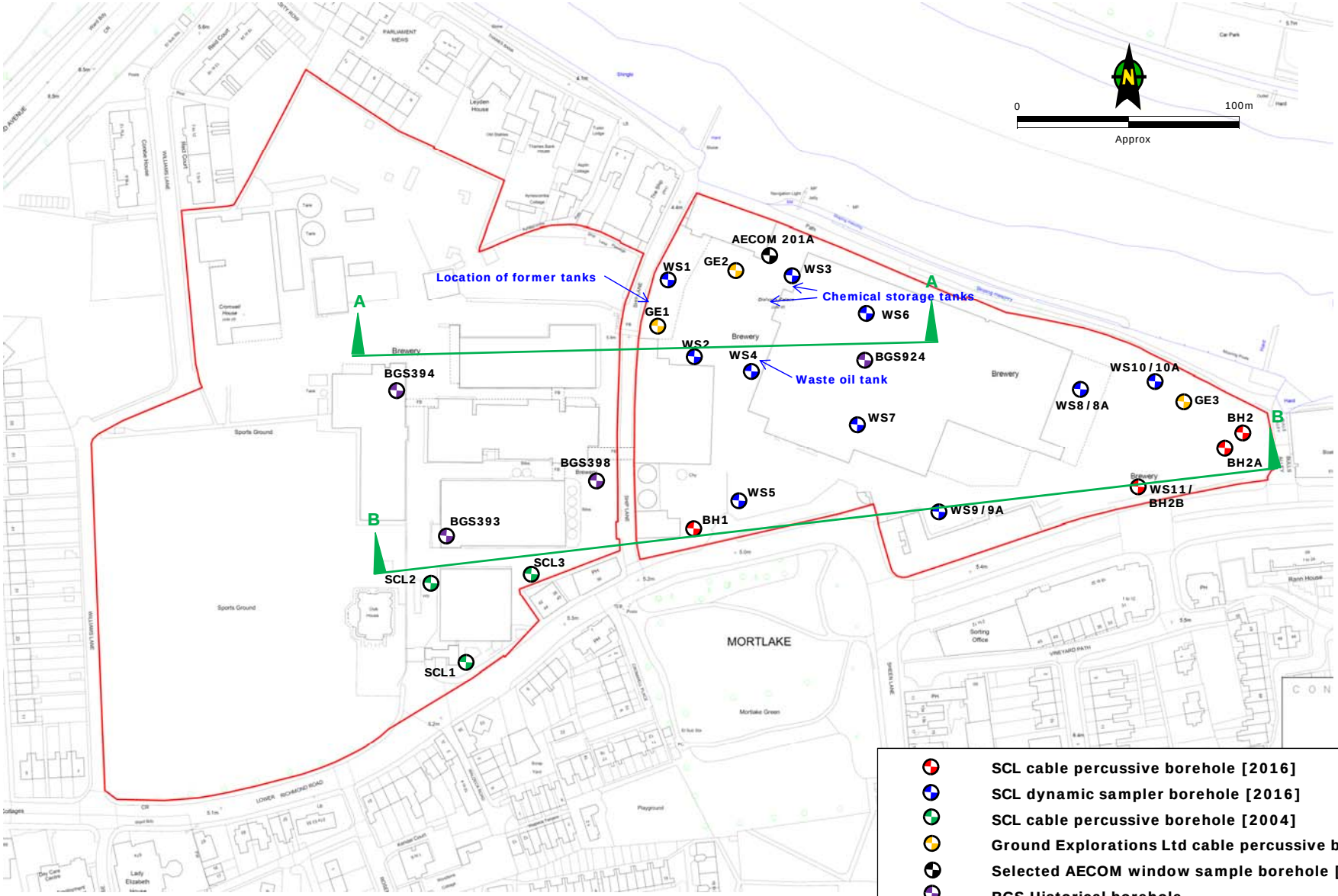
Site Location

Stag Brewery, Lower Richmond Road, Mortlake, London SW14 7ET

Report No: **10022/OT**

Exploratory Hole Location Plan



- SCL cable percussive borehole [2016]
- SCL dynamic sampler borehole [2016]
- SCL cable percussive borehole [2004]
- Ground Explorations Ltd cable percussive borehole [1980]
- Selected AECOM window sample borehole [2015]
- BGS Historical borehole

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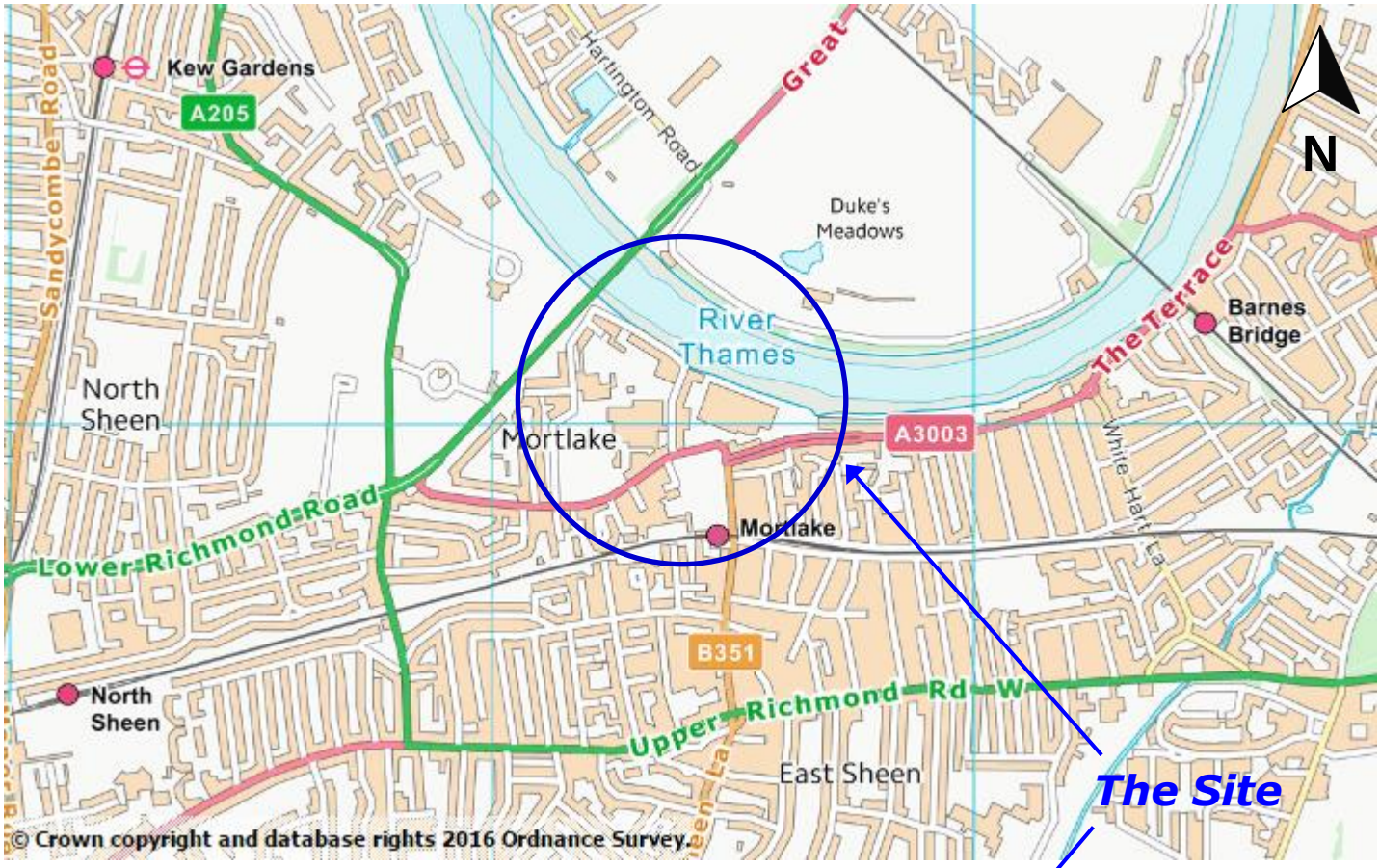
Site Location	**Stag Brewery, Lower Richmond Road, Mortlake, London SW14 7ET**	Report No: **10022/OT**

Site Location Plan



Approx NGR of site 520410E, 176030N

Soil Consultants

STAG BREWERY MORTLAKE

Phase 2 Environmental Site Assessment Report

September 2015

47075502

Prepared for: AB InBev UK Limited

Prepared by: AECOM

DOCUMENT PRODUCTION / APPROVAL RECORD				
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CONTENTS

EXECUTIVE SUMMARY

AECOM Infrastructure & Environment UK Limited (AECOM) was appointed by AB In-bev UK Limited to undertake soil and groundwater quality monitoring at the Stag Brewery, Mortlake, London, SW14 7ET.

Site Characterisation Scope: The site investigation undertaken included the drilling of two boreholes with groundwater monitoring well installations to supplement the existing network of thirteen groundwater monitoring wells installed during previous phases of investigation. Twenty-eight soil bores were also drilled across the Site to provide a higher density of exploratory points, better understand the ground conditions and collect soil samples for laboratory chemical analysis.

Ground Conditions: The ground conditions at the site were assessed from twenty-eight soil bores were drilled using dynamic percussive drilling techniques to a maximum depth of 5.0m below ground level (bgl). The drilling work was undertaken between 20 and 28 August 2015. The deepening sequence of geology encountered in the site investigation includes Made Ground, superficial deposits of River Terrace Gravels and London Clay bedrock.

Made Ground is between 1.2m and 2.6m thick and comprised loose roadstone, red/yellow brick and concrete gravels, sand and gravels of flint and occasional reworked clay. Buried obstructions, thought to represent relict concrete slabs, were encountered at eleven locations.

The boundary between the River Terrace Deposits and London Clay was encountered at depths between 6.5 and 6.9m bgl. The London Clay was encountered to the maximum depth of drilling (7.0 bgl).

Groundwater: Groundwater elevation monitoring on 28 August 2015 indicated the groundwater to be between 3.57 and 5.14 mbgl. Groundwater flow direction is inferred to be west. The tidal effects of the River Thames were measured in three boreholes across the site by continuous monitoring over 2.5 days. The results indicated a maximum fluctuation of 60mm in a well 20m from the River Thames. However, no measurable effect on groundwater elevation was recorded on the two wells located 65m and 200m from the River Thames.

Soil Quality: No obvious visual or olfactory evidence of hydrocarbon contaminated soils was noted from the drilling arisings. Furthermore, only one result (2.1ppm) out of 113 screening tests performed was above the detection limit (<0.1ppm) of the Photo-Ionisation Detector (PID) equipment during soil headspace monitoring.

A total of 25 samples of Made Ground and 14 samples of natural ground were analysed at Alcontrol Laboratories for a suite of inorganic and organic chemical parameters. The results were compared to generic assessment criteria (GAC) suitable for three possible end uses: residential with gardens, residential without without gardens and commercial. The comparison indicated that the soil chemistry does not represent an unacceptable risk to human health regardless of the end use scenario.

Asbestos Containing Materials (ACMs): During the site investigation suspected ACMs were observed as fragmented tiles from one exploratory hole (BH4A between ground level and 1.3m bgl). A total of twenty-six samples of Made Ground were also visually screened at the analytical laboratory (by microscope) and asbestos fibres were observed in eight samples. Asbestos quantification analysis on the eight samples measured a concentration of ACMs <0.1% and below the hazardous waste criteria threshold.

Asbestos in soils is not considered an unacceptable risk for future residential and or commercial site use given the relatively low volumes measured in the samples. Future below ground works should consider the potential for asbestos to be present in Made Ground and appropriate standard construction controls adopted.

Groundwater Quality: During groundwater monitoring no obvious visual or olfactory indication of contamination was identified from the sampled groundwater. A total of fourteen groundwater samples were analysed at Alcontrol Laboratories for a suite of inorganic and organic chemical parameters. The results were compared to GAC protective of the adjacent River Thames (marine Environmental Quality Standards)

and England Drinking Water Standards. The comparison indicated that the majority of chemical parameters were below the relevant GAC and, although some minor exceedances were measured at isolated locations, the groundwater quality is considered commensurate with that in an urban environment.

Conclusions: The site characterisation has not encountered soil and groundwater conditions that represent a constraint to redevelopment of the Site for mixed commercial and residential use above what would normally be expected from previously developed land.

The chemical analysis of the Site soils and groundwater has not identified concentrations that represent an environmental risk to human health or controlled waters. No environmental improvement works are considered necessary at the Site based on a mixed use development scheme.

It is likely that works to remove relict buried foundations and slabs will be required to allow construction of deep structures and foundations. Furthermore, it is unlikely that the physical composition of the existing shallow Made Ground soils will be of suitable composition for use in soft planted areas. Imported soils are therefore likely to be required for green open spaces and landscaping.

1. INTRODUCTION

1.1 General Introduction

This report presents the findings of a Phase 2 Environmental Site Assessment (ESA) at the Stag Brewery, Mortlake, London, SW14 7ET (the "Site"). A site location plan is presented in **Figure 1**.

The Stag Brewery has been used for the production and packaging of alcoholic beverages since the late 1850s. However, the Stag Brewery will cease manufacturing operations in 2015 and the site is to be divested for redevelopment.

1.2 Objectives

The objective of this report is to present an assessment of the environmental ground conditions at the Site. Specifically, the objectives are to:

1. Perform an environmental assessment of the site to evaluate the chemical status of the underlying soil and groundwater conditions. The results of this assessment will be used to refine the conceptual site model (CSM) and to evaluate the potential for plausible contaminant linkages and unacceptable environmental risk at the Site; and

2. Evaluate whether the soil and groundwater conditions represent a constraint to site redevelopment for mixed residential, retail and commercial uses and determine whether a contamination remediation and verification scheme will be required.

1.3 Scope of Work

A summary of the scope of work performed to meet the objectives of this study are set out below. The scope was designed following the review of existing Site information (**Section 2**) and based on the proposed site redevelopment for mixed uses. The rationale for each exploratory hole is provided in **Section 3.1**.

- The drilling of a borehole (BH201A) using rotary drilling techniques to 6.0m bgl adjacent to the Site boundary with the River Thames in the north of the Site.
- The drilling of two boreholes (BH203 & BH203A) using rotary drilling techniques in the east of the Site.
- The drilling of twenty-eight soil bores (BH2A to BH5A, BH7A to BH10A, BH201 to BH214A) using percussive drilling techniques to 5.0m bgl to provide shallow ground conditions assessment across the Site.
- Sampling and laboratory chemical analysis of soil samples from twenty-four boreholes for a suite of inorganic and organic chemical parameters.
- Installation of a groundwater monitoring well in the superficial gravels at BH201A and in the Made Ground at BH203 & BH203A.
- A return visit to monitor and sample groundwater from BH201A and the existing network of thirteen monitoring wells across the site.
- Laboratory chemical analysis of thirteen groundwater samples and one duplicate for a suite of inorganic and organic chemical parameters.

- Evaluation of the chemical soil and groundwater results by performing a generic quantitative risk assessment (GQRA) considering risks to human health and controlled waters.

The scope of work listed above was completed between 20 August and 21 September 2015.

2. PROJECT BACKGROUND

2.1 Site Location & Description

The site is located in Mortlake, London, SW14 7ET. The Site is centered at National Grid Reference 520360, 175990. A site location plan is presented in **Figure 1.**

The site covers a total area of 84,697m², which is divided between an East Site and West Site, separated by Ship Lane:

- East Site covers an area of 54,057m^2 and includes seven buildings, a trailer park with a weighbridge, a warehouse, an energy centre and storage blocks.
- West Site covers an area of 30,640m². The West Site comprises production buildings, workshop and stores, bulk gas storage, fabrication shop, ancillary plant, the former effluent plant, car park and Watney's sports ground.

The general site layout is shown on **Figure 2**.

2.2 Surrounding Land Use

Surrounding land uses are indicated on **Figure 2** and include the following:

- North: The River Thames is adjacent to the northern boundary of the East Site. Residential properties and a public house are located immediately north of the West Site between the site boundary and the River Thames.
- South: The A3003 (Lower Richmond Road) is adjacent to the southern Site boundary. Beyond this are residential and commercial properties, Mortlake Green and Mortlake Station. The Richmond Line of the London and South Western Railway runs east-west and is located approximately 100m south of the site at its closest point;
- East: The land use to the east mostly comprises residential properties with some commercial properties; and
- West: Residential properties are located adjacent to the western site boundary, with Clifford Avenue running south-west–north-east 115m from the site. Beyond this is Mortlake Crematorium and cemetery.

2.3 Site Topography

The site topography has been evaluated based on the topographic survey completed across the proposed development site in 2015[1].

The topographical survey has indicated the general current site elevations to be generally between 5.72m and 6.55m above Ordnance Datum (mAOD).

2.4 Previous Site Evaluation

AECOM completed a Phase 1 ESA (ESA) in July 2015. In preparation of the Phase 1 ESA, AECOM were provided with seven historical environmental assessment reports (see **Section**

[1] Data provided by AB Inbev following survey of a specialist contractor (August 2015). Topographical Survey at Stag Brewery Mortlake.

8; **References**) completed between 1995 and 2012. Pertinent information extracted from the Phase 1 ESA and the historical reports is detailed below.

- The brewery has been present in East Site since at least 1868, with the remainder of the East Site occupied by residential properties. The brewery expanded or was redeveloped by 1896, replacing the residential houses. The brewery buildings are first shown in West Site in the mid- 1960s, at which time the whole of the East Site is developed with brewery buildings. Both sites are in their current 2015 layout by 2006.

- The Stag Brewery Site is underlain by Made Ground followed by Superficial Deposits (River Terrace Gravels) and by London Clay.

- Groundwater rests within the Superficial Deposits at depths between approximately 2.0m to 5.5m bgl. Groundwater is not abstracted for use within 230m of the Site and is not within a groundwater source protection zone.

- The River Thames, the Superficial Deposits and the residents located immediately south and west of the Site represent sensitive receptors.

- A network of thirteen boreholes with groundwater monitoring wells was installed across the Brewery between 1995 and 2003. Groundwater from these wells has been monitored and samples collected for laboratory analytical testing on four occasions between 2003 and 2012. Results of this monitoring have not identified unacceptable or widespread groundwater contamination at the Stag Brewery.

- Soil sampling from seven soil bores drilled in 2003 did not indicate elevated concentrations of metal and total petroleum hydrocarbon concentrations in soils.

Overall, the lack of widespread measurable chemical contamination in soil and groundwater beneath the Site suggested that there is not an unacceptable risk of adverse impact to human health, groundwater or the River Thames. However, localized areas of potential impact to chemical soil and groundwater quality could not be discounted. This Phase 2 ESA was therefore commissioned to further investigate the ground conditions beneath the Site with a higher density of exploratory boreholes and additional soil and groundwater chemical testing to update the site conceptual site model (CSM).

3. METHODOLOGY & APPROACH

3.1 Site Investigation Rationale

The evaluation of the existing environmental assessment data and CSM presented in the Phase 1 ESA has indicated that a higher density of exploratory holes is required on the Site to evaluate the current soil and groundwater conditions. In particular, the previous site assessment data was principally from the West Site, with limited information for the East Site. The rationale was therefore to determine:

- The nature and thickness of the Made Ground and the shallow geology across the East and West Site area; and
- Inspect and sample shallow soil and groundwater from across the site for laboratory chemical analysis.

An exploratory hole location plan is included as **Figure 3**. The rationale for the positioning of each exploratory hole is given in **Table 3.1**.

Table 3.1: Site Investigation Rationale

Investigation Location ID	Location and Rationale
BH2 (existing well) BH2A (proposed soil bore)	BH2A to be drilled adjacent to above ground heavy fuel oil storage tanks on the western edge of the East Site. Groundwater monitoring well BH2 is located approximately 1.0m from BH2A.
BH3 (existing well) BH3A (proposed soil bore)	BH3A to be drilled down topographic gradient of a diesel storage tank in the north of the West Site. Groundwater monitoring well BH3 is located approximately 1.0m from BH3A.
BH4 (existing well) BH4A (proposed soil bore)	BH4A and BH5A to be drilled in the contractors' storage area in the north of West Site. Groundwater monitoring wells BH4 and BH5 are located within approximately 1.0m from BH4A and BH5A respectively.
BH5 (existing well) BH5A (proposed soil bore)	
BH7 (existing well) BH7A (proposed soil bore)	BH7A to be drilled south of workshop building in west of the West Site in the area of tanker clean in place (CIP). Groundwater monitoring well BH7 is located approximately 1.0m from BH7A.
BH8 (existing well) BH8A (proposed soil bore)	BH8A to be drilled within the empty waste container and waste storage area in the west of the West Site. Groundwater monitoring well BH8A is located approximately 1.0m from BH8A.
BH9 (existing well) BH9A (proposed soil bore)	BH9A to be drilled adjacent to area of suspected trade drain leakage between the Brew House and Fermentation Block (eastern half of the West Site). Groundwater monitoring well BH9 is located approximately 1.0m from BH8A.
BH109 (existing well) BH109A (proposed soil bore)	BH9A to be drilled in a storage area for acids and alkalis to the north of the beer conditioning building (north-east of the West Site). Groundwater monitoring well BH109 is located approximately 1.0m from BH109A.

Table 3.1: Site Investigation Rationale	
Investigation Location ID	**Location and Rationale**
BH201 & BH201A	BH201 & BH201A are adjacent to a former heavy fuel storage vault in the B Block building and also down-gradient of the Packaging Building (north-west corner of the East Site). This location is at the Site northern boundary and 20m from the River Thames. BH201 and BH201A represent two attempts to penetrate or avoid the obstruction. BH201A was able to reach the intended depth (6m bgl) and a well installed to monitor the groundwater quality.
BH202 & BH202A	To be drilled in the north of the East Site to provide general Site coverage. The presence of an obstruction at 1.8m bgl meant that the intended drilling depth and installation of a groundwater monitoring well in the superficial gravels could not be completed. BH202 and BH202A represent two attempts to penetrate or avoid the obstruction.
BH203 & BH203A	BH203 & BH203A were drilled in the east of East Site where vehicle maintenance and oil storage areas were historically located and to provide general Site coverage. The presence of an obstruction at 3.0m meant that the intended drilling depth and installation of a groundwater monitoring well in the superficial gravels could not be completed. BH203 and BH203A represent two attempts to penetrate or avoid the obstruction. Groundwater monitoring well were installed in both boreholes within the Made Ground.
BH204	To be drilled in the south of the East Site to provide general Site coverage south of the Packaging Building.
BH205	To be drilled in the east of the East Site to provide general Site coverage east of the Packaging Building.
BH206	To be drilled in the south-east of the East Site to provide general Site coverage south-east of the Packaging Building.
BH207	To be drilled on the south-western corner of the Packaging Building between the Power House chemical store (Area 13) and Packaging Waste Oil storage area (Area 14).
BH208 / BH208A	To be drilled to investigate the soil conditions within the Trailer Park immediately north of the Energy Block. BH208 and BH208A represent two attempts to penetrate or avoid an obstruction.
BH209	To be drilled in the south of the East Site to provide general Site coverage.
BH210	Targeted to investigate the soil conditions south of the operational area.
BH211	Targeted to investigate the soil conditions in the vicinity of the KG Slurry Tank and the remaining operational area.
BH212	To be drilled to investigate an oil storage area adjacent to the engineering workshop (north-west of West Site). Groundwater monitoring well BH112 is located approximately 2m from BH212.
BH213	To be drilled within contractors' storage area in the north of West Site.

Table 3.1: Site Investigation Rationale	
Investigation Location ID	**Location and Rationale**
BH214 / BH214A	To be drilled in the north of the East Site to provide general Site coverage. The presence of an obstruction at 2.6m meant that the intended drilling depth and installation of a groundwater monitoring well in the superficial gravels could not be completed. BH214 and BH204A represent two attempts to penetrate or avoid the obstruction.

The exploratory investigation work was undertaken between 20 and 28 August 2015. The following methodology and approach was undertaken to meet the objectives of this study.

3.2 Health and Safety Planning

The site works were conducted in accordance with AECOM pre-determined health, safety and environment arrangements, standard operating procedures and method statements. A detailed site inspection was undertaken on 20 August 2015 by AECOM to select sampling locations and determine the most appropriate sequence of work.

A detailed survey of the buried services in the vicinity of the proposed exploratory locations was undertaken by a specialist contractor employed by Site Vision Surveys Limited the 20th of August 2015. This was undertaken with reference to Site supplied buried services and utility plans.

The 28 exploratory positions were also pre-excavated by hand to a minimum depth of 1.2m bgl as a secondary precaution and as a pre-drill check. No buried services were exposed in the hand excavated pits.

3.3 Hand Excavated Pits

The pre-drill pits were excavated at the 28 drilling locations using concrete coring or hand-held breaker to penetrate site hardstanding and then hand tools to a depth of 1.2m. These pits allowed environmental soil inspection, sampling and logging in the upper 1.2m of soil and also as a precautionary pre-drill check of the shallow subsurface for potential buried services.

The depths of twenty-three excavated positions were extended by drilling (see **Sections 3.5** & **3.6**). Hand pits BH201, BH202, BH208, BH7B failed to penetrate a shallow concrete slab obstructions at 0.8m bgl and was therefore unable to progress as a soil bore.

3.4 Soil Bores

Twenty-three soil bores (BH2A, BH3A, BH4A, BH5A, BH7A, BH8A, BH9A, BH109A, BH202A, BH203, BH203A, BH204, BH205, BH206, BH207, BH208A, BH209, BH210, BH211, BH212, BH213, BH214 and BH214A) were drilled using dynamic percussive drilling techniques to a maximum depth of 5.0m bgl. The boreholes were drilled at 100mm diameter and soil arisings were recovered in plastic lined cores for detailed inspection, logging and sampling.

On completion of the inspection and soil sampling the exploratory positions that had penetrated the full thickness of Made Ground were infilled with bentonite clay pellets and hydrated to seal the boreholes. Where the boreholes failed to penetrate the Made Ground, the

boreholes were infilled with the excavated spoil in the general order of excavation. The site surfacing was reinstated to a similar condition to previous. The borehole logs are included in **Appendix B**.

3.5 Borehole Drilling & Well Construction

Borehole BH201A was drilled to a depth of 6.0m bgl using rotary techniques and a 350mm diameter auger. The monitoring well was constructed with 50mm diameter High Density Polyethylene (HDPE) monitoring standpipes. The well installation in BH201A has a screened section between 2.0m and 5.5m bgl designed to intersected the groundwater table in the Superficial gravels (at approximately 3.7m bgl) to allow for possible groundwater fluctuation across the well screen due to the tidal influence from the adjacent River Thames. The response zone annulus was filled with washed 4mm gravel and the annulus above the response zone sealed with bentonite pellets hydrated with site tap water. The well was completed with lockable headwork concreted into place flush with the surrounding ground surface. The borehole logs, including monitoring well construction details, is included in **Appendix B**.

BH203 was initially targeted to investigate soil and groundwater, however due to the presence of underground obstructions it was abandoned and location BH203A was selected. Another obstruction in BH203A was found. A groundwater monitoring well was installed in both boreholes within the Made Ground.

It was considered that Made Ground collapsed when the drilling augers were pulled from the excavations just before the insertion of the well pipe. Following the wells development, it was decided to exclude these wells from the monitoring stage as the excessive amount of sand and silt accumulated in both standpipes within a short period may influence the quality and representativeness of the groundwater samples.

3.6 Soil Logging & Sampling

The soil cores and excavated materials were logged by an experienced field geologist as drilling progressed. The logging was undertaken in general accordance with BS EN ISO14688, BS EN ISO14689 and BS5930:1999.

During logging the field geologist inspected the excavated for possible visual and olfactory indications of hydrocarbon contamination or discoloured/ stained soils. These observations (if any) are also presented on the exploratory borehole logs.

A portable monitoring instrument (Photo Ionisation Detector (PID)) was used to measure soil headspace for ionisable hydrocarbons. Soil samples were taken at regular intervals through the unsaturated soil profile, placed in sealed plastic bags, manipulated by hand and left for a short time (typically 5 minutes). The headspace above the soil in the bags was then tested for the presence of ionisable hydrocarbons using the PID (fitted with a 10.6 eV lamp and calibrated to isobutylene).

Soil samples were selected for laboratory testing at the discretion of the AECOM field engineer and based on the PID readings and site observations. Soil samples were transferred directly into laboratory-supplied containers and labelled for shipment, under chain of custody procedures. Soils containers were stored in cooler boxes containing ice packs to maintain low temperatures during storage and shipment to the laboratory.

3.7 Groundwater Monitoring

On 20 August 2015 AECOM completed an inspection of the existing monitoring well network to confirm the locations of the thirteen existing groundwater monitoring wells (BH2, BH3, BH4, BH5, BH7, BH8, BH9, BH10, BH104B, BH109, BH110, BH111 and BH112). Each of these thirteen wells was located and the headworks and standpipes intact. The inspection included the measurement of the groundwater level in the wells and comparison with the as-built borehole logs to determine the thickness of sediment in the well bases. This indicated significant sediment accumulations, up to 2.13m, in the wells that required de-silting followed by well development to determine whether the wells represented robust groundwater sampling locations.

On 24 and 25 August 2015 AECOM undertook the de-silting of all existing groundwater monitoring wells. Air lift surging technique was used to de-silt all monitoring wells. The monitoring wells were alternatively surged and pumped with air using a petrol operated compressor in combination with a peristaltic pump. In air surging, air was injected into the wells to lift the water to the surface. As the air bubbles rose, they created a surging effect that carried water and dislodged the sediments out of the well. As the groundwater reached the top of the casing, the air supply was shut off, allowing the aerated water column to fall. A peristaltic pump was used to pump each well periodically to remove the silt and sand deposits from the screen and bottom of the boreholes.

The desilting works were successful and further details are included in **Appendix A**. Following the desilting and purging, standing water levels ranging between 4.15m and 5.25m bgl were measured in the monitoring wells, with the exception of well BH112 which remained dry due to stiff mass of silt and sand deposits on the bottom of the well that could not be removed.

With the exception of BH9 where fast drawdown and slow recharge of groundwater was noted, all monitoring wells displayed slow drawdown and fast recharge. This, along with the amount of water available, suggested that the monitoring network was adequate to collect a good quality sample set from the saturated zone of the superficial deposits.

The groundwater was left to equilibrate for a period of three days following the successful de-silting and development the twelve existing wells and development of the new well (BH201A). AECOM then returned to the Site to install water level loggers in three monitoring wells (BH201A, BH4 and BH10). The loggers were left in the wells for 2.5 days (between 28 August and 31 August 2015) to measure potential tidal influences on groundwater elevation.

Level loggers were installed at the following locations:

- BH4: At the northern boundary of the West Site and approximately 65m from the River Thames;
- BH10: In the central portion of the West Site and approximately 200m from the River Thames); and
- BH201A: On the northern boundary of the East Site and approximately 20m from the River Thames.

These locations were selected to evaluate the tidal influence at variable distance from the River Thames and to provide good spatial representation across the Site. A barologger was installed in monitoring well BH2 for the entire period of tidal monitoring to enable data corrections to account for variations in barometric pressure. Graphs showing groundwater

elevation versus time for each of the tidal monitoring locations are presented in the **Graphs Section**.

3.8 Groundwater Sampling

Groundwater monitoring and sampling was completed by an AECOM site engineer on 1st and 2nd September 2015 and six days following the well de-silting and development. Prior to purging and sampling, the groundwater levels and volumes of groundwater within the monitoring wells were established using an air/oil/water interface probe. Monitoring wells were purged of at least three well volumes or until groundwater parameters (pH, temperature, electrical conductivity, reduction-oxidation (redox) potential and dissolved oxygen content) had stabilised across at least three consecutive readings taken at intervals during purging. Purging and sampling was carried out using a dedicated low-flow sampling peristaltic pump and flow cell in order to provide accurate parameter measurements and to minimise groundwater agitation.

3.9 Environmental Laboratory Analysis

The soil and groundwater samples were shipped to ALcontrol Laboratories for chemical analysis. The analytical schedule of tests is included as **Table 3.9a** and **3.9b** and with details for each sample included in **Tables 1** and **2** appended to this report. The results of the laboratory analysis included on appended **Tables 3** and **4** attached with this report.

Table 3.9: Laboratory Soil Chemical Analysis

Analysis Suite	Made Ground	Superficial Deposits
Metals in solid samples	23	14
Hexavalent Chromium	23	14
PAH	23	14
TPH CWG	23	14
VOC MS	23	14
EPH CWG (Aliphatic)	23	14
EPH CWG (Aromatic)	23	14
GRO	23	14
pH	23	14
Total Organic Carbon	23	14
Total Sulphate	23	14
Easily Liberated Sulphide	22	14
Ammoniacal Nitrogen	22	14
Asbestos ID	21	3
Asbestos Quantification	10	1

Table 3.9: Laboratory Soil Chemical Analysis		
Analysis Suite	**Made Ground**	**Superficial Deposits**
PCB 7 & WHO 12 (S) by GC MS	1	0

Metals suite (Arsenic, Boron, Cadmium, Chromium (III+VI), Copper, Lead, Mercury, Nickel, Selenium, Zinc).
EPH – Extractable Petroleum Hydrocarbons including aliphatic & aromatic carbon banded speciation.
VOC - Volatile Organic Compounds
PAH - Polycyclic Aromatic Hydrocarbons (PAHs).
PCB - Polychlorinated Biphenyls.
Asbestos (visual identification and quantification)

Table 3.9b: Laboratory Groundwater Chemical Analysis	
Analysis Suite	**Number of Samples**
COD, unfiltered	14
Ammoniacal Nitrogen as N	14
Ammoniacal Nitrogen as NH4	14
Nitrate as NO3	14
Phosphate as PO4	14
Sulphate	14
Metals (suite of nine dissolved metals)	14
SVOC (W) by GC MS	13
VOC (W) by GC MS	14
pH Value	14
TPH CWG (W) by GC FID	14
TPH Total (Includes EPH Total and GRO Total)	14

The laboratory soil and groundwater certificates are included as **Appendices C**.

3.10 Screening Criteria

Analytical soil and groundwater data reported as part of this Environmental Assessment report have been evaluated by comparison against generic assessment criteria (GAC). The selected GAC are based on the receptor assumptions associated with the proposed site use and

underlying ground conditions. These include the health of site occupants and controlled waters, which has been evaluated against a number of different end use scenarios:

- Residential with gardens,
- Residential without gardens; and
- Commercial

The main controlled water receptor is the River Thames, located immediately north of the East Site. Groundwater concentrations have therefore been compared to marine Environment Quality Standards (EQS) as a preference. Although not considered a suitable viable resource, given the limited thickness of the saturated aquifer, the groundwater in the River Terrace Gravel Formation has been compared to England Drinking Water Standards (EDWS).

GAC have been selected or derived by AECOM in accordance with the most recent UK regulatory guidance. For human health receptors, this comprises the EA's Contaminated Land Exposure Assessment (CLEA) methodology, most recently updated in January 2009. For controlled waters receptors, the prevailing technical guidance is the EA's Remedial Targets Methodology. Where criteria are unavailable based on these UK sources, they have been selected from reputable international and national agencies external to the UK. Such external sources have no Regulatory authority in the UK; however, since they are derived using risk-based techniques, they may be acceptable in the absence of UK guidelines.

In summary, analytical data have been screened against the criteria shown in **Table 3.10** and in order of preference.

Table 3.10: Summary of Adopted GAC

Human Health	Controlled Water
Defra C4SL 12/2014	Water Supply (Water Quality) Regulations 2010
AECOM (modified LQM/CIEH S4ULs)	Drinking Water Standards (UK, 2010)
AECOM (modified EIC)	Resource Protection Values (Scottish Environmental Protection Agency, 2013)
USEPA RSL	World Health Organisation (WHO) Drinking Water Guidelines (DWG) 2011
Dutch Serious 2009	PNEC (EU REACH) - Coastal
Dutch Intervention 2009	Groundwater Target Values (Water Framework Directive 2010 (England & Wales))
	PNEC (EU REACH) - Coastal
	New Hampshire DES (2009)
	California Draft health protective concentration
	USEPA RSL (tapwater)

4. SITE INVESTIGATION FINDINGS

4.1 Ground Conditions

The stratigraphy beneath the Site has been characterised in the 2003 CRA Baseline Soil and Groundwater Investigation and the previous Dames & Moore 1995 Ground Investigation. The geology encountered during the historical site investigations included a deepening sequence of Made Ground, Superficial Deposits and London Clay.

Table 4.1a summarises the stratigraphy encountered during the September 2015 investigation. **Table 4.1b** summarises the stratigraphy reported in the 2003 CRA Baseline Soil and Groundwater Investigation Report. Borehole logs of the September 2015 investigation are presented in **Appendix B** and borehole logs from the previous investigations are included in the Phase 1 ESA (**Reference 1 Section 8**).

Table 4.1a: Summary of Ground Conditions Encountered during the AECOM, September 2015 Investigation

Exploratory Hole	Depth to Bottom of Strata (m bgl)			Installation Strata	Date Completed
	Made Ground	Alluvium/ Superficial Deposits	London Clay		
BH2A	1.1	3.5*	-	None	25 August 2015
BH3A	1.5	3.0*	-	None	28 August 2015
BH4A	1.3	4*	-	None	27 August 2015
BH5A	1.8	3.0*	-	None	28 August 2015
BH7A/7B	1.2	3*	-	None	27 August 2015
BH8A	2.2	3.5*	-	None	26 August 2015
BH9A	3.3*	-	-	None	26 August 2015
BH109A	1.2	3.5*	-	None	28 August 2015
BH201/201A	1.9	5.1	6.0*	Superficial	24-25 August 2015
BH202 / BH202A	1.8*	-	-	None	24 August 2015
BH203 / BH203A	No recovery	No recovery	5*	None	20 August 2015
BH204	1.2	3.5*	-	None	21 August 2015
BH205	2.5	3.0*	-	None	21 August 2015
BH206	1.8*	-	-	None	21 August 2015
BH207	2.6	3.5*	-	None	25 August 2015
BH208 / BH208A	1.0	3.5*	-	None	25 August 2015
BH209	2.70	3.4*	-	None	25 August 2015
BH210	2.10	3.5*	-	None	26 August 2015
BH211	2.10	3.5*	-	None	26 August 2015
BH212	1.7	3.5*	-	None	27 August 2015

Table 4.1a: Summary of Ground Conditions Encountered during the AECOM, September 2015 Investigation					
Exploratory Hole	Depth to Bottom of Strata (m bgl)			Installation Strata	Date Completed
	Made Ground	Alluvium/ Superficial Deposits	London Clay		
BH213	1.6	3.0*	-	None	27 August 2015
BH214 / BH214A	2.6*	-	-	None	25 August 2015

*Denotes full thickness of strata not penetrated.
- Strata not encountered.

The ground conditions encountered included:

- **Made Ground**: Where full penetrated, the thickness of Made Ground measured in the AECOM soil bores ranged between 1.2m and 2.6m.
- An extended thickness of made ground were measured at four locations where full penetration of Made Ground was not possible due to the presence of buried obstructions. These positions included BH9A, BH202/ BH202A, BH206 and BH214/214A. The obstructions ranged in depth from 1.8m to 3.3m bgl.
- Buried hardstandings, which were penetrated, were encountered at:
    - BH201: Concrete slab of unknown thickness at 0.7m bgl;
    - BH202: Concrete slab of unknown thickness at 0.8m bgl;
    - BH202A: Concrete slab of unknown thickness at 1.8m bgl;
    - BH203: A 0.1m thick concrete slab between 0.9m and 1.0m followed by another concrete slab of unknown thickness at 3.0m bgl;
    - BH203A: A 0.1m thick concrete slab between 0.9m and 1.0m followed by another 0.1m thick concrete slab between 3.5m and 3.6m;
    - BH206: Concrete slab of unknown thickness at 1.8m bgl;
    - BH208: Concrete slab of unknown thickness at 0.8m bgl;
    - BH214: Concrete slab of unknown thickness at 2.6m bgl;
    - BH214A: Concrete slab of unknown thickness at 2.0m bgl;
    - BH7B: Concrete slab of unknown thickness at 0.6m bgl; and
    - BH9A: Concrete slab of unknown thickness at 3.3m bgl.
- A layer of surface concrete / tarmac hardstanding was encountered at all locations with the exception of BH4A and BH5A AECOM soil bore locations (Note: two attempts at drilling were undertaken at six positions: BH7A/B, BH201/A, BH202/A, BH203/A, BH208/A and BH214/A). The underlying Made Ground generally comprised loose roadstone, red/yellow brick and concrete gravels, sand and gravels of flint and occasional reworked clay.

- **Superficial Deposits**: Generally comprising clayey, silty sand with varying gravel content with areas of soft, brown, sandy clay. The full thickness (3.2m) of the superficial deposits was proven in one AECOM 2015 botehole (BH201A) and the base of this stratum measured at 5.1m bgl.

- **London Clay**: Grey to brown clay. The top of the London Clay was encountered at 5.1m in one AECOM borehole (BH201A).

Table 4.1b: Summary of Ground Conditions Reported in the CRA, 2003 Soil & Groundwater Baseline Report

Exploratory Hole	Depth to Bottom of Strata (m bgl)			Installation Strata	Date Completed
	Made Ground	Alluvium/ Superficial Deposits	London Clay		
BH2	0.25	6.6	6.8*	Superficial	09 October 2003
BH3	0.3	6.5	6.6*	Superficial	05 October 2003
BH4	0.2	6.6	6.7*	Superficial	06 October 2003
BH5	0.5	6.9	7.0*	Superficial	05 October 2003
BH7	0.6	6.6	6.7*	Superficial	06 October 2003
BH8	0.4	7.2*	-	Superficial	06 October 2003
BH9	2.2*	-	-	Made Ground	06 October 2003
BH10	0.35	6.9	7.0*	Superficial	06 October 2003

It is noted that the Made Ground encountered during the August 2015 investigation is thicker than that reported in the 2003 baseline investigation. During the 2015 investigation works, soil cores were collected in plastic liners which allow an accurate logging of the soil. During the 2003 baseline investigation a rotary auger drilling technique was used to extract soils to the ground surface on the auger flights. This method is a less accurate sampling and logging methodology. The thicknesses of Made Ground reported in the 2015 investigation are therefore considered to be more accurate.

The base of the superficial deposits were encountered in six baseline investigation locations (2003) and to depths between 6.5m and 6.9m (with the exception of BH8, where the base of the superficial deposit was not fully penetrated by 7.2m bgl; the full depth of this borehole).

The top of the London Clay was encountered at depths between and 6.5 and 6.9m bgl at six baseline investigation locations and to a maximum depth of 7.0m bgl. The full thickness of London Clay was not proven during the investigations.

4.2 Field Observations

Visual and olfactory observations of note were made at the following borehole locations:

- Contractor Storage area, north portion of the West Site:

- BH4A, Possible asbestos fragments were noted in the Made Ground between ground level and 1.3m bgl.

- The Waste Storage area located in the west of the West Site:

- BH8A, Black ash was noted in the Made Ground between 0.4m and 0.8m bgl with PID readings of 2.1 parts per million (ppm) at 0.5m bgl and <0.1ppm at 1.0m bgl.

During groundwater purging and sampling no measurable free phase product was identified. In addition, no oily sheen or staining was observed and no hydrocarbon odours detected. The following visual and olfactory observations of note were made at BH9:

PID measurements of ionisable hydrocarbons were taken from soils at regular intervals during drilling. In total, 113 soil headspace measurements were undertaken. In 112 of the 113 measurements the result was less than the limit of detection of the PID (<0.1 parts per million (ppm)). One headspace measurement of 2.1ppm was measured from soil sampled from BH8A (0.5m bgl).

4.3 Hydrogeology

Groundwater Elevations

During drilling, water strikes were encountered at two of the nine locations at depths of 2.2m bgl (3.70m Above Ordnance Datum (AOD)) in BH9A and 3.7m bgl (2.27m AOD) in BH201A.

Groundwater elevation measurements from the thirteen wells located on the Site was undertaken on 28th August 2015 between 12.25pm and 13.10pm to reliably estimate the groundwater flow direction and to minimise the potential influence of the River Thames tidal effect. **Table 3** indicates groundwater level measurement data.

A static perched water level was measured at 1.75m bgl (4.025m AOD) at BH9.

Static groundwater levels within the superficial deposits were measured between 3.586m bgl in BH201A (5.575m AOD) and 5.14m bgl (6.49m AOD) at BH3.

The groundwater elevation trend from five groundwater monitoring rounds completed between 2003 and 2015 is included as appended **Graph 1**. The graph indicates that groundwater elevations are relatively consistent during the five monitoring rounds.

Groundwater Flow Direction

Inferred groundwater flow contours for the superficial aquifer beneath the site, based on the results of this 2015 monitoring round, are presented as **Figure 4**. The elevated groundwater levels in BH9 have been omitted from the groundwater contour evaluation as this installation is indicative of perched water in the Made Ground.

The 2015 monitoring results indicate the inferred groundwater flow direction to be to the west.

Tidal Effects on Groundwater Elevation

Following the groundwater elevation monitoring, three pressure transducers were installed in monitoring wells BH4, BH10 and BH201A to continuously measure groundwater elevations within the superficial deposits for a period of approximately 2.5 days and assess the tidal influence of the River Thames on the groundwater levels beneath the Site. The results are included on Graphs xxx to xxx appended to this report.

The assessment of the transducers data indicates that only the groundwater levels of the northern boundary of the East Site, represented by BH201A, is moderately affected by the tidal influence of the River Thames with daily fluctuations ranging from

approximately 40 to 60mm with a peak of approximately 120mm during the early hours of the 31st of August possibly due to rainfall. This monitoring well is located approximately 20m from the southern bank of the River Thames.

In the monitoring well BH4 located approximately 65m from the southern bank of the River Thames along the northern boundary of the West Site, the tidal effect appears to be time lagged from BH201A due to the distance from the river but not significant. The groundwater level fluctuations in this area are comparable to those detected 150m further south within the central portion of the site represented by BH10.

It is noted that from the visual inspection of the River Thames in proximity of the site, the banks are constructed with concrete and stone blocks.

5. LABORATORY QA/QC

5.1 Quality Control

The majority of laboratory analytical techniques undertaken are certified by the United Kingdom Accreditation Service (UKAS). The range of accredited analyses offered by the selected sub-contract laboratory (ALcontrol) is considered to be as comprehensive as is available from commercial laboratories in the UK. UKAS and the Environment Agency's Monitoring Certification Scheme (MCERTS) status for all analyses undertaken is shown on the laboratory certificates presented in **Appendix C**.

5.2 Duplicate Analysis

One duplicate groundwater sample was collected during the September 2015 sampling event from BH4 and labelled DUP01. The duplicate was tested for the same analytical suite as the primary sample and for QA/QC purposes.

The evaluation of the duplicate samples is based on the Relative Percent Difference (RPD), which is defined as:

RPD = 100 x (|X1 - X2|/(X1 + X2))

where X1 and X2 are the values of the concentration obtained for an analyte X in the duplicate sample, and |X1-X2| is the absolute difference of X1 and X2.

Relative percentage differences (RPDs) have been calculated for chemical concentrations recorded above the method detection limits between a primary sample from BH4 and a duplicate sample (DUP01). The 'limits' of ±25% for inorganic analysis and ±100% for organic analyses are based on AECOM's experience from a large number of projects and should be viewed as a guideline for the expected RPD values in a water matrix. These guideline limits should be used with caution with laboratory results within ten-times the laboratory method detection limit (MDL). The RPD assessment is presented in **Table 11**.

- Elevated RPDs for inorganics were observed for copper (40%) and selenium (43%) above the guideline value of 25% for organic parameters. The elevated RPDs for these two parameters are not a significant concern given that the other eight metal parameters were within the acceptable range. In the remainder of the report the higher concentrations from either the primary or duplicate sample from BH4 will be used.
- The calculated RPDs for the remaining inorganics analysis were in the range 0 to 11% which is within the acceptable range.
- RPD assessment for the organics analysis was not possible given the results were below the analytical method detection limits.

5.3 Conclusion

The laboratory analytical results are considered suitable for review based on the sampling methodologies described in **Section 3.8**, the laboratory accreditation and the results of the RPD assessment.

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6. GENERIC QUANTITATIVE RISK ASSESSMENT

6.1 Stage 2 Generic Assessment

Given that the final development scheme is not yet finalized, AECOM have elected screening criteria based on three possible end uses: residential without gardens, residential with gardens and commercial.

The most sensitive controlled waters receptor is considered to be the River Thames, which flows along the northern site boundary in a west to east direction and the Secondary A Aquifer within the underlying River Terrace Deposits. Further details of the selected generic assessment criteria (GAC) are given in **Section 3.10**.

6.2 Soil

6.2.1 Heavy Metals

A total of 37 soil samples were analysed for a suite of eleven metals. The results are included in appended **Table 4**. A summary of the GAC exceedances is presented in the following Table and discussed below.

Analyte	Number of detects	GAC (mg/kg)			Range in Detected Conc. (mg/kg)	Number of GAC Exceedences			Location with Maximum Conc.
		Human Health - Res. Without Gardens	Human Health - Res. With Gardens	Human Health - Commerc.		Human Health - Res. Without Gardens	Human Health - Res. With Gardens	Human Health - Commerc.	
Arsenic	37	40	37	640	9.55 to 94	1	1	0	BH7A; 0.7m
Lead	37	310	200	2300	5.73 to 2,910	2	6	1	BH213, 0.6m

The concentrations of cadmium, chromium (III+VI), copper, mercury, nickel, selenium, zinc and hexavalent chromium were measured at concentration below the GAC for the three land use scenarios and are therefore not considered to represent an unacceptable risk to human health.

The detected concentrations of arsenic in the 37 samples tested ranged between 9.55mg/kg and 94mg/kg. None of these concentrations exceeded the human health GAC for a commercial end use. The measured concentration from BH7A (94mg/kg; 0.7m bgl) exceeded the GACs for both residential with and without gardens scenarios. The average arsenic concentration from the 37 samples is 19mg/kg and well below the GAC for the possible end use scenarios. Arsenic is therefore not considered to represent an unacceptable risk to human health regardless of the end use.

The detected concentrations of lead in the 37 samples tested ranged between 5.73mg/kg and 2,910mg/kg. The measured concentration from BH213 (2,910mg/kg; 0.6m bgl) exceeded the GACs for commercial use. The measured concentrations from BH208 at 0.8m, BH212 at 0.6m bgl, and BH4A at 0.9m bgl exceeded the GAC for residential with gardens and the samples from BH213 at 0.6m bgl and BH7A at 0.7m bgl exceeded the GAC for residential without gardens. The average lead concentration from the 37 samples is 156mg/kg and well below the GAC for the three possible end use scenarios.

6.2.2 Total Petroleum Hydrocarbons, BTEX and MTBE

A total of 37 soil samples were analysed for total petroleum hydrocarbons (TPH), BTEX and MTBE. TPH data were reported with a carbon banded aliphatic/aromatic split to enable risk assessment following the Criteria Working Group (CWG) methodology. The results are included in appended **Table 5.**

No TPH, BTEX and MTBE were detected at concentrations in excess of human health GAC for the three end use scenarios in in the 37 soil samples from the Site.

6.2.3 Poly-cyclic Aromatic Hydrocarbons

A total of 37 soil samples were analysed for the presence of poly-cyclic aromatic hydrocarbons (PAHs). The results are included in appended **Table 5**.

The suite of PAH tests included twenty-one parameters. The PAH detections in the remaining thirty-seven samples were below the GAC for all proposed end uses with the exception of coal tar.

The detected concentrations of coal tar in the 37 samples tested ranged between <0.015mg/kg and 1.47mg/kg. None of these concentrations exceeded the human health GAC for a commercial end use.

The measured concentration from BH4A (1.47mg/kg; 0.9m bgl) exceeded the GACs for both residential with and without gardens scenarios. In addition, the concentration from two further samples from BH212 (1.05mg/kg; 0.6m) and BH7A (1.05mg/kg; 0.7m bgl) exceeded the GAC for residential without gardens end use. The average coal tar concentration from the 37 samples is 0.24mg/kg and well below the GAC for the possible end use scenarios. Coal tar is therefore not measured at unacceptable concentration widespread across the site and is not considered to represent an unacceptable risk to human health regardless of the end use.

6.2.4 Volatile Organic Compounds

A total of 37 soil samples were analysed for a suite of sixty-four volatile organic compounds (VOCs) parameters. The results are included in appended **Table 6**. No VOCs were detected at concentrations in excess of the MDL in the 37 soil samples analysed for these compounds.

It is noted that the MDLs for chloromethane, vinyl chloride, trichloroethene, 1,2-dichloroethane, 1,2,3-trichloropropane and 1,2-dibromo-3-chloropropane exceed GACs for human health in a residential scenario. Given that VOCs have not been measured at concentration below the MDL in the 37 samples, it is considered unlikely that these parameters represent an unacceptable risk or environmental concern.

6.2.5 Polychlorinated biphenyl (PCB)

One soil sample was analysed for the presence of a suite of Poly-Chlorinated Biphenyls (PCBs). The results are included in appended **Table 5**. No PCB compounds were detected at concentrations in excess of the MDL in the sample analysed for these compounds.

The laboratory MDLs for pentachlorobiphenyl, 3,3,4,4,5- (PCB 126) and hexachlorobiphenyl, 3,3,4,4,5,5- (PCB 169) exceed the associate human health residential GACs. Given that none of the PCB congeners in the suite of parameters have been measured at concentration above the MDL in this sample, it is considered

unlikely that these parameters represent an unacceptable risk or environmental concern.

6.2.6 Asbestos

A total of twenty-six samples of Made Ground were visually assessed at the laboratory for the presence of ACMs. The results are included in appended **Table 5**. Asbestos was visually identified (by microscope) in eight samples, including:

- BH2A (0.5m to 1.0m bgl): Amosite trace detected (loose fibres in soil);
- BH4A (0.9m bgl): Amosite and Chrysotile detected (loose fibres in soil);
- BH201A (0.7m bgl): Amosite detected;
- BH203A (0.5m bgl): Soil containing loose fibres and debris of asbestos bitumen;
- BH207 (0.7m bgl): Chrysotile detected (loose fibres in soil);
- BH208 (0.8m bgl): Chrysotile detected (loose fibres in soil);
- BH209 (0.5m bgl): Chrysotile detected (loose fibres in soil); and
- BH210 (0.8m bgl): Amosite detected.

Further quantification testing was undertaken in the laboratory on the eight samples. This quantification test indicates that the visually identified ACMs were below the hazardous waste threshold limit of <0.1% volume in the samples.

During the intrusive works, possible asbestos fragments were noted in the Made Ground of location BH4A between ground level and 1.3m bgl. There is no prescribed human health value for asbestos concentrations in soils in the UK. The system for evaluation is site-specific and dependent on site use and receptor. It is usually preferred that soils containing asbestos remain sealed in the ground and future disturbance controlled by code of construction practices.

Overall we consider that asbestos in soils is not presently an unacceptable risk for future residential and or commercial site use given the relatively low volumes measured in the samples. Future below ground works should consider the potential for asbestos to be present in Made Ground and appropriate standard construction controls adopted.

6.2.7 Miscellaneous Inorganic Compounds

A total of 37 soil samples were analysed for the presence of sulphide, sulphate, ammoniacal nitrogen as NH4 and pH. The results are included in appended **Table 4**.

None of these parameters were measured at concentrations that exceed the human health GAC for the three end use scenarios.

6.3 Groundwater

Groundwater analytical data from the 2015 sampling round are presented in **Tables 7** to **10** alongside the GAC used for generic risk assessment screening purposes.

The GAC used for protection of controlled waters in this assessment have been selected as England and Wales Environmental Quality Standards (EQSs) appropriate for protection of the River Thames. Where EQSs are not available drinking water standards (DWSs) from the UK or World Health Organisation have been selected.

Exceedances of GAC are summarised below.

6.3.1 Metals

A total of fourteen groundwater samples were analysed for metals. The results are included in appended **Table 7**. A summary of the results is in the following Table and discussed below.

Analyte	Number of detections	GAC (µg/l)		Range in Detected Concentrations (µg/l)	Average concentration	Number of GAC Exceedences		Location with Maximum Concentration
		Controlled Waters DWS	Controlled Waters EQS			Controlled Waters DWS	Controlled Waters EQS	
Arsenic	14	10	25	3.79 - 45.4	17	8	3	BH7
Cadmium	14	5	0.2	<0.1 - 0.228	0.063	0	1	BH9
Chromium (III+VI)	14	50	0.6	1.21 - 7.52	3.1	0	14	BH9
Cobalt	14	6	3	0.262 - 11.8	3.6	3	6	BH201A
Copper	13	2000	5	0.939 - 61.3	5.5	0	1	BH9
Lead	12	25	7.2	0.028 - 22.8	1.7	--	1	BH9
Manganese	14	50	--	7.19 - 2270	691	11	0	BH111
Selenium	14	10	--	0.781 – 13.2	4.1	1	0	BH110
Silver	0	94	0.5	<1.5	<1.5	0	13	Not detected
Thallium	0	0.2	--	<0.96	<0.96	13	0	Not detected
Zinc	14	6000	40	1.27 - 280	30	0	1	BH9

The groundwater sampled from BH9 is from perched water within Made Ground and is therefore not representative of the groundwater in the underlying superficial aquifer. A total of seven of the eighteen metals exceeded the EQS and three metals exceeded the DWS in the groundwater sample from BH9. The concentrations from BH9 are omitted from the discussion below.

The concentrations of silver and thallium were below the laboratory MDL in the fourteen samples tested. However, the laboratory MDL is marginally higher than the applicable EQS and DWS.

The concentrations of cadmium, chromium, copper, lead, silver and zinc were below the drinking water standards in the fourteen samples tested. Furthermore, the concentration of manganese, selenium and thallium were below the EQS in the fourteen samples tested.

The measured concentrations of arsenic exceeded the EQS in three samples and the DWS in eight samples of the fourteen samples tested. The average concentration from the fourteen samples is 17µg/l and exceeds the DWS, but is below the EQS.

The measured concentrations of cadmium exceeded the EQS in one (BH9 (0.228µg/l) of the fourteen samples tested. The average cadmium concentration from the fourteen samples is 0.063 µg/l and is below the EQS. None of the measured concentrations of cadmium exceed the DWS.

The measured concentrations of chromium (III & VI) exceeded the EQS in the fourteen samples tested, but did not exceed the DWS. The EQS GAC considers that the chromium detected is the more toxic chromium VI. However, the results of the analysis of soils have not detected chromium IV above the laboratory MDL in the 37 soils tested. The chromium detected in groundwater is therefore likely to be the less toxic chromium III. The application of the EQS is therefore over-conservative. In addition, the chromium concentrations are below the DWS.

The measured concentrations of cobalt exceeded the EQS in six (BH109, BH110, BH201A, BH5, BH7, BH9) of the fourteen samples tested. The measured concentrations of cobalt also exceeded the DWS in three (BH109, BH201A and BH9) of the fourteen samples tested. The average cobalt concentration from the fourteen samples is 3.6µg/l and is below the DWS (6µg/l) but exceeds the EQS (3µg/l).

EQS are not available for selenium and therefore the DWS have been adopted. The detected concentration of selenium exceeded the DWS in the groundwater sample collected from BH110. The average selenium concentration (4.1µg/l) is below the DWS (10µg/l).

The measured concentrations of manganese exceeded the DWS in eleven of the fourteen samples tested. The average concentration from the fourteen samples is 691µg/l and exceeds the DWS (50 µg/l).

The measured concentration of metals exceeded the DWS and EQS in groundwater from across the site. However, the measured concentrations are variable and in many cases are within one order of magnitude of the screening criteria. AECOM considers the metal concentrations detected to be representative of the quality of urban groundwater in a shallow perched aquifer.

The sensitivity of this aquifer is further reduced given that the aquifer does not represent a significant resource and is not within a source protection zone for an abstraction for potable use. In addition, the selected DWS GAC are applicable for groundwater at the consumers tap and after the necessary treatment for human consumption and the EQS are applicable for the quality at the receiving water. The use of these GAC is therefore considered conservative in this application.

6.3.2 Total Petroleum Hydrocarbons, BTEX and MTBE

A total of fourteen groundwater samples were analysed for TPH, BTEX and MTBE. The results are included in appended **Table 8**.

TPH was not measured above the laboratory MDL in eleven of fourteen samples tested. TPH was measured in samples from three monitoring wells (BH9, BH109 and BH111) at total TPH concentrations between 65.8µg/l and 1,430µg/l. DWS or EQS are not available for these compounds.

BTEX and MTBE concentrations were below the laboratory MDL in the fourteen samples tested and below the corresponding EQS and DWS.

6.3.3 Polycyclic Aromatic Hydrocarbons

A total of fourteen groundwater samples were analysed for a suite of 16 PAH compounds. The results are included in appended **Table 9** and summarized in the Table below.

Analyte	Number of detections	GAC (µg/l)		Range in Detected Concentrations (µg/l)	Number of GAC Exceedences		Location with Maximum Concentration
		Controlled Waters DWS	Controlled Waters EQS		Controlled Waters DWS	Controlled Waters EQS	
Anthracene	0	90	0.1	<1	--	13	All below MDL
Fluoranthene	1	4	0.1	<1 – 6.12	--	13	BH9
Benz(a)anthracene	0	0.1	--	<1	13	--	All below MDL
Chrysene	0	1	--	<1	2	--	BH9
Benzo(a) pyrene	1	0.01	0.05	<1 – 4.69	13	13	BH9
Dibenz(a,h)anthracene	0	0.01	--	<1	13	--	BH9
Benzo(b)&(k)fluoranthene	1	--	0.03	<2 – 8.42	--	13	BH9
PAHs (sum of 4)	1	0.1	--	<4 – 14.47	13	--	BH9
benzo(g,h,i)perylene + indeno(1,2,3-cd)pyrene	1	--	0.002	<2 – 6.05	--	13	BH9

The concentrations of PAHs in thirteen groundwater samples from the superficial River Gravels were below the laboratory MDL (<1 to <4 µg/l).

The MDL for six PAHs are above the EQS and four PAHs above the EQS. However, the lack of PAH detections above MDL indicate that this is not a significant concern..

One groundwater sample was from groundwater perched above a concrete slab and within the Made Ground at BH9. The concentrations of fluoranthene, benzo(a)pyrene, benzo(b)&(k)fluoranthene, PAHs (sum of 4) and benzo(g,h,i)perylene + indeno(1,2,3-cd)pyrene exceed the relevant EQS and/or DWS in groundwater sampled from location BH9. These exceedances are not considered a significant concern as the detected concentrations are representative of the perched water quality and none of these parameters are measured above the GAC in groundwater from the superficial River Gravels.

6.3.4 Volatile Organic Compounds and Semi-volatile Organic Compounds

A total of fourteen groundwater samples were analysed for a suite of sixty-five VOC and thirteen samples were analysed for a suite of sixty SVOC parameters. The results are included in appended **Table 10**.

VOCs have not been identified in excess of the MDL in ten of the fourteen samples tested. Chlorobenzene was measured in samples from four monitoring wells (BH111, BH201A, BH7 and BH9). These results are below the DWS (300 µg/l).

SVOCs have not been identified in excess of the MDL in ten of the fourteen samples tested. 1,1,1-trichloroethane, trihalomethanes, 4-methylphenol and carbon disulfide were measured in samples from three monitoring wells (BH4, BH9 and BH111). These results are below the available EQS and DWS.

The concentration of phenol in groundwater from BH9 (10.7µg/l) exceeded the EQS (7.7µg/l), but not the DWS (5,800µg/l).

The laboratory MDL for 24 VOC & SVOC parameters exceeded the relevant EQS and/or DWS. Given the lack of detections of VOC and SVOC parameters in groundwater, this is not considered to be a significant concern.

6.3.5 Miscellaneous Inorganic Compounds

The miscellaneous inorganic suite included nitrate (as NO3-), phosphate, ammoniacal nitrogen as N, ammoniacal nitrogen (as NH4), sulphate, COD and pH. The results are included in appended **Table 7**.

The groundwater pH at the Site ranged between 7.10 and 8.09 indicating slightly alkaline groundwater conditions.

Nitrate was not detected above the laboratory MDL (<0.3 mg/l) in two of the fourteen samples tested. The concentration of nitrate in twelve groundwater samples ranged between 0.94 and 21.9mg/l. The nitrate concentrations in these samples do not exceed the DWS (50 mg/l).

Phosphate was not detected above the laboratory MDL (<0.05 mg/l) in two of the fourteen samples tested. The concentration of phosphate in twelve groundwater samples ranged between 0.056 and 14.1mg/l. EQS or DWS are not available for this compound.

Sulphate was not detected above the laboratory MDL (<2 mg/l) in one of the fourteen samples tested. The concentration of sulphate in thirteen groundwater samples ranged between 37.5 and 457mg/l. EQS or DWS are not available for this compound.

Ammoniacal nitrogen was not detected above the laboratory MDL (<0.2 mg/l) in seven of the fourteen samples tested. The concentration of ammoniacal nitrogen in seven groundwater samples ranged between 0.508 and 5.66mg/l. The ammoniacal nitrogen concentration in six of these samples exceeded the DWS (0.389 mg/l). The most elevated concentration of ammoniacal nitrogen was measured in groundwater perched within the Made Ground at BH9. The average ammoniacal nitrogen concentration from groundwater sampled from the superficial River Gravels was 0.67mg/l and marginally exceeds the DWS.

COD was not detected above the laboratory MDL (<7 mg/l) in six of the fourteen samples tested. The concentration of COD in eight groundwater samples ranged between 8.09 and 3,330mg/l. EQS or DWS are not available for this compound.

7. CONCLUSIONS

7.1 General Site Description

This report presents the findings of a Phase 2 ESA at the Stag Brewery Mortlake facility, Mortlake, London, SW14 7ET. The Stag Brewery has been used for the production and packaging of alcoholic beverages since the late 1850s. However, the Stag Brewery will cease manufacturing operations in 2015 and the site is to be divested for redevelopment. The objective of this report is to present an assessment of the environmental ground conditions at the Site.

The site investigation undertaken included the drilling of two boreholes with a groundwater monitoring well installations to supplement the existing network of thirteen groundwater monitoring wells installed during previous phases of investigation. Twenty-eight soil bores were also drilled across the Site to provide a higher density of exploratory points, better understand the ground conditions and collect soil samples for laboratory chemical analysis.

7.2 Site Characterisation Findings

Ground Conditions

The ground conditions at the site were assessed from twenty-eight soil bores were drilled using dynamic percussive drilling techniques to a maximum depth of 5.0m bgl. The drilling work was undertaken between 20 and 28 August 2015. The deepening sequence of geology encountered in the site investigation includes Made Ground, superficial deposits of River Terrace Gravels and London Clay bedrock.

Made Ground is between 1.2m and 2.6m thick and comprised loose roadstone, red/yellow brick and concrete gravels, sand and gravels of flint and occasional reworked clay. Buried obstructions, thought to represent relict concrete slabs, were encountered at eleven locations.

The boundary between the River Terrace Deposits and London Clay was encountered at depths between 6.5 and 6.9m bgl. The London Clay was encountered to the maximum depth of drilling (7.0 bgl).

Hydrogeology

Groundwater elevation monitoring on 28 August 2015 indicated the groundwater to be between 3.57 and 5.14 mbgl. Groundwater flow direction is inferred to be west. The tidal effects of the River Thames were measured in three boreholes across the site by continuous monitoring over 2.5 days. The results indicated a maximum fluctuation of 60mm in a well 20m from the River Thames. However, no measurable effect on groundwater elevation was recorded on the two wells located 65m and 200m from the River Thames.

Soil Quality

No obvious visual or olfactory evidence of hydrocarbon contaminated soils was noted from the drilling arisings. Furthermore, only one result (2.1ppm) out of 113 screening tests performed was above the detection limit (<0.1ppm) of the Photo-Ionisation Detector (PID) equipment during soil headspace monitoring.

A total of 25 samples of Made Ground and 14 samples of natural ground were analysed at Alcontrol Laboratories for a suite of inorganic and organic chemical parameters. The results were compared to generic assessment criteria (GAC) suitable for thee end use scenarios: residential with gardens, residential without gardens and commercial. The comparison

indicated that the soil chemistry does not represent an unacceptable risk to human health regardless of the end use scenario.

Asbestos Containing Materials (ACMs): During the site investigation suspected ACMs were observed as fragmented tiles from one exploratory hole (BH4A between ground level and 1.3m bgl). A total of twenty-six samples of Made Ground were also visually screened at the analytical laboratory and asbestos fibres were observed in eight samples. Asbestos quantification analysis on the eight samples measured a concentration of ACMs <0.1% and below hazardous waste criteria.

Overall we consider that asbestos in soils is not presently an unacceptable risk for future residential and or commercial site use given the relatively low volumes measured in the samples. Future below ground works should consider the potential for asbestos to be present in Made Ground and appropriate standard construction controls adopted.

Groundwater Quality

During groundwater monitoring no obvious visual or olfactory indication of contamination was identified from the sampled groundwater. A total of fourteen groundwater samples were analysed at Alcontrol Laboratories for a suite of inorganic and organic chemical parameters. The results were compared to GAC protective of the adjacent River Thames (marine Environmental Quality Standards) and England Drinking Water Standards. The comparison indicated that the majority of chemical parameters were below the relevant GAC and although some minor exceedances were measured at isolated locations, the groundwater quality is considered commensurate with that in an urban environment.

7.3 Conclusions

The site characterization has not encountered soil and groundwater conditions that represent a constraint to redevelopment of the Site for mixed commercial and residential use above what would normally be expected from previously developed land.

The chemical analysis of the Site soils and groundwater has not identified concentrations that represent an environmental risk to human health or controlled waters. No environmental improvement works are considered necessary at the Site based on a mixed use development scheme.

It is likely that works to remove relict buried foundations and slabs will be required to allow construction of deep structures and foundations. Furthermore, it is unlikely that the physical composition of the existing shallow Made Ground soils will be of suitable composition for use in soft planted areas. Imported soils are therefore likely to be required for soft planting and landscaping.

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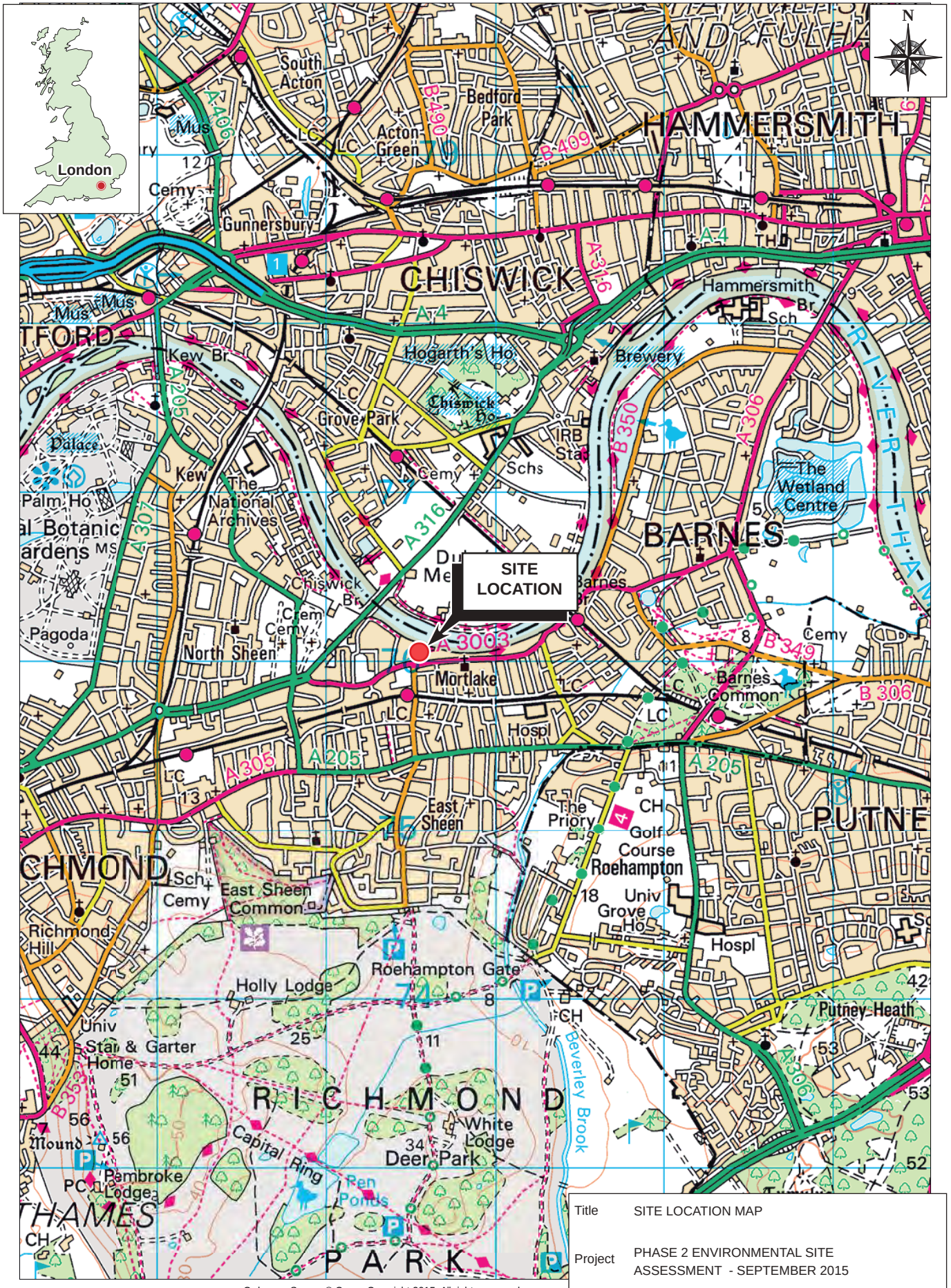
FIGURES



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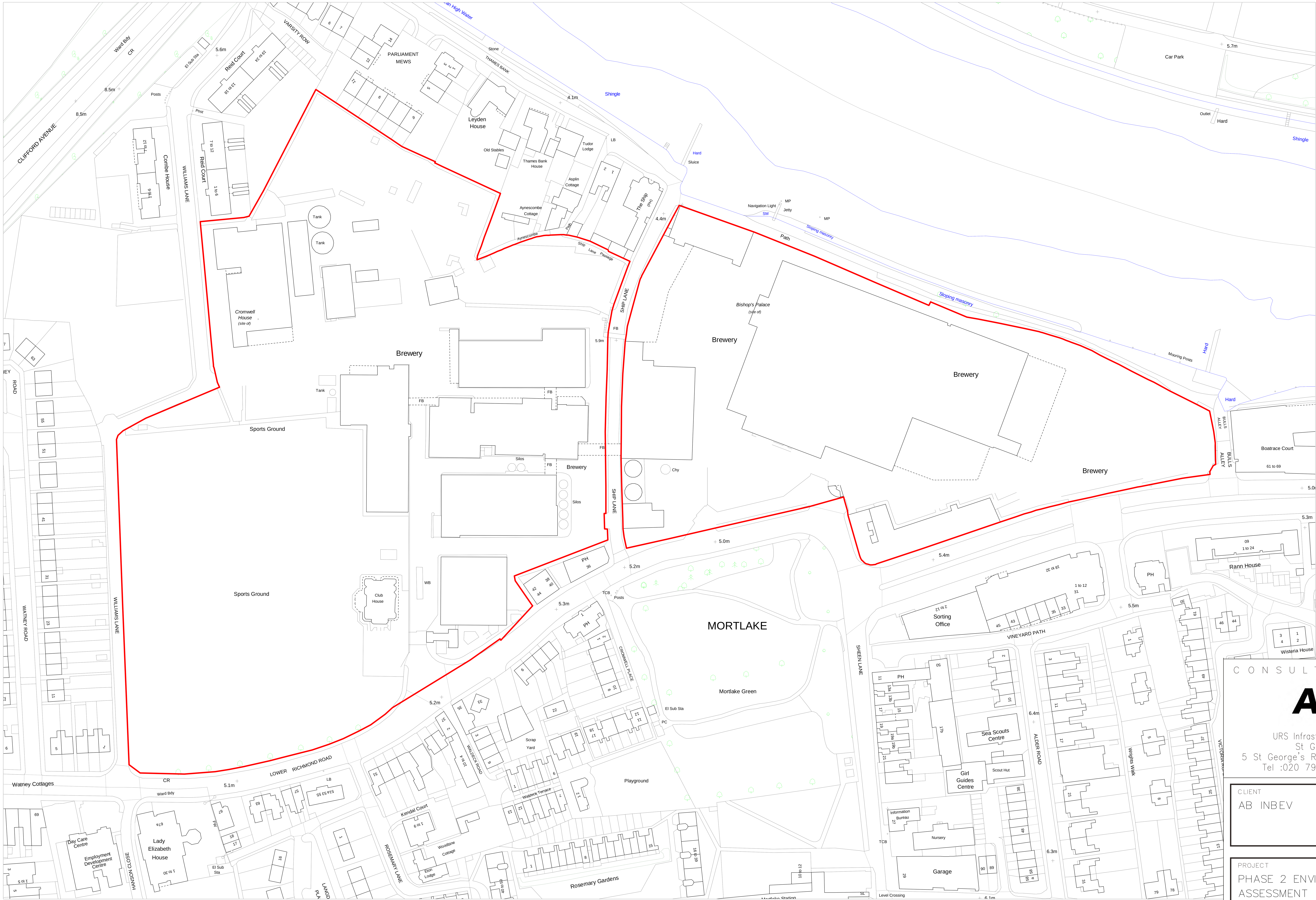
0 1km
SCALE

Title	SITE LOCATION MAP
Project	PHASE 2 ENVIRONMENTAL SITE ASSESSMENT - SEPTEMBER 2015
Client	AB INBEV

AECOM

App'd:	Drawn:	Date:
MM	AM/LCS	SEPT 2015
FINAL		Ref: MM/AM/WIMB
Scale: AS SHOWN		Job No: 47074683
Drg. Size: A4		**FIGURE 1**



N

SITE BOUNDARY

0 50 100 150m

APPROXIMATE SCALE

CONSULTING ENGINEERS

AECOM

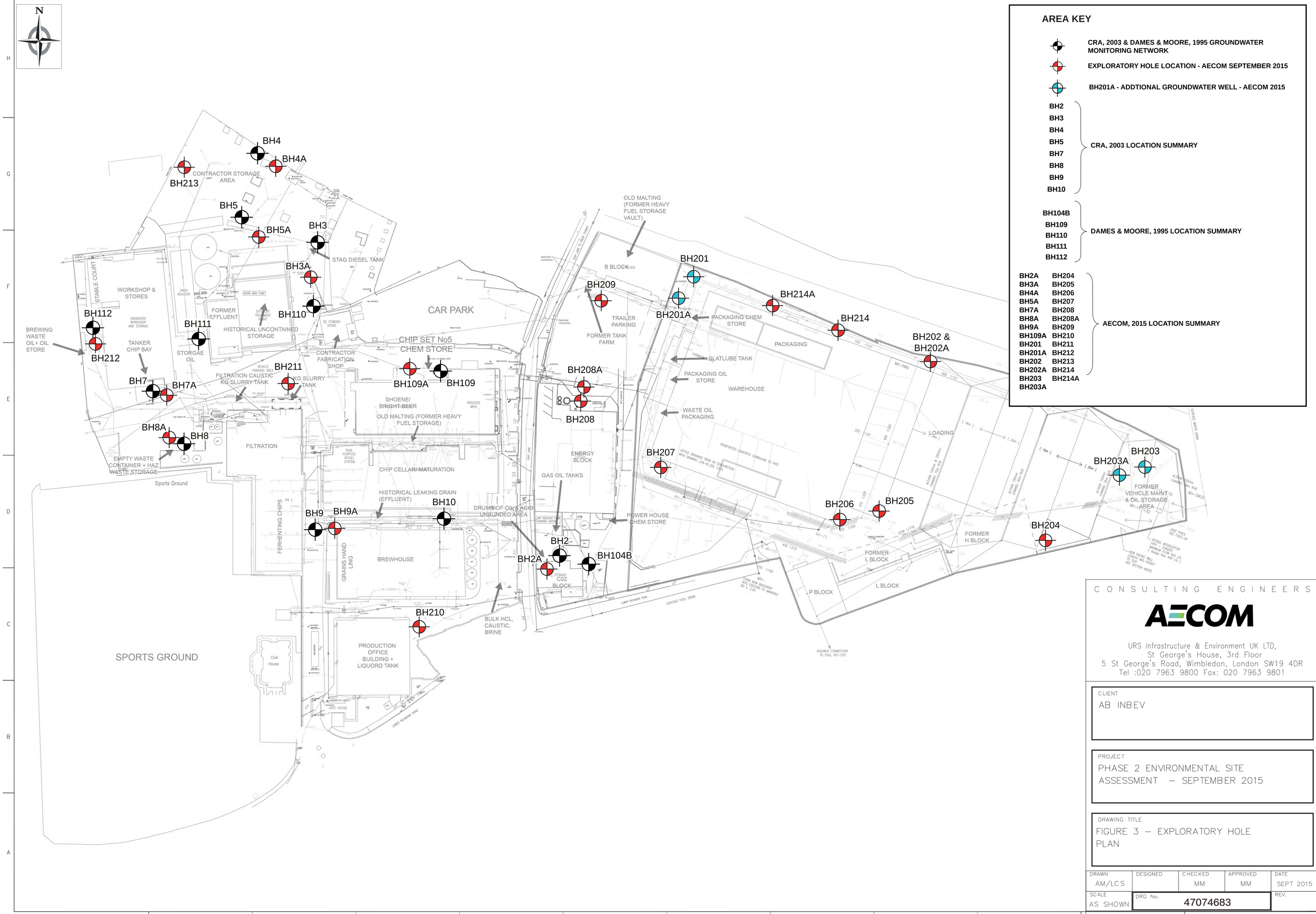
URS Infrastructure & Environment UK LTD,
St George's House, 3rd Floor
5 St George's Road, Wimbledon, London SW19 4DR
Tel :020 7963 9800 Fax: 020 7963 9801

CLIENT
AB INBEV

PROJECT
PHASE 2 ENVIRONMENTAL SITE ASSESSMENT – SEPTEMBER 2015

DRAWING TITLE
FIGURE 2 – SITE LAYOUT PLAN

DRAWN	DESIGNED	CHECKED	APPROVED	DATE
LCS		MM	MM	SEPT 2015
SCALE	DRG No.			REV.
AS SHOWN	47074683			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AREA KEY
CRA, 2003 & DAMES & MOORE, 1995 GROUNDWATER MONITORING NETWORK
EXPLORATORY HOLE LOCATION - AECOM SEPTEMBER 2015
BH201A - ADDTIONAL GROUNDWATER WELL - AECOM 2015
BH2
BH3
BH4
BH5
BH7
BH8
BH9
BH10
CRA, 2003 LOCATION SUMMARY
BH104B
BH109
BH110
BH111
BH112
DAMES & MOORE, 1995 LOCATION SUMMARY
BH2A BH204
BH3A BH205
BH4A BH206
BH5A BH207
BH7A BH208
BH8A BH208A
BH9A BH209
BH109A BH210
BH201 BH211
BH201A BH212
BH202 BH213
BH202A BH214
BH203 BH214A
BH203A
AECOM, 2015 LOCATION SUMMARY
BH4
BH4A
BH213
CONTRACTOR STORAGE AREA
BH5
BH5A
BH3
STAG DIESEL TANK
BH3A
BH110
BH112
BH111
BH212
BREWING WASTE OIL+ OIL STORE
TANKER CHIP BAY
STORGAE OIL
FORMER EFFLUENT
EFFLUENT TREATMENT PLANT
HISTORICAL UNCONTAINED STORAGE
STABLE COURT
WORKSHOP & STORES
ENGINEERS WORKSHOP AND STORAGE
UNOX REACTOR
RISING MAIN SUMP
DE POWDER STORE
CONTRACTOR FABRICATION SHOP
CAR PARK
CHIP SET No5 CHEM STORE
BH109A
BH109
BH7
BH7A
BH211
FILTRATION CAUSTIC KG SLURRY TANK
KG SLURRY TANK
VEHICLE PARKING AREA
SHOENE/ BRIGHT BEER
PROCESS AREA
OLD MALTING (FORMER HEAVY FUEL STORAGE)
BH8A
BH8
FILTRATION
EMPTY WASTE CONTAINER + HAZ WASTE STORAGE
Sports Ground
DUAL PURPOSE VESSEL SYSTEM
CHIP CELLAR/ MATURATION
ENERGY BLOCK
GAS OIL TANKS
HISTORICAL LEAKING DRAIN (EFFLUENT)
BH10
BH9
BH9A
DRUMS OF OIL & ACID UNBUNDED AREA
DRY WEATHER FLOW SAMPLING STATION
POWER HOUSE CHEM STORE
FERHENTING CHIPS
GRAINS HAND LING
BREWHOUSE
BH2
BH2A
BH104B
C02 BLOCK
BH210
BULK HCL, CAUSTIC, BRINE
PRODUCTION OFFICE BUILDING + LIQUORD TANK
Club House
GATE HOUSE
SPORTS GROUND
LOWER RICHMOND ROAD
EXISTING FOUL DRAIN
ASSUMED CONNECTION TO FOUL OFF-SITE
OLD MALTING (FORMER HEAVY FUEL STORAGE VAULT)
B BLOCK
BH209
TRAILER PARKING
FORMER TANK FARM
BH201
BH201A
BH214A
BH214
PACKAGING CHEM STORE
PACKAGING
SLATLUBE TANK
PACKAGING OIL STORE
WAREHOUSE
WASTE OIL PACKAGING
BH208A
BH208
BH207
REINFORCED CONCRETE SURROUND TO PIPE
BH202 & BH202A
LOADING
BH206
BH205
FORMER H BLOCK
FORMER L BLOCK
P BLOCK
L BLOCK
BH204
BH203
BH203A
FORMER VEHICLE MAINT & OIL STORAGE AREA
VENT PIPES SEE 1805-24
NEW FACING WALL LENGTH AND HEIGHT SEE SECTION ABOVE
CONSULTING ENGINEERS
AECOM
URS Infrastructure & Environment UK LTD,
St George's House, 3rd Floor
5 St George's Road, Wimbledon, London SW19 4DR
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CLIENT
AB INBEV
PROJECT
PHASE 2 ENVIRONMENTAL SITE ASSESSMENT – SEPTEMBER 2015
DRAWING TITLE
FIGURE 3 – EXPLORATORY HOLE PLAN
DRAWN AM/LCS
DESIGNED
CHECKED MM
APPROVED MM
DATE SEPT 2015
SCALE AS SHOWN
DRG No. 47074683
REV.

AREA KEY

- GROUNDWATER MONITORING WELL NETWORK - DAMES & MOORE,1995 & CRA, 2003
- BH201A , ADDITIONAL GROUNDWATER MONITORING WELL - AECOM 2015
- 1.950 — GROUNDWATER CONTOUR
- 1.594 — GROUNDWATER ELEVATION
- * — (ANOMOLOUS) DATE, PERCHED WATER
- GROUNDWATER FLOW DIRECTION

BH213 CONTRACTOR STORAGE AREA
BH4 1.350
BH4A
BH5 BH5A 1.330
BH3 1.350
BH3A
BH110 1.435
BH111 1.313
BH112
BH212
BH7 1.315
BH7A
BH211
BH8A
BH8 1.340
BH9 *
BH9A
BH10 Dry
BH210
BH109 1.633
BH109A
BH208A
BH208
BH209
BH103
BH201 1.950
BH201A 1.989
BH214A
BH214
BH202 & BH202A
BH207
BH206
BH205
BH204
BH203
BH203A
BH106B
BH2 1.569
BH2A
BH104B 1.514

1.350 1.450 1.550 1.650 1.750 1.850 1.950

BREWING WASTE OIL+ OIL STORE
TANKER CHIP BAY
EMPTY WASTE CONTAINER + HAZ WASTE STORAGE
STABLE COURT
WORKSHOP & STORES
ENGINEERS WORKSHOP AND STORAGE
FORMER EFFLUENT TREATMENT PLANT
HISTORICAL UNCONTROLLED STORAGE
CONTRACTOR FABRICATION
FILTRATION CAUSTIC KG SLURRY TANK
KG SLURRY TANK
FILTRATION
FERHENTING CHIPS
GRAINS HAND LING
BREWHOUSE
CHIP SET No5 CHEM STORE
CAR PARK
SHOENE/ BRIGHT BEER
OLD MALTING (FORMER HEAVY FUEL STORAGE)
CHIP CELLAR/MATURATION
HISTORICAL LEAKING DRAIN (EFFLUEN
DRUMS OF OIL & ACID UNBUNDED AREA
GAS OIL TANKS
ENERGY BLOCK
POWER HOUSE CHEM STORE
OLD MALTING (FORMER HEAVY FUEL STORAGE VAULT)
B BLOCK
TRAILER PARKING
FORMER TANK FARM
PACKAGING CHEM STORE
PACKAGING
SLATLUBE TANK
PACKAGING OIL STORE
WAREHOUSE
WASTE OIL PACKAGING
LOADING
FORMER VEHICLE MAINT & OIL STORAGE AREA
FORMER H BLOCK
FORMER L BLOCK
P BLOCK
L BLOCK
BULK HCL, CAUSTIC, BRINE
PRODUCTION OFFICE BUILDING + LIQUORD TANK
GATE HOUSE
Club House
SPORTS GROUND
LOWER ROWORD ROAD
EXISTING FOUL DRAIN
ASSUMED CONNECTION TO FOUL OFF-SITE
EXISTING SURFACE WATER DRAIN

CONSULTING ENGINEERS

AECOM

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PROJECT
PHASE 2 ENVIRONMENTAL SITE ASSESSMENT – SEPTEMBER 2015

DRAWING TITLE
FIGURE 4 – GROUNDWATER CONTOUR PLAN, 28TH AUGUST 2015, FULL DIP ROUND

DRAWN	DESIGNED	CHECKED	APPROVED	DATE
LCS		MM	MM	SEPT 2015
SCALE: AS SHOWN	DRG No.: 47074683			REV.

TABLES

Table 1 - Soil Sampling Schedule

Sample ID		BH109A	BH201A	BH201A	BH202A	BH203A	BH204	BH204	BH205	BH205	BH206	BH207	BH207
Depth		0.8	0.7	1.90 - 2.00	0.8	0.50	1.30	3.3	1.00	2.50	1.1	0.70	2.60 - 3.50
Sampling Date		28/08/2015	25/08/2015	25/08/2015	25/08/2015	20/08/2015	21/08/2015	21/08/2015	21/08/2015	21/08/2015	21/08/2015	25/08/2015	25/08/2015
Sample Description		MADE GROUND: Soft, dark brown, sandy, gravelly clay. Sand is fine to coarse. Gravel is fine to medium, angular to subangular of flint, crushed concrete and brick.	MADE GROUND: Brown/red/ yellow, gravelly, fine-coarse sand. Gravel is fine-coarse, angular-subangular of brick, flint and natural stone.	Light brown, dense, medium-fine SAND with occasional rounded flint.	MADE GROUND: Brown, gravelly, fine coarse sand. Gravel is fine-medium, subangular-subrounded of concrete.	MADE GROUND: Very dense, sandy, angular to sub-angular gravel of brick, granite and concrete.	MADE GROUND: Very soft, brown/ red, very sandy clay. Sand is fine-coarse.	Brown, sandy, fine-medium, subangular-subrounded GRAVEL.	MADE GROUND: Very dense, brown, sandy, fine-medium, angular-subangular gravel of brick, concrete, flint, glass. Sand is fine-coarse.	MADE GROUND: Very dense, brown, sandy, fine-medium, angular-subangular gravel of brick, concrete, flint, glass. Sand is fine-coarse.	MADE GROUND: Soft brown sandy clay. Gravel is fine-medium, angular-subangular of brick and concrete.	MADE GROUND: Grey/red, dense, fine to coarse sand and gravel of concrete and brick.	Brown, dense, gravelly SAND. Gravel fine, occasionally medium of flint. Sand is fine to medium.
Scheduled Chem. Group	**Total Analyses**												
Metals in solid samples by OES	12	1	1	1	1	1	1	1	1	1	1	1	1
Hexavalent Chromium	12	1	1	1	1	1	1	1	1	1	1	1	1
PAH by GCMS	12	1	1	1	1	1	1	1	1	1	1	1	1
TPH CWG GC	12	1	1	1	1	1	1	1	1	1	1	1	1
VOC MS	12	1	1	1	1	1	1	1	1	1	1	1	1
EPH CWG (Aliphatic) GC	12	1	1	1	1	1	1	1	1	1	1	1	1
EPH CWG (Aromatic) GC	12	1	1	1	1	1	1	1	1	1	1	1	1
GRO by GC-FID	12	1	1	1	1	1	1	1	1	1	1	1	1
pH	12	1	1	1	1	1	1	1	1	1	1	1	1
Total Organic Carbon	12	1	1	1	1	1	1	1	1	1	1	1	1
Total Sulphate	12	1	1	1	1	1	1	1	1	1	1	1	1
Easily Liberated Sulphide	12	1	1	1	1	1	1	1	1	1	1	1	1
Ammonium Soil by Titration	12	1	1	1	1	1	1	1	1	1	1	1	1
Asbestos ID	10		1	1	1	1	1	1	1	1	1	1	
Asbestos Quant	6		1	1	1	1			1			1	
PCB 7 & WHO 12 (S) by GC MS	0												

Sample ID		BH208A	BH208A	BH209	BH209	BH210	BH210	BH211	BH211	BH212	BH212	BH213	BH213	BH214
Depth		0.8	1.1	0.5	2.70 - 3.40	0.8	2.20 - 2.80	0.7	2.2	0.6	1.80 - 2.50	0.6	1.70 - 2.00	0.85
Sampling Date		25/08/2015	25/08/2015	25/08/2015	25/08/2015	26/08/2015	26/08/2015	26/08/2015	26/08/2015	27/08/2015	27/08/2015	27/08/2015	27/08/2015	25/08/2015
Sample Description		MADE GROUND: Dark brown, slightly clayey, gravelly, fine to coarse sand. Gravel fine occasionally coarse, subangular to subrounded of brick and flint.	Medium density, brown, gravelly, fine to coarse SAND. Gravel is fine to medium, subangular to subrounded of flint.	MADE GROUND: Brown, grey/ black, gravelly, fine to coarse sand. Gravel is fine to coarse, angular to subangular of brick and concrete.	Brown, gravelly, fine to coarse SAND. Gravel is fine to medium, subangular to subrounded of flint. Very little gravel between 3.0 -3.2m.	MADE GROUND: Dense, brown, sandy, fine to coarse, subangular to rounded gravel of natural stones.	Brown, gravelly, fine to coarse SAND. Gravel is fine to medium to subrounded of flint. Becoming more gravelly with depth.	MADE GROUND: Brown, sandy, fine to coarse, subangular to rounded gravel of natural stone, wood and occasional brick. Becoming clayey with depth.	Brown, gravelly, fine to coarse SAND. Gravel is fine to medium, subangular to rounded of flint.	MADE GROUND: Pink / red, gravelly, fine to coarse sand. Gravel is fine to medium of flint with occasional coarse brick and crushed concrete.	Dense, brown, gravelly fine to coarse SAND. Gravel is fine to medium subangular to rounded. becoming more gravelly with depth.	MADE GROUND: Brown / grey, slightly clayey, sandy, fine to coarse, angular to subangular gravel of brick, concrete, tile and plastic. Sand is fine to coarse.	Dense, brown, gravelly, fine to coarse SAND. Gravel is fine to medium, angular to subrounded of flint.	MADE GROUND: Light brown, dense gravelly sand. Sand is medium to coarse. Gravel is medium to coarse, subangular to subrounded of flint and concrete.
Scheduled Chem. Group	**Total Analyses**													
Metals in solid samples by OES	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Hexavalent Chromium	13	1	1	1	1	1	1	1	1	1	1	1	1	1
PAH by GCMS	13	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH CWG GC	13	1	1	1	1	1	1	1	1	1	1	1	1	1
VOC MS	13	1	1	1	1	1	1	1	1	1	1	1	1	1
EPH CWG (Aliphatic) GC	13	1	1	1	1	1	1	1	1	1	1	1	1	1
EPH CWG (Aromatic) GC	13	1	1	1	1	1	1	1	1	1	1	1	1	1
GRO by GC-FID	13	1	1	1	1	1	1	1	1	1	1	1	1	1
pH	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Organic Carbon	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Sulphate	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Easily Liberated Sulphide	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Ammonium Soil by Titration	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Asbestos ID	6	1		1		1		1		1		1		
Asbestos Quant	3	1		1		1								
PCB 7 & WHO 12 (S) by GC MS	1	1												

Sample ID		BH2A	BH2A	BH3A	BH4A	BH4A	BH5A	BH5A	BH7A	BH7A	BH8A	BH8A	BH9A	BH9A
Depth		0.5	1.5	0.5	0.9	3.50 - 4.00	0.5	2.5-3	0.7	2.50 - 3.00	0.5	3.00 - 3.50	0.5	2.2-3.3
Sampling Date		25/08/2015	25/08/2015	28/08/2015	27/08/2015	27/08/2015	28/08/2015	28/08/2015	27/08/2015	27/08/2015	26/08/2015	26/08/2015	26/08/2015	26/08/2015
Sample Description		MADE GROUND: brown sandy fine-medium angular gravel of flint and crushed concrete. Sand is fine-coarse.	Soft, brown, sandy clay.	MADE GROUND: Brown, gravelly, fine coarse sand. Gravel is fine-medium, occasionally coarse, angular-subangular of brick, glass and concrete.	MADE GROUND: Brown, grey, slightly clayey, gravelly, fine-coarse sand. Gravel is fine-medium, angular-subangular of concrete, brick tile and rootlets.	Brown, very gravelly, fine-coarse SAND. Gravel is fine-medium, subangular-subrounded of flint.	MADE GROUND: Brown, slightly clayey, gravelly, fine-coarse sand. Gravel is fine-medium, occasionally coarse, subangular-subrounded of red brick.	Dense, brown, gravelly, fine-coarse SAND. Gravel is fine-medium, subangular-rounded of flint.	MADE GROUND: Soft, dark brown/grey, slightly gravelly, silty clay. Gravel is fine and subangular of red brick with fragments of wood.	Dense, brown, gravelly, fine-coarse SAND. Gravel content increases with depth. Gravel is fine-medium, subangular-subrounded of flint.	MADE GROUND: Black sand and gravel. Gravel is medium to coarse, angular to sub-rounded of flint. Sand is fine-coarse of ash.	Dense, brown, gravelly, fine-coarse SAND. Gravel is fine-medium subangular-rounded of flint.	MADE GROUND: Dense, brown, gravelly, fine-coarse sand. Gravel is fine-medium, subrounded-rounded of natural stone, becoming clayey with depth. Poor recovery.	MADE GROUND: black, sandy, fine-medium, angular, red/grey gravel of flint and crushed concrete. Sand is fine-coarse.
Scheduled Chem. Group	**Total Analyses**													
Metals in solid samples by OES	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Hexavalent Chromium	13	1	1	1	1	1	1	1	1	1	1	1	1	1
PAH by GCMS	13	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH CWG GC	13	1	1	1	1	1	1	1	1	1	1	1	1	1
VOC MS	13	1	1	1	1	1	1	1	1	1	1	1	1	1
EPH CWG (Aliphatic) GC	13	1	1	1	1	1	1	1	1	1	1	1	1	1
EPH CWG (Aromatic) GC	13	1	1	1	1	1	1	1	1	1	1	1	1	1
GRO by GC-FID	13	1	1	1	1	1	1	1	1	1	1	1	1	1
pH	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Organic Carbon	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Sulphate	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Easily Liberated Sulphide	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Ammonium Soil by Titration	13	1	1	1	1	1	1	1	1	1	1	1	1	1
Asbestos ID	8	1		1	1		1	1	1		1		1	
Asbestos Quant	2	1			1									
PCB 7 & WHO 12 (S) by GC MS	0													

Table 2 - Groundwater Sampling Schedule

	Sample ID	BH2	BH3	BH4	BH5	BH7	BH8	BH9	BH10
	Sampling Date	02/09/2015	01/09/2015	01/09/2015	01/09/2015	01/09/2015	01/09/2015	02/09/2015	01/09/2015
Scheduled Chem. Group	Total Analyses								
Toxic 9 Metals Filtered (W)	7	1	1	1	1	1	1	1	1
COD, unfiltered	7	1	1	1	1	1	1	1	1
Ammoniacal Nitrogen as N	7	1	1	1	1	1	1	1	1
Ammoniacal Nitrogen as NH4	7	1	1	1	1	1	1	1	1
Nitrate as NO3	7	1	1	1	1	1	1	1	1
Phosphate (ortho) as PO4	7	1	1	1	1	1	1	1	1
Sulphate	7	1	1	1	1	1	1	1	1
Boron (diss.filt)	7	1	1	1	1	1	1	1	1
Metals Prep	7	1	1	1	1	1	1	1	1
VOC (W) by GC MS	7	1	1	1	1	1	1	1	1
pH Value	7	1	1	1	1	1	1	1	1
TPH Total (Includes EPH Total and GRO Total)	7	1	1	1	1	1	1	1	1
BTEX & MTBE	7	1	1	1	1	1	1	1	1

	Sample ID	BH104B	BH109	BH110	BH111	BH201A	DUP01 (BH4)
	Sampling Date	02/09/2015	01/09/2015	01/09/2015	01/09/2015	02/09/2015	01/09/2015
Scheduled Chem. Group	Total Analyses						
Toxic 9 Metals Filtered (W)	6	1	1	1	1	1	1
COD, unfiltered	6	1	1	1	1	1	1
Ammoniacal Nitrogen as N	6	1	1	1	1	1	1
Ammoniacal Nitrogen as NH4	6	1	1	1	1	1	1
Nitrate as NO3	6	1	1	1	1	1	1
Phosphate (ortho) as PO4	6	1	1	1	1	1	1
Sulphate	6	1	1	1	1	1	1
Boron (diss.filt)	6	1	1	1	1	1	1
Metals Prep	6	1	1	1	1	1	1
VOC (W) by GC MS	5	1	1	1	1	1	0
pH Value	6	1	1	1	1	1	1
TPH Total (Includes EPH Total and GRO Total)	6	1	1	1	1	1	1
BTEX & MTBE	6	1	1	1	1	1	1