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Site	CO2, West Waterloo Dock, Liverpool
Job Number:	CCG-C-18-10350
Trial Pit Number:	TP6
Plate Number:	1

APPENDIX G

ROCK CORE PHOTOGRAPHS


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH1 6.70-9.70mbgl
KATUN
6.7
8.2
8.2
9.7


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH1 9.70-12.70mbgl
KATUN
9.7
11.2
11.2
12.7


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH2 7.20-10.20mbgl
KATUN
7.2
8.7
8.7
10.2


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH2 10.20-13.20mbgl
KATUN
10.2
11.7
11.7
13.2


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH3 7.50-10.50mbgl
KATUN
7.5
9.0
9.0
10.5


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH3 10.50-13.50mbgl
KATUN
10.5
12.0
12.0
13.5


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH4 9.80-10.80mbgl
KATUN
9.8
10.8


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH4 10.80-13.80mbgl
KATI IN
10.8
12.3
12.3
13.8


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH5 18.30-21.30mbgl
KATUN
18.3
19.3
19.3
20.3
20.3
21.3


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH5 21.30-23.30mbgl
21.3
22.3
22.3
23.3


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH5 23.30-26.30mbgl
KATUN
23.3
24.8
24.8
26.3


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH6 18.50-19.10mbgl
18.5
19.1


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH6 20.60-23.60mbgl
KATUN
20.6
22.1
22.1
23.6


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH6 23.60-26.60mbgl
23.6
25.1
25.1
26.6


CCG REF: CCG-C-18-10350
SITE: CO2, WEST WATERLOO DOCK, LIVERPOOL
CLIENT: ROMAL CAPITAL
BH7 15.60-18.60mbgl
15.6
17.1
17.1
18.6

APPENDIX H

GAS AND GROUNDWATER MONITORING DATA

GAS AND WATER MONITORING RESULTS

	Date:	15-Oct-18	19-Oct-18	24-Oct-18	30-Oct-18								
	Visit Number	1	2	3	4								
	Atmos Press mb	1015	1027	1031	1001								
	Pressure Trend	Steady	Steady	Steady	Steady								
	Air Temp °C	12	12	12									
	Cloud cover	Clear	Cloudy	Overcast	Clear								
	Wind velocity	Moderate	Moderate	Strong									
	Precipitation	Dry	Dry	Dry	Dry								
	State of Ground	Dry	Dry	Damp	Dry								
BH4	CH_4 (%) (max/steady):	0.0	0.0	0.0	0.0								
	CO_2 (%) (max/steady):	0.0	0.1	0.0	0.0								
	O_2 (%) (max/steady):	20.4	19.9	20.1	19.8								
	H_2S (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	CO (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	PID (ppm) (max/steady)	0.0	0.0	0.0	0.0								
	Flow (l/hr) (max/steady)	<0.1	<0.1	<0.1	<0.1								
	Water Level / depth to base (m):	5.81	6.49	Dry	6.38								
BH5	CH_4 (%) (max/steady):	0.0	0.0	0.0	0.0								
	CO_2 (%) (max/steady):	0.0	0.0	0.0	0.0								
	O_2 (%) (max/steady):	20.4	20.2	20.0	19.8								
	H_2S (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	CO (ppm) (max/steady):	0.0	0.0	0.0	0.0								
	PID (ppm) (max/steady)	0.0	0.0	0.0	0.0.								
	Flow (l/hr) (max/steady)	<0.1	<0.1	<0.1	<0.1								
	Water Level / depth to base (m):	3.23	3.20	2.81	3.15								
BH6	CH_4 (%) (max/steady):	Not Drilled	0.0	0.0	0.0								
	CO_2 (%) (max/steady):	Not Drilled	0.1	0.1	0.0								
	O_2 (%) (max/steady):	Not Drilled	20.1	20.0	19.9								
	H_2S (ppm) (max/steady):	Not Drilled	0.0	0.0	0.0								
	CO (ppm) (max/steady):	Not Drilled	0.0	0.0	0.0								
	PID (ppm) (max/steady)	Not Drilled	0.0	0.0	0.0								
	Flow (l/hr) (max/steady)	Not Drilled	<0.1	<0.1	<0.1								
	Water Level / depth to base (m):	Not Drilled	3.08	2.64	3.80								
BH7	CH_4 (%) (max/steady):	Not Drilled	0.0	0.0	0.0								
	CO_2 (%) (max/steady):	Not Drilled	0.0	0.0	0.0								
	O_2 (%) (max/steady):	Not Drilled	20.2	20.1	19.9								
	H_2S (ppm) (max/steady):	Not Drilled	0.0	0.0	0.0								
	CO (ppm) (max/steady):	Not Drilled	0.0	0.0	0.0								
	PID (ppm) (max/steady)	Not Drilled	0.0	0.0	0.0								
	Flow (l/hr) (max/steady)	Not Drilled	<0.1	<0.1	<0.1								
	Water Level / depth to base (m):	Not Drilled	2.65	3.11	Dry								

CCG-CMS-FO-129

Issue 2

Job No: CCG-C-18-10350 | **Site: CO2, West Waterloo Dock, Liverpool**

Instrument: **GSXI**

TEST DATE AND CONDITIONS		
Date	20/06/2018	
Atmospheric Pressure	1000	mB
Ambient Temperature	23.4	°C
Environics Serial No.	5089	

GAS DATA LTD
Unit 4, Fairfield Court
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LJ
Tel 02476303311 Fax 02476307711

GFM436 Final Inspection & Calibration Check Certificate

Customer	C C Geotechnical
Certificate Number	120242
Order Number	319979

Serial Number	12220
Software Version	G436-00.0027/0009

Recalibration DUE Date
20/06/2019

Instrument Checks					
Keyboard	✓		Display Contrast	✓	
Pump Flow In	450	*Accept > 200 cc/min*	Pump Flow @ -200mB	250	*Accept > 200 cc/min*
Clock Set / Running	✓		Labels Fitted	✓	

Gas Checks						
Sensor	CH_4		CO_2		O_2	
	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %
	60.1	60	40.3	40	20.9	20.9
	Accept ±3.0		*Accept ±3.0*		*Accept ±0.5*	
	4.9	5	5	5	6	6
	Accept ±0.3		*Accept ±0.3*		*Accept ±0.3*	
Zero Reading 100% N2	0	0	0	0	0	0
	Accept ±0.0		*Accept ±0.0*		*Accept ±0.1*	

Optional Gas Checks						
Applied Gas & Range		Concentration Tested @ (ppm)	Instrument Readings *(ppm)*			
Gas Type	Range *(ppm)*		Zero Reading		Instrument Gas Reading	
H2S	5000	*1500*	0	*Accept ±0.0*	1500	*Accept ±5.0*
CO	2000	*1000*	0	*Accept ±0.0*	1003	*Accept ±5.0*
				Accept ±0.0		*Accept ±5.0*
				Accept ±0.0		*Accept ±5.0*
Hexane	*2.0%*	2.0%	0	*Accept ±0.0*	1.99	*Accept ±10.0*

Cross Gas Effects									
Applied Gas *(ppm)*		Instrument Readings *(ppm)*							
Gas Type	Concentration	Toxic 1:	H2S	Toxic 2:	CO	Toxic 3:			
H2S	*1500*	1500		0					
CO	*1000*	90		1003					
Hexane	*2.0%*	0		0					

Pressure Checks			
Atmospheric Pressure [AP] *(mB)*			
Current Atmospheric Pressure (mB)		Instrument Atmospheric Pressure Reading (mB)	
AP Open Ports		1000	*Accept ±2.0*
AP Port (Internal)	*+800 mB*	800	*Accept ±5.0*
	+1200mb	1200	*Accept ±5.0*

Flow Checks					
Borehole Flow			Differential Pressure		
Applied Reading *(l/h)*	Instrument Reading *(l/h)*		Applied Pressure *(Pa)*	Instrument Reading *(Pa)*	
-30	-30.9	*Accept ±3.0*	-452	-482	*Accept ±50*
-3	-3.1	*Accept ±1.0*	-19	-22	*Accept ±6.0*
0	0	*Accept ±0.0*	0	0	*Accept ±0.5*
3	3	*Accept ±0.5*	16	17	*Accept ±3.0*
30	30.9	*Accept ±3.0*	339	359	*Accept ±50*
60	61.3	*Accept ±6.0*	1023	1070	*Accept ±130*
90	91.1	*Accept ±9.0*	1998	O/R	*Accept ±250*

Temperature Checks		
Calibration Temperature Applied Temperature °C	Instrument Temperature Reading °C	
-10	-10	*Accept ±2.0*
0	0	*Accept ±1.0*
30	30	*Accept ±1.0*
60	60	*Accept ±1.0*
100	100.5	*Accept ±1.0*

Technician:	Date Tested:
Les Treece	*20/06/19*

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to BS EN ISO9001:2015. Certificate NQA 8374. Valid until 22/03/2019

APPENDIX I

SOIL & ROCK ENGINEERING TEST DATA

Units 1 & 2
Deltic Place
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CC GEOTECHNICAL LTD
Consulting Geoenvironmental and Geotechnical Engineers

LABORATORY REPORT

CONTRACT NUMBER: CCG-C-18-10350

CONTRACT TITLE: CO2, WEST WATERLOO DOCK, LIVERPOOL

CLIENT: ROMAL CAPITAL
43 Castle Street, Liverpool, L2 9TL

DATE RECEIVED: 20/09/18
DATE COMMENCED: 20/09/18
DATE COMPLETED: 18/10/18
REPORT DATE: 19/10/18

Test Description	Qty
Particle Size Distribution BS 1377-2:1990 (a)	20
Point Load Test Int. J. Rock Mech. Sci. & Geomech. Abstr. Vol.22, No.2, pp. 51 - 60, 1985 (#)	71
Uniaxial Compressive Strength ISRM Vol 16 No 2, pp 135-140 1979 (#)	9
Concrete Core Compressive Strength BS EN 12504-1:2009 (a)	1

Notes: Observations and interpretations are not accredited by UKAS
# denotes non-accredited test
a denotes UKAS accredited test
s denotes test undertaken by approved subcontractor

Approved Signatories: Chris Bolan (Managing Director) – Daniel Kerfoot (Laboratory Manager)

CCG-CMS-FO-200 Issue 3

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH1	B	0.50	1.00	-	-	-	-	-	-	-	-	-	Y	Dark grey silty sandy GRAVEL. Gravel is fine to coarse subangular sandstone, concrete, slag, brick, cinders. (MADE GROUND) (BS1377:Pt2:9.2)
BH1	B	1.50	2.00	-	-	-	-	-	-	-	-	-	Y	Dark grey silty sandy GRAVEL. Gravel is fine to coarse subangular sandstone, limestone, slag, brick, cinders. (MADE GROUND) (BS1377:Pt2:9.2)
BH1	B	2.50	3.00	-	-	-	-	-	-	-	-	-	Y	Dark grey silty sandy GRAVEL. Gravel is fine to coarse subangular sandstone, limestone, slag, brick, ceramic, glass. (MADE GROUND) (BS1377:Pt2:9.2)
BH1	B	3.50	4.00	-	-	-	-	-	-	-	-	-	Y	Dark grey very gravelly silty SAND. Gravel is fine to coarse angular to subrounded concrete, sandstone, brick, glass. (MADE GROUND) (BS1377Pt2:9.2)
BH1	B	4.50	5.00	-	-	-	-	-	-	-	-	-	Y	Dark grey very silty very sandy GRAVEL. Gravel is fine to coarse subangular to subrouded brick, sandstone, limestone, granite, coal, metal fragments. (MADE GROUND) (BS1377Pt2:9.2)

SITE: WATERLOO DOCK (CCG-C-18-10350) DATE: 22.09.18

CLIENT: ROMAL CAPITAL

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

CC Geotechnical Ltd
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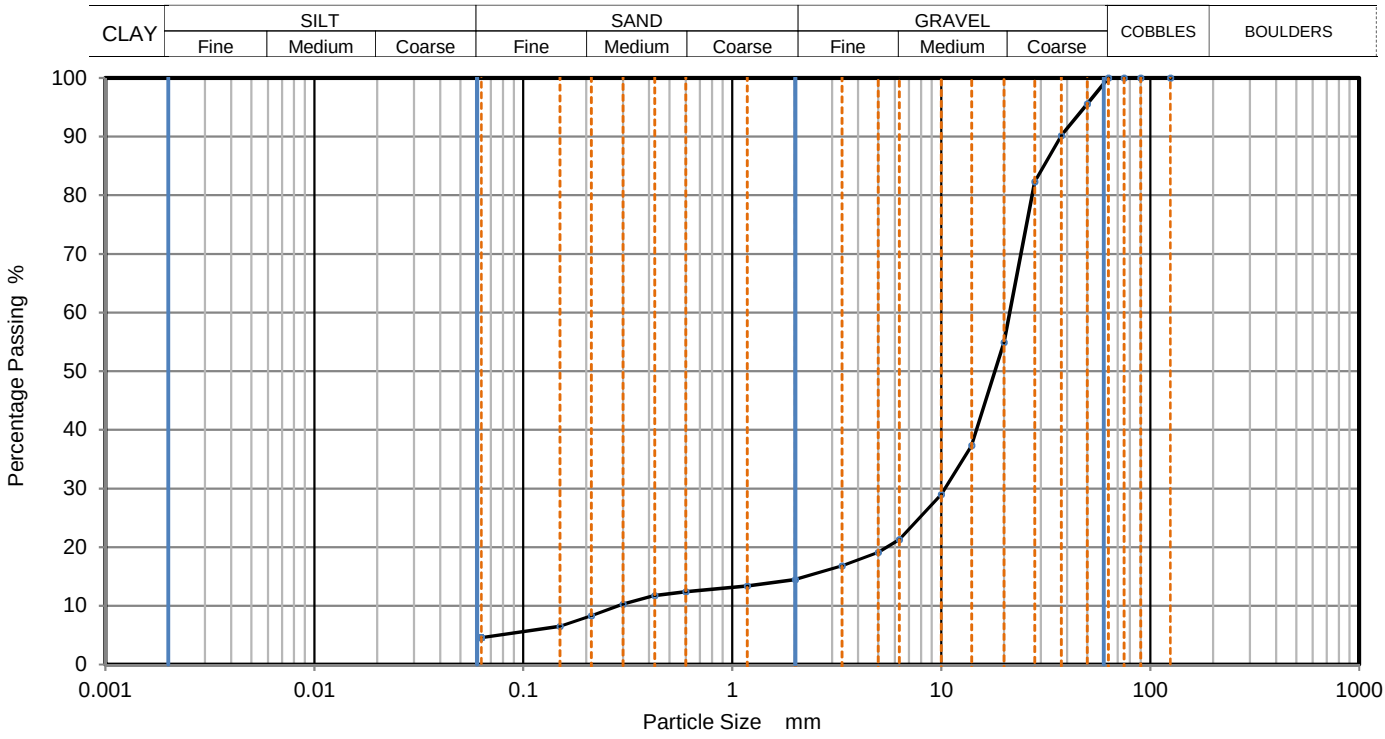
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH1
Site Name	WATERLOO DOCK			Sample No.	1
Specimen Description	Dark grey silty sandy GRAVEL. (MADE GROUND)			Depth, m	0.5-1.0
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	96		
37.5	90		
28	82		
20	55		
14	37		
10	29		
6.3	21		
5	19		
3.35	17		
2	14		
1.18	13		
0.6	12		
0.425	12		
0.3	10		
0.212	8		
0.15	7		
0.063	5		

Dry Mass of sample, g	2013

Sample Proportions	% dry mass
Very coarse	0
Gravel	86
Sand	9
Fines <0.063mm	5

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
JE	DK	DK	25/09/2018 09:16	Sheet

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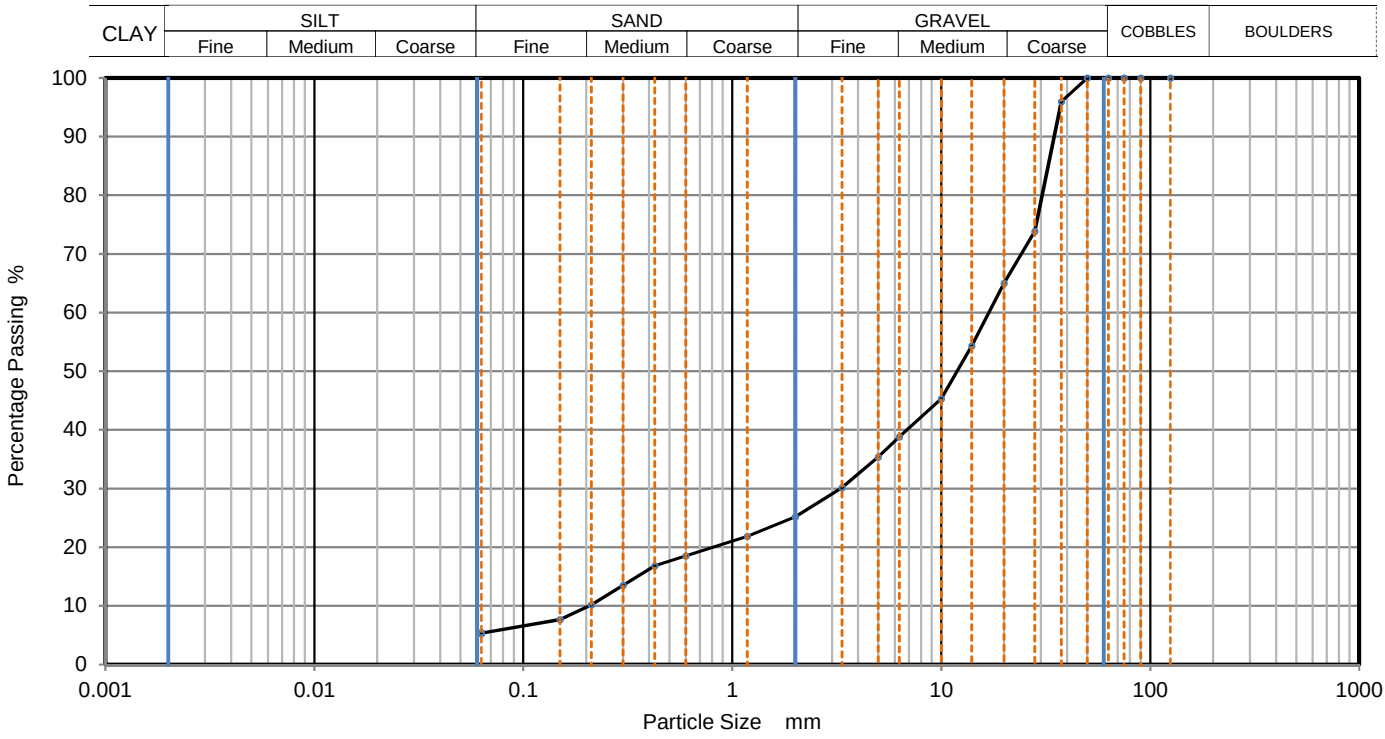
e: lab@ccgeotechnical.com

PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH1
Site Name	WATERLOO DOCK			Sample No.	2
Specimen Description	Dark grey silty sandy GRAVEL. (MADE GROUND)			Depth, m	1.5-2.0
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	96		
28	74		
20	65		
14	54		
10	45		
6.3	39		
5	35		
3.35	30		
2	25		
1.18	22		
0.6	19		
0.425	17		
0.3	14		
0.212	10		
0.15	8		
0.063	5		

Dry Mass of sample, g	2012

Sample Proportions	% dry mass
Very coarse	0
Gravel	75
Sand	20
Fines <0.063mm	5

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
JE	DK	DK	25/09/2018 09:17	Sheet

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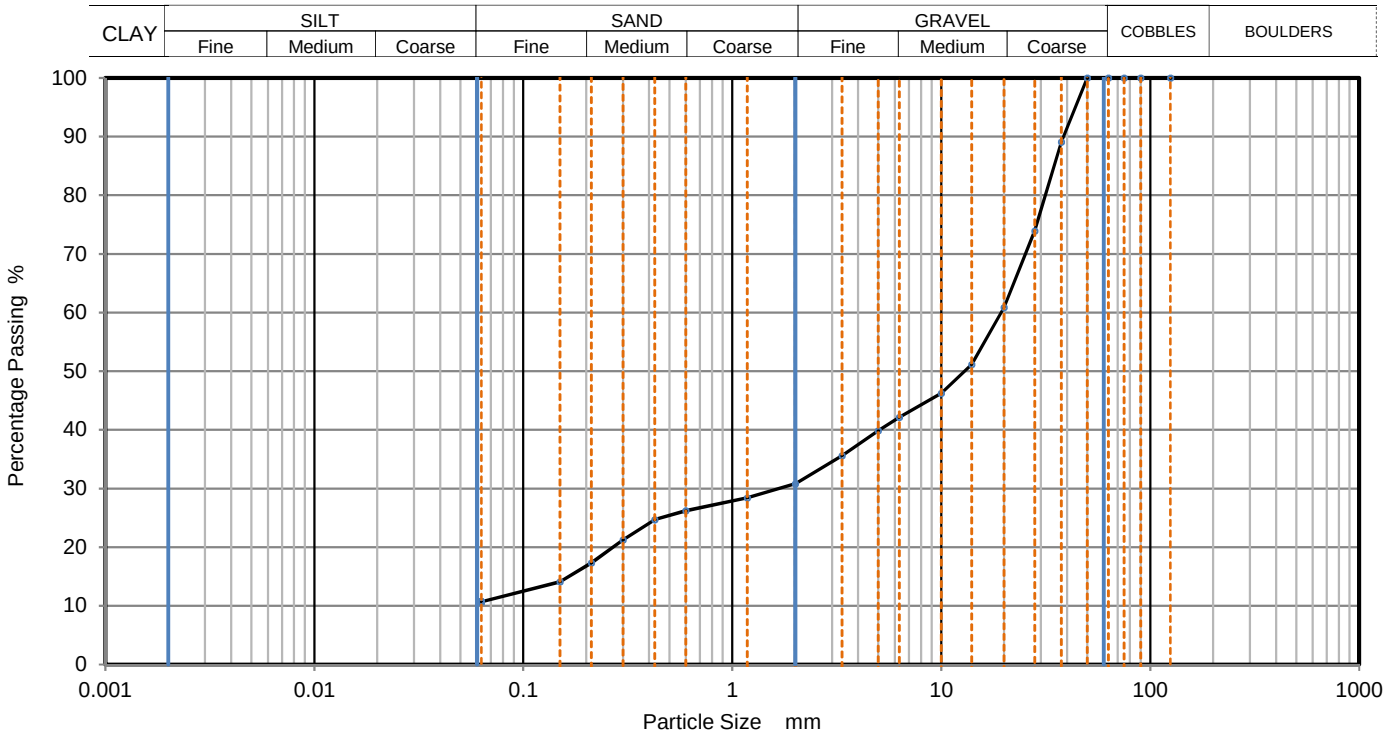
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH1
Site Name	WATERLOO DOCK			Sample No.	3
Specimen Description	Dark grey silty sandy GRAVEL. (MADE GROUND)			Depth, m	2.5-3.0
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	89		
28	74		
20	61		
14	51		
10	46		
6.3	42		
5	40		
3.35	36		
2	31		
1.18	28		
0.6	26		
0.425	25		
0.3	21		
0.212	17		
0.15	14		
0.063	11		

Dry Mass of sample, g: 2455

Sample Proportions	% dry mass
Very coarse	0
Gravel	69
Sand	20
Fines <0.063mm	11

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
JE	DK	DK	25/09/2018 09:18	Sheet

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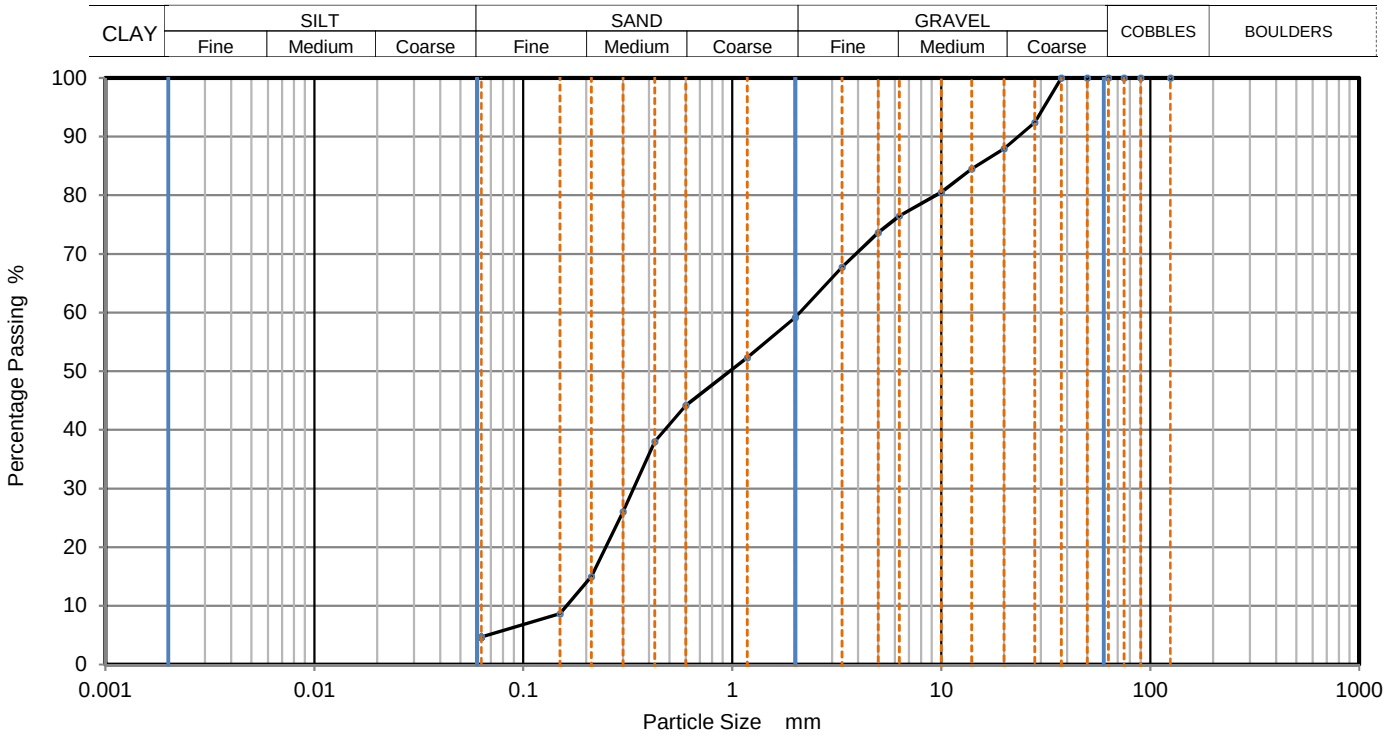
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH1
Site Name	WATERLOO DOCK			Sample No.	4
Specimen Description	Dark grey very gravelly silty SAND. (MADE GROUND)			Depth, m	3.5-4.0
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	92		
20	88		
14	85		
10	81		
6.3	76		
5	74		
3.35	68		
2	59		
1.18	52		
0.6	44		
0.425	38		
0.3	26		
0.212	15		
0.15	9		
0.063	5		

Dry Mass of sample, g: 2041

Sample Proportions	% dry mass
Very coarse	0
Gravel	41
Sand	54
Fines <0.063mm	5

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
JE	DK	DK	25/09/2018 09:21	Sheet

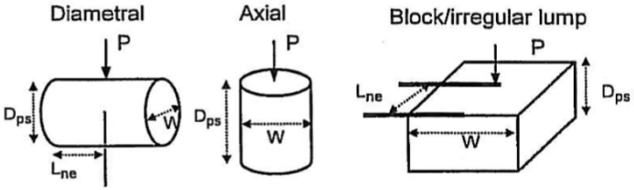
POINT LOAD TEST RESULTS

Int. J. Rock Mech. Sci. & Geomech. Abstr. Vol.22, No.2, pp. 51 - 60, 1985

PROJECT No.:- CCG-C-18-10350 SITE:- CO2, WEST WATERLOO DOCK, LIVERPOOL

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH1	6.90	a			85.41	42	1.60	68	0.35	1.15	0.40	8.02	NAT	P
BH1	7.45	a			85.61	53	2.10	76	0.36	1.21	0.44	8.78	NAT	P
BH1	8.00	a			85.70	57	3.10	79	0.50	1.23	0.61	12.24	NAT	P
BH1	8.55		d		62	86	4.40	-	0.59	1.28	0.76	15.19	NAT	L
BH1	9.10	a			85.35	45	4.30	70	0.88	1.16	1.02	20.45	NAT	P
BH1	9.60	a			85.41	51	3.50	74	0.63	1.20	0.75	15.10	NAT	P
BH1	9.95	a			85.55	42	3.60	68	0.79	1.15	0.90	18.03	NAT	P
BH1	10.25	a			85.68	43	2.00	68	0.43	1.15	0.49	9.82	NAT	P
BH1	10.60	a			85.71	60	4.10	81	0.63	1.24	0.78	15.55	NAT	P
BH1	11.50	a			85.74	38	5.60	64	1.35	1.12	1.51	30.26	NAT	P
BH1	11.90	a			85.48	58	5.40	79	0.86	1.23	1.05	21.07	NAT	P
BH1	12.40		d		52	86	3.70	-	0.50	1.28	0.64	12.77	NAT	P

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)



DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**CO2, WEST WATERLOO DOCK, LIVERPOOL**
CLIENT:	**ROMAL CAPITAL**
CCG REF:	**CCG-C-18-10350**
Sample ref:	BH1 10.40mbgl
Date of coring:	18/09/2018
Sampled by:	CB/KM
Sample description:	Sandstone

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	4m 21s
Maximum load at failure (kN):	45.6
Compressive strength (N/mm2):	**8.0**
Test date:	11/10/2018
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**CO2, WEST WATERLOO DOCK, LIVERPOOL**
CLIENT:	**ROMAL CAPITAL**
CCG REF:	**CCG-C-18-10350**
Sample ref:	BH1 11.70mbgl
Date of coring:	18/09/2018
Sampled by:	CB/KM
Sample description:	Sandstone

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	4m 25s
Maximum load at failure (kN):	41.7
Compressive strength (N/mm2):	**7.4**
Test date:	11/10/2018
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

CCG-CMS-FO-200 Issue 3

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH2	B	0.50	0.50	-	-	-	-	-	-	-	-	-	Y	Dark grey very sandy silty GRAVEL. Gravel is fine to coarse subrounded to subangular cinders, sandstone, concrete, limestone, glass, shell, brick, wood, slag. (MADE GROUND) (BS1377Pt2:9.2)
BH2	B	1.00	1.00	-	-	-	-	-	-	-	-	-	Y	Dark grey very sandy silty GRAVEL. Gravel is fine to coarse subrounded to subangular concrete, brick, sandstone, cinders, limestone. (MADE GROUND) (BS1377Pt2:9.2)
BH2	B	1.50	1.50	-	-	-	-	-	-	-	-	-	Y	Dark grey silty SAND & GRAVEL. Gravel is fine to coarse subangular to subrounded brick, sandstone, granite, slag. (MADE GROUND) (BS1377Pt2:9.2)
BH2	B	2.50	2.50	-	-	-	-	-	-	-	-	-	Y	Dark grey silty very gravelly fine to coarse grained SAND. Gravel is fine to coarse subangular to subrounded sandstone, brick, granite, wood, limestone, glass. (MADE GROUND) (BS1377Pt2:9.2)
BH2	B	3.50	3.50	-	-	-	-	-	-	-	-	-	Y	Dark grey very sandy slightly silty GRAVEL. Gravel is fine to coarse subangular to subrounded concrete, sandstone, glass, brick, granite, cinders. (MADE GROUND) (BS1377Pt2:9.2)
BH2	B	4.50	4.50	-	-	-	-	-	-	-	-	-	Y	Dark grey very sandy slightly silty GRAVEL. Gravel is fine to coare subangular to subrounded limestone, brick, glass, concrete. (MADE GROUND) (BS1377Pt2:9.2)
BH2	B	6.00	6.00	-	-	-	-	-	-	-	-	-	Y	Dark grey very sandy slightly silty GRAVEL. Gravel is fine to coarse subangular to subrounded concrete, brick, glass, granite. (MADE GROUND) (BS1377Pt2:9.2)
BH2	B	7.50	7.50	-	-	-	-	-	-	-	-	-	Y	Dark grey very sandy slightly silty GRAVEL. Gravel is fine to coarse subangular to subrounded concrete, sandstone, limestone, granite, brick, cinders. (MADE GROUND) (BS1377Pt2:9.2)

SITE: WATERLOO DOCK (CCG-C-18-10350) DATE: 22.09.18

CLIENT: ROMAL CAPITAL

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

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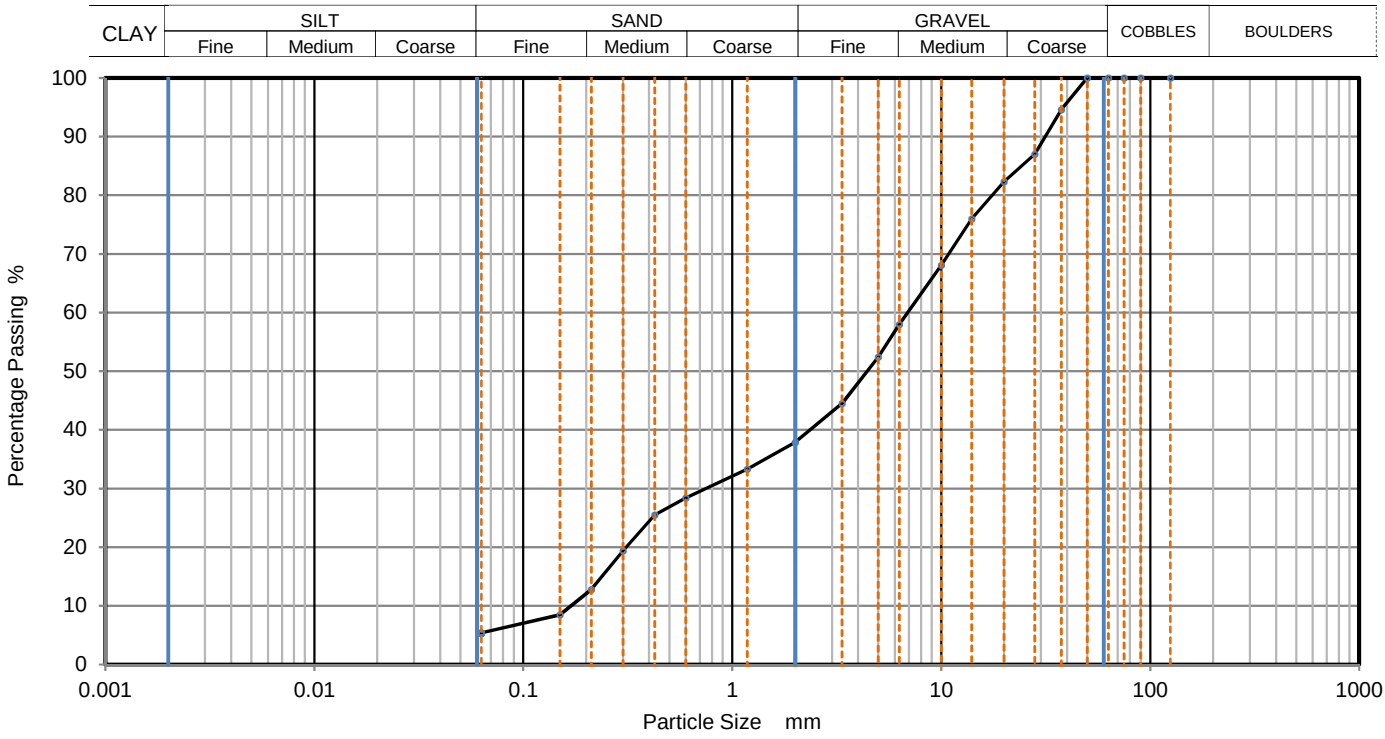
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH2
Site Name	WATERLOO DOCK			Sample No.	1
Specimen Description	Dark grey very sandy silty GRAVEL. (MADE GROUND)			Depth, m	0.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	95		
28	87		
20	82		
14	76		
10	68		
6.3	58		
5	52		
3.35	45		
2	38		
1.18	33		
0.6	28		
0.425	26		
0.3	19		
0.212	13		
0.15	9		
0.063	5		

Dry Mass of sample, g: 3396

Sample Proportions	% dry mass
Very coarse	0
Gravel	62
Sand	33
Fines <0.063mm	5

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	22/09/2018 13:38	Sheet

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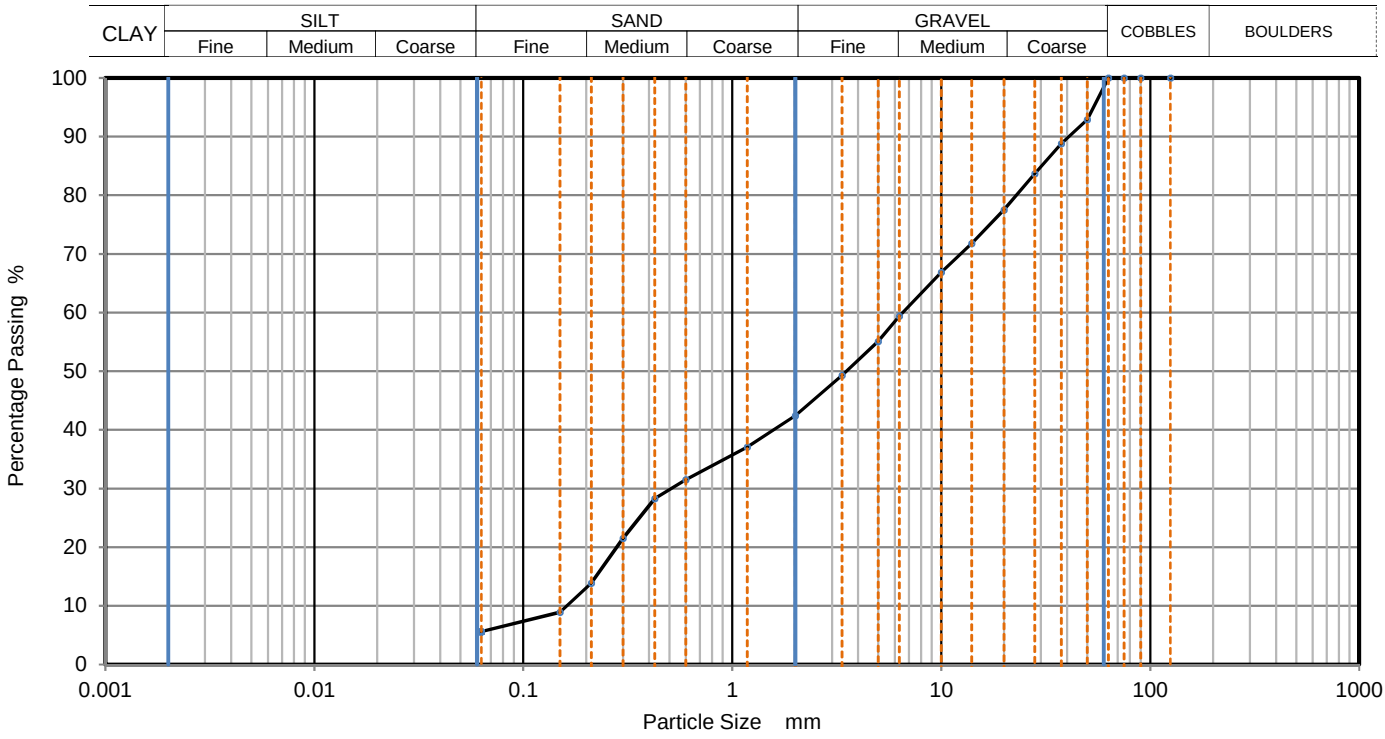
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH2
Site Name	WATERLOO DOCK			Sample No.	2
Specimen Description	Dark grey very sandy silty GRAVEL. (MADE GROUND)			Depth, m	1.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	93		
37.5	89		
28	84		
20	78		
14	72		
10	67		
6.3	59		
5	55		
3.35	49		
2	42		
1.18	37		
0.6	32		
0.425	28		
0.3	22		
0.212	14		
0.15	9		
0.063	6		

Dry Mass of sample, g	3324

Sample Proportions	% dry mass
Very coarse	0
Gravel	58
Sand	36
Fines <0.063mm	6

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	22/09/2018 13:40	Sheet

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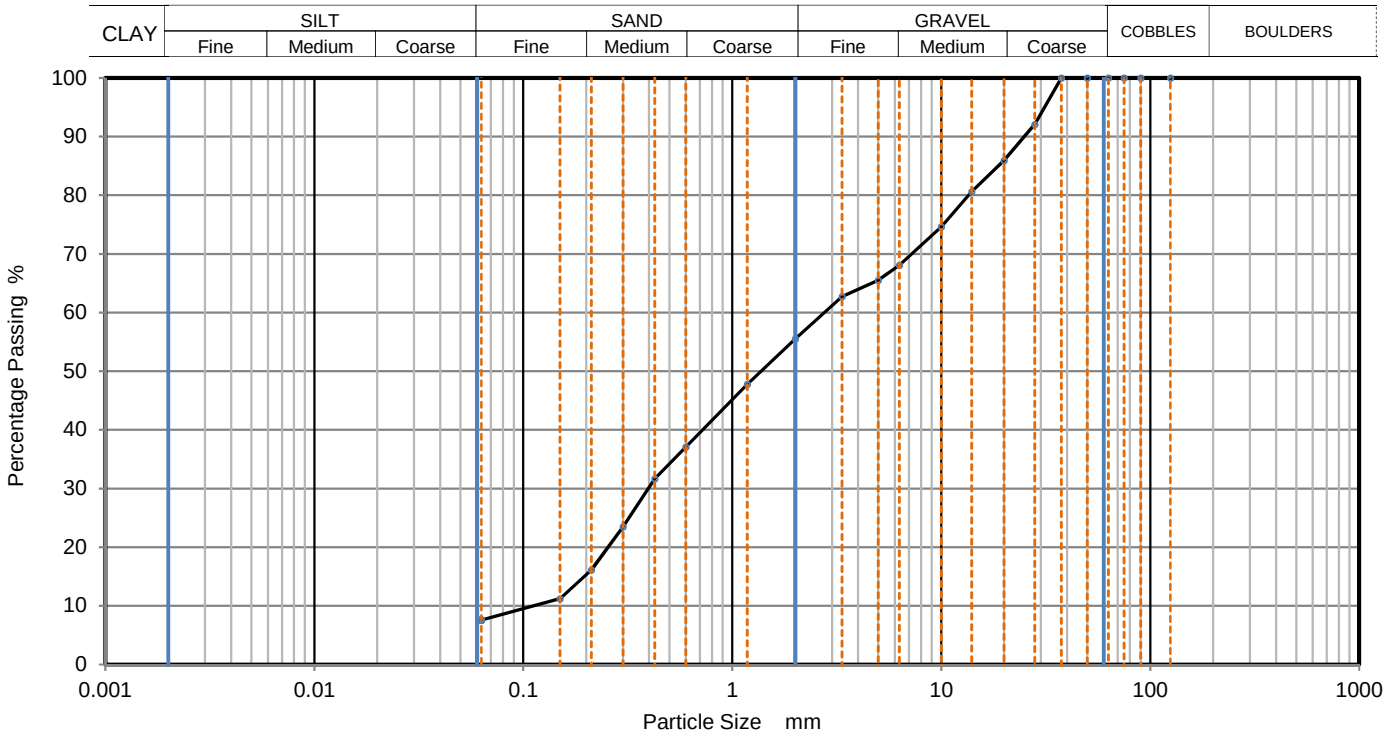
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH2
Site Name	WATERLOO DOCK			Sample No.	3
Specimen Description	Dark grey silty SAND & GRAVEL. (MADE GROUND)			Depth, m	1.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	92		
20	86		
14	81		
10	75		
6.3	68		
5	66		
3.35	63		
2	56		
1.18	48		
0.6	37		
0.425	32		
0.3	24		
0.212	16		
0.15	11		
0.063	8		

Dry Mass of sample, g	2318

Sample Proportions	% dry mass
Very coarse	0
Gravel	44
Sand	48
Fines <0.063mm	8

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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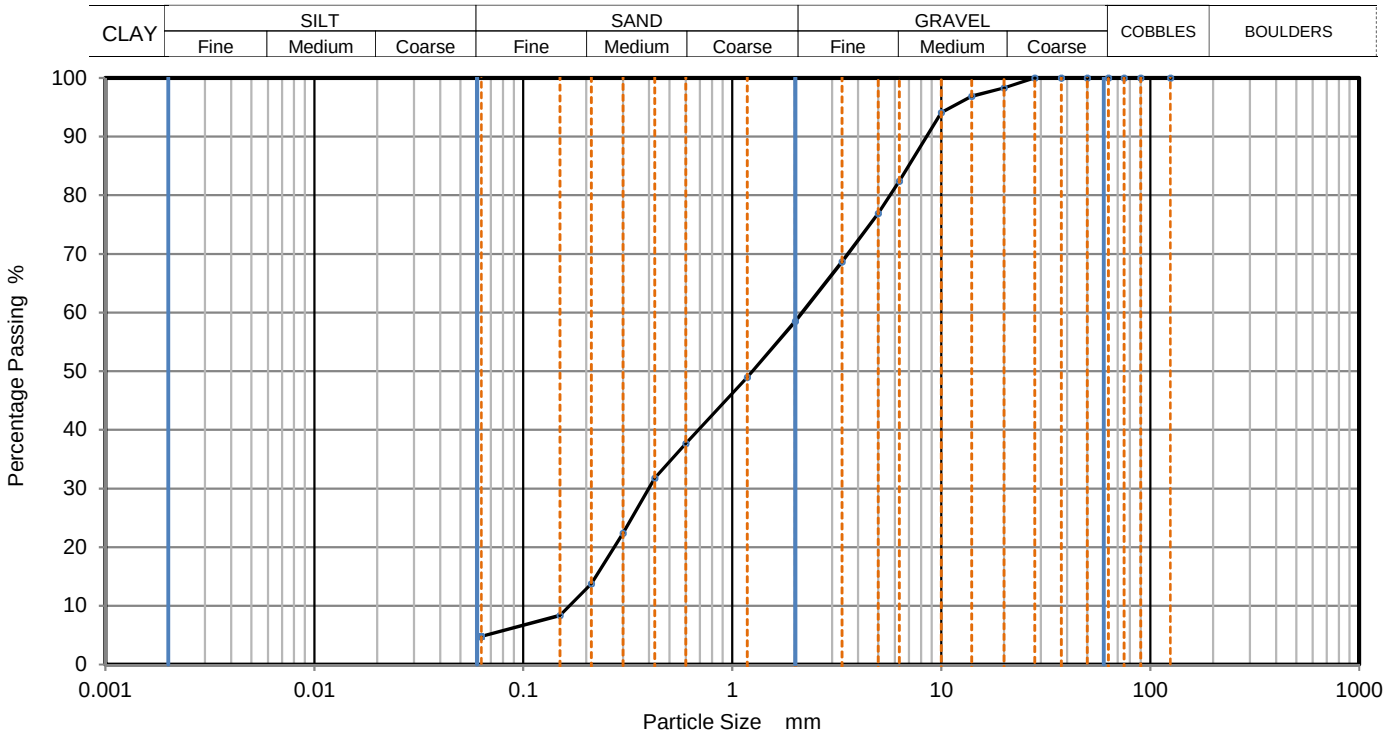
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH2
Site Name	WATERLOO DOCK			Sample No.	4
Specimen Description	Dark grey silty very gravelly fine to coarse grained SAND. (MADE GROUND)			Depth, m	2.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	97		
10	94		
6.3	82		
5	77		
3.35	69		
2	59		
1.18	49		
0.6	38		
0.425	32		
0.3	22		
0.212	14		
0.15	8		
0.063	5		

Dry Mass of sample, g	1413

Sample Proportions	% dry mass
Very coarse	0
Gravel	41
Sand	54
Fines <0.063mm	5

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
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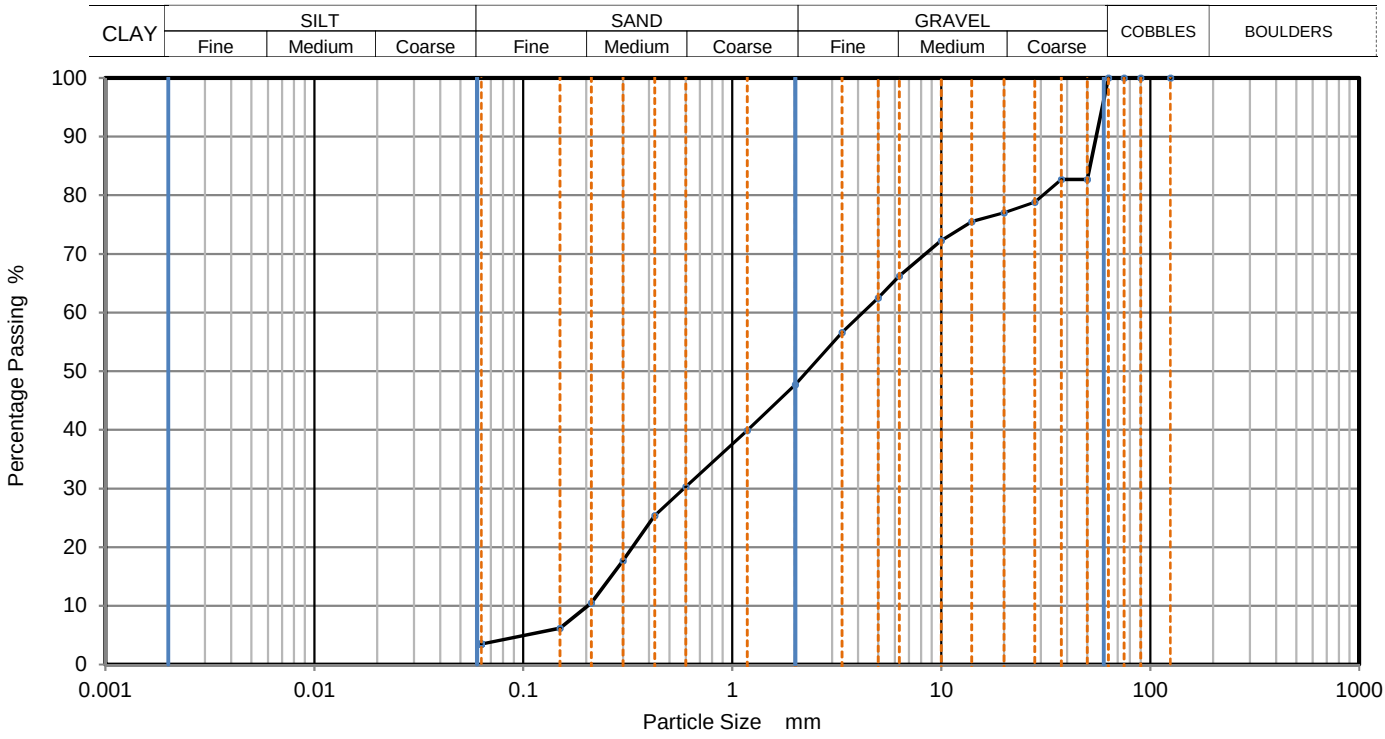
PARTICLE SIZE DISTRIBUTION

Job Ref	CCG-C-18-10350				
Borehole/Pit No.	BH2				
Site Name	WATERLOO DOCK			Sample No.	5
Specimen Description	Dark grey very sandy slightly silty GRAVEL. (MADE GROUND)			Depth, m	3.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	83		
37.5	83		
28	79		
20	77		
14	76		
10	72		
6.3	66		
5	63		
3.35	57		
2	48		
1.18	40		
0.6	30		
0.425	25		
0.3	18		
0.212	11		
0.15	6		
0.063	4		

Dry Mass of sample, g	2277

Sample Proportions	% dry mass
Very coarse	0
Gravel	52
Sand	44
Fines <0.063mm	4

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	22/09/2018 13:50	Sheet

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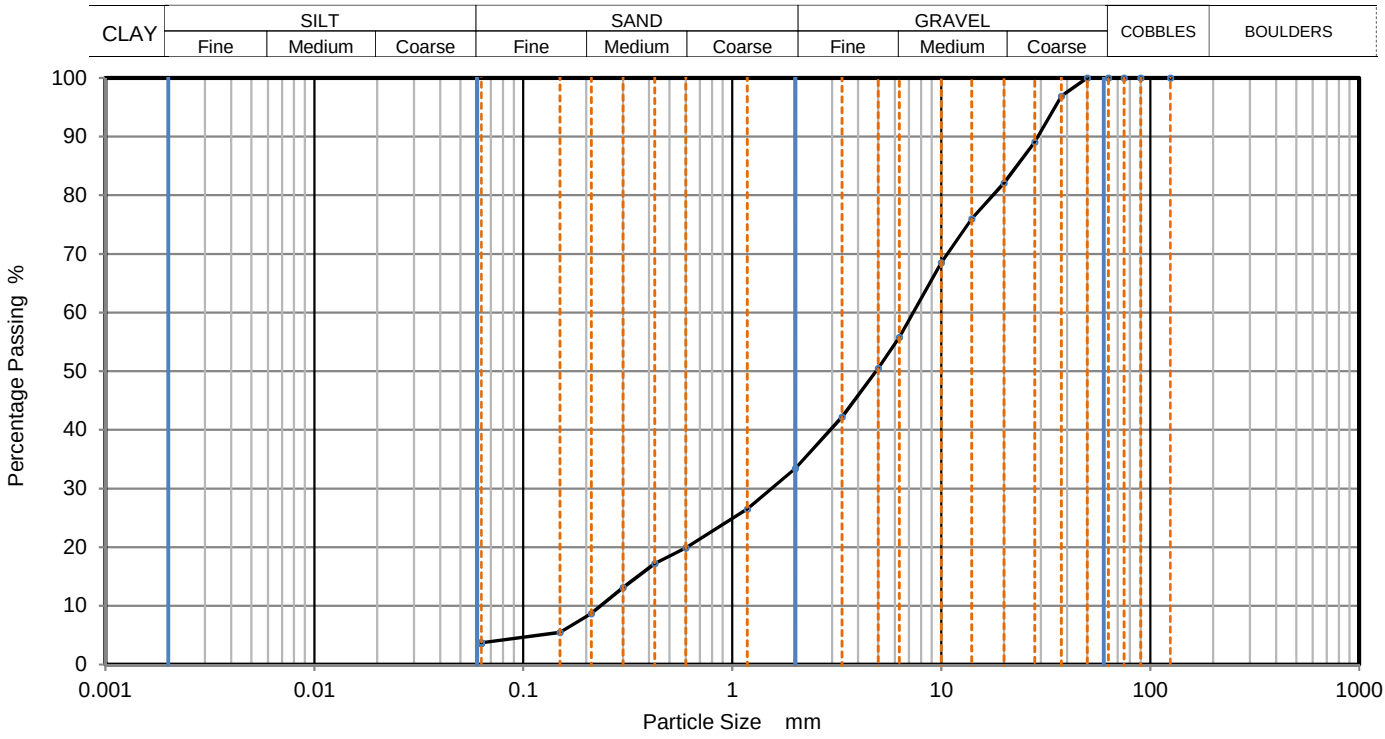
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH2
Site Name	WATERLOO DOCK			Sample No.	6
Specimen Description	Dark grey very sandy slightly silty GRAVEL. (MADE GROUND)			Depth, m	4.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	97		
28	89		
20	82		
14	76		
10	69		
6.3	56		
5	51		
3.35	42		
2	33		
1.18	27		
0.6	20		
0.425	17		
0.3	13		
0.212	9		
0.15	6		
0.063	4		

Dry Mass of sample, g: 2598

Sample Proportions	% dry mass
Very coarse	0
Gravel	67
Sand	29
Fines <0.063mm	4

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	22/09/2018 13:53	Sheet

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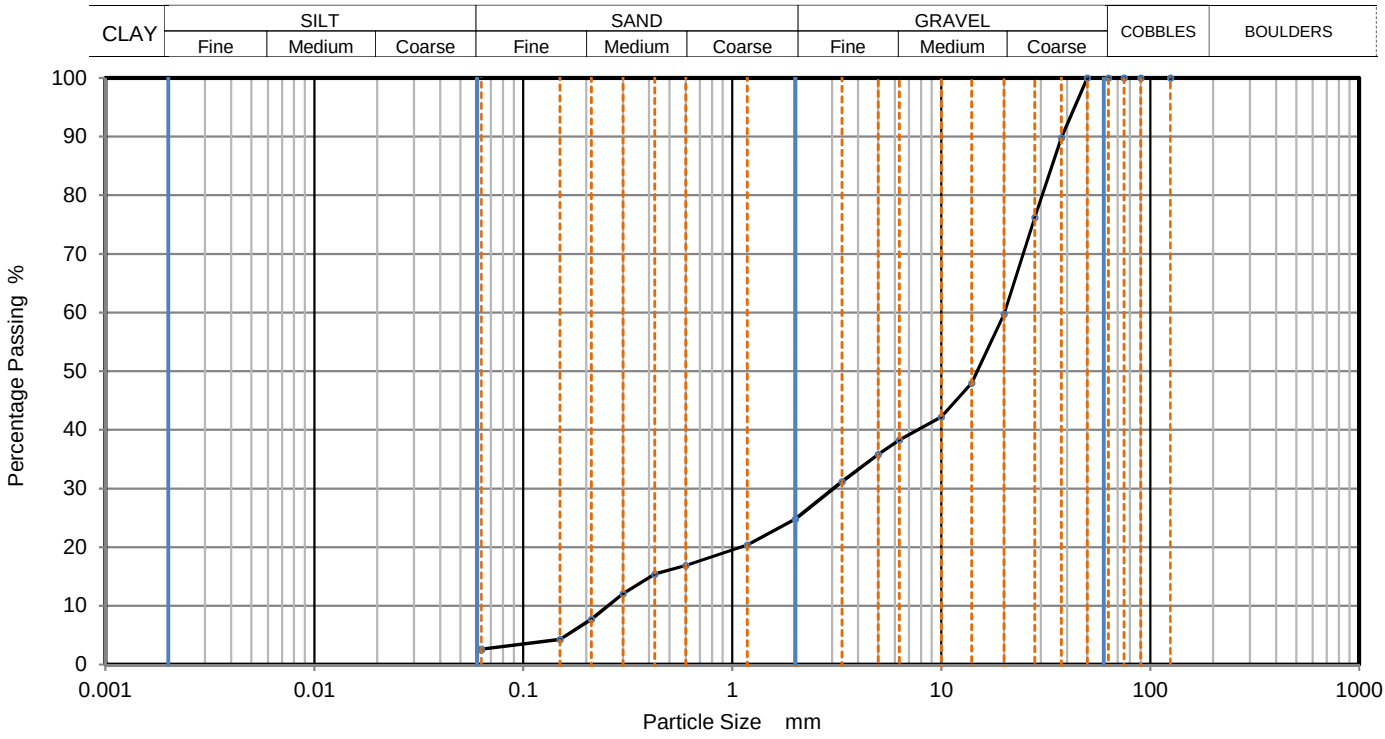
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH2
Site Name	WATERLOO DOCK			Sample No.	7
Specimen Description	Dark grey very sandy slightly silty GRAVEL. (MADE GROUND)			Depth, m	6.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	90		
28	76		
20	60		
14	48		
10	42		
6.3	38		
5	36		
3.35	31		
2	25		
1.18	20		
0.6	17		
0.425	15		
0.3	12		
0.212	8		
0.15	4		
0.063	3		

Dry Mass of sample, g	3471

Sample Proportions	% dry mass
Very coarse	0
Gravel	75
Sand	22
Fines <0.063mm	3

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	22/09/2018 14:49	Sheet

CC Geotechnical Ltd
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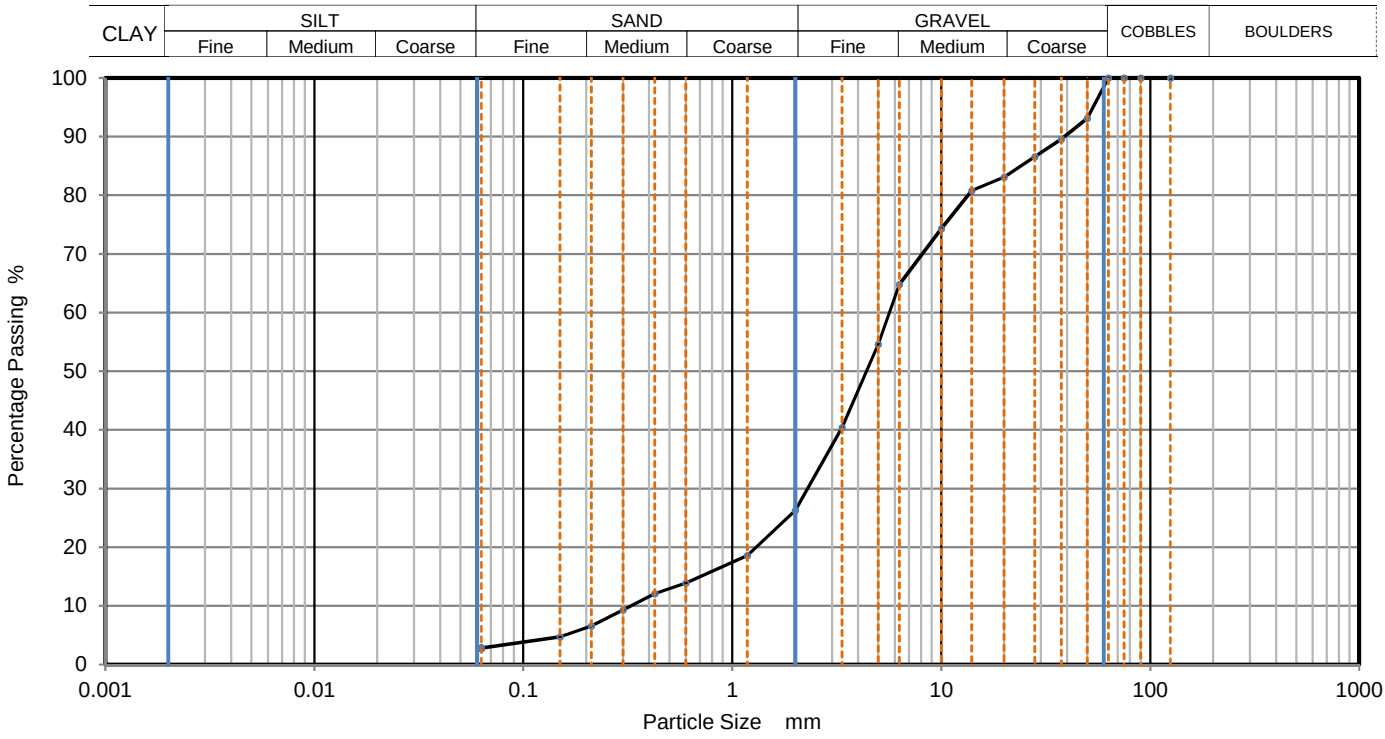
PARTICLE SIZE DISTRIBUTION

				Job Ref	CCG-C-18-10350
				Borehole/Pit No.	BH2
Site Name	WATERLOO DOCK			Sample No.	8
Specimen Description	Dark grey very sandy slightly silty GRAVEL. (MADE GROUND)			Depth, m	7.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	93		
37.5	90		
28	87		
20	83		
14	81		
10	74		
6.3	65		
5	55		
3.35	40		
2	26		
1.18	19		
0.6	14		
0.425	12		
0.3	9		
0.212	7		
0.15	5		
0.063	3		

Dry Mass of sample, g	2198

Sample Proportions	% dry mass
Very coarse	0
Gravel	74
Sand	23
Fines <0.063mm	3

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
MH	DK	DK	22/09/2018 14:51	Sheet

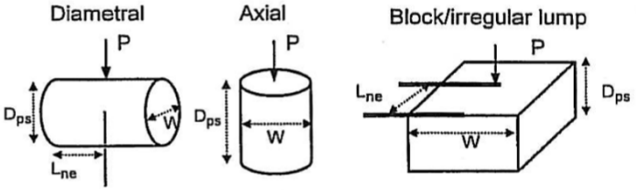
POINT LOAD TEST RESULTS

Int. J. Rock Mech. Sci. & Geomech. Abstr. Vol.22, No.2, pp. 51 - 60, 1985

PROJECT No.:- CCG-C-18-10350 SITE:- CO2, WEST WATERLOO DOCK, LIVERPOOL

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH2	7.40	a			85.81	37	2.80	64	0.69	1.11	0.77	15.43	NAT	P
BH2	8.15	a			85.71	44	4.00	69	0.83	1.16	0.96	19.30	NAT	P
BH2	9.50	a			85.68	52	3.50	75	0.62	1.20	0.74	14.84	NAT	P
BH2	9.00	a			85.72	53	3.80	76	0.66	1.21	0.79	15.87	NAT	P
BH2	9.40	a			85.8	55	3.30	78	0.55	1.22	0.67	13.38	NAT	P
BH2	10.00		d		54	86	2.20	-	0.30	1.28	0.38	7.59	NAT	L
BH2	10.40	a			85.91	39	3.00	65	0.70	1.13	0.79	15.86	NAT	P
BH2	10.90	a			85.8	56	3.90	78	0.64	1.22	0.78	15.59	NAT	P
BH2	11.50	a			85.75	58	4.70	80	0.74	1.23	0.91	18.30	NAT	P
BH2	12.00	a			85.67	50	3.70	74	0.68	1.19	0.81	16.17	NAT	P
BH2	12.40	a			85.69	60	4.00	81	0.61	1.24	0.76	15.18	NAT	P
BH2	12.80		d		85	86	4.40	-	0.59	1.28	0.76	15.19	NAT	L

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)



DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**CO2, WEST WATERLOO DOCK, LIVERPOOL**
CLIENT:	**ROMAL CAPITAL**
CCG REF:	**CCG-C-18-10350**
Sample ref:	BH2 9.20mbgl
Date of coring:	16/09/2018
Sampled by:	KM/PC CB/KM
Sample description:	Sandstone

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	3m 47s
Maximum load at failure (kN):	32.4
Compressive strength (N/mm2):	**5.7**
Test date:	11/10/2018
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**CO2, WEST WATERLOO DOCK, LIVERPOOL**
CLIENT:	**ROMAL CAPITAL**
CCG REF:	**CCG-C-18-10350**
Sample ref:	BH2 12.20mbgl
Date of coring:	16/09/2018
Sampled by:	KM/PC CB/KM
Sample description:	Sandstone

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	4m 39s
Maximum load at failure (kN):	51.2
Compressive strength (N/mm2):	**9.0**
Test date:	11/10/2018
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

CCG-CMS-FO-200 Issue 3

SUMMARY OF LABORATORY SOIL TEST RESULTS

BH / TP / WS Number	Sample Type	Depth From (m)	Depth To (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Shear Strength (kN/m^2)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425mm (%)	Soil Classification	UKAS accredited test (Y/N)	Description / Test Method Samples described in accordance with BS EN ISO 14688-2 2004
BH3	B	1.00	1.00	-	-	-	-	-	-	-	-	-	Y	Brown very sandy silty GRAVEL. Gravel is fine to coarse subangular concrete, sandstone, brick, limestone, wood, granite. (MADE GROUND) (BS1377Pt2:9.2)
BH3	B	1.50	1.50	-	-	-	-	-	-	-	-	-	Y	Brown silty sandy GRAVEL. Gravel is fine to coarse subangular to subrounded sandstone, limestone, wood, concrete, brick, granite. (MADE GROUND) (BS1377Pt2:9.2)
BH3	B	2.50	2.50	-	-	-	-	-	-	-	-	-	Y	Brown very sandy silty GRAVEL. Gravel is fine to coarse subangular to subrounded sandstone, glass, granite, brick, limestone, glass. (MADE GROUND) (BS1377Pt2:9.2)
BH3	B	3.50	3.50	-	-	-	-	-	-	-	-	-	Y	Brown slightly silty SAND & GRAVEL. Gravel is fine to coarse subangular slag, limestone, granite, sandstone. (MADE GROUND) (BS1377Pt2:9.2)
BH3	B	4.50	4.50	-	-	-	-	-	-	-	-	-	Y	Brown very gravelly slightly silty SAND. Gravel is fine to coarse subangular to subrounded brick, concrete, granite, cinders. (MADE GROUND) (BS1377Pt2:9.2)
BH3	B	6.00	6.00	-	-	-	-	-	-	-	-	-	Y	Dark brown very sandy slightly silty GRAVEL. Gravel is fine to coarse subrounded to subangular concrete, cinders, sandstone, brick, limestone. (MADE GROUND) (BS1377Pt2:9.2)
BH3	B	7.50	7.50	-	-	-	-	-	-	-	-	-	Y	Dark brown silty SAND & GRAVEL. Gravel is fine to coarse subangular to subrounded glass, ceramic, limestone, brick, sandstone .(MADE GROUND) (BS1377Pt2:9.2)

SITE: WATERLOO DOCK (CCG-C-18-10350) DATE: 22.09.18

CLIENT: ROMAL CAPITAL

UKAS TESTING 4514

Key:- BD = Bulk Disturbed; SD = Small Disturbed; U100 = Undisturbed 100mm; WS = Window Sample
CL = Low Plasticity; CI = Intermediate; CH = High; CV = Very high; CE = Extremely high; NP = Non-plastic
(* Denotes Hand Shear Vane test result)
Sample description not accredited by UKAS

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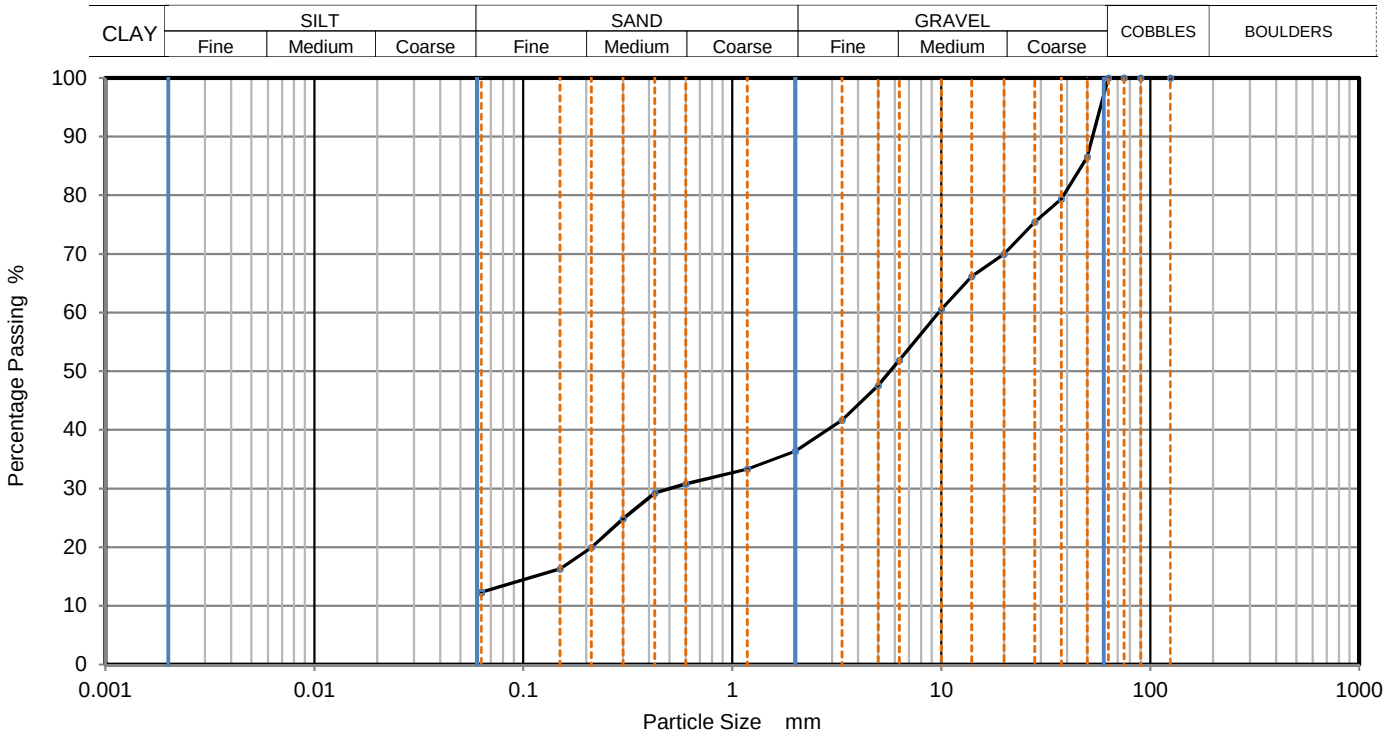
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH3
Site Name	WATERLOO DOCK			Sample No.	1
Specimen Description	Brown very sandy silty GRAVEL. (MADE GROUND)			Depth, m	1.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	87		
37.5	79		
28	75		
20	70		
14	66		
10	61		
6.3	52		
5	48		
3.35	42		
2	36		
1.18	33		
0.6	31		
0.425	29		
0.3	25		
0.212	20		
0.15	16		
0.063	12		

Dry Mass of sample, g: 2817

Sample Proportions	% dry mass
Very coarse	0
Gravel	64
Sand	24
Fines <0.063mm	12

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
JE	DK	DK	25/09/2018 09:32	Sheet

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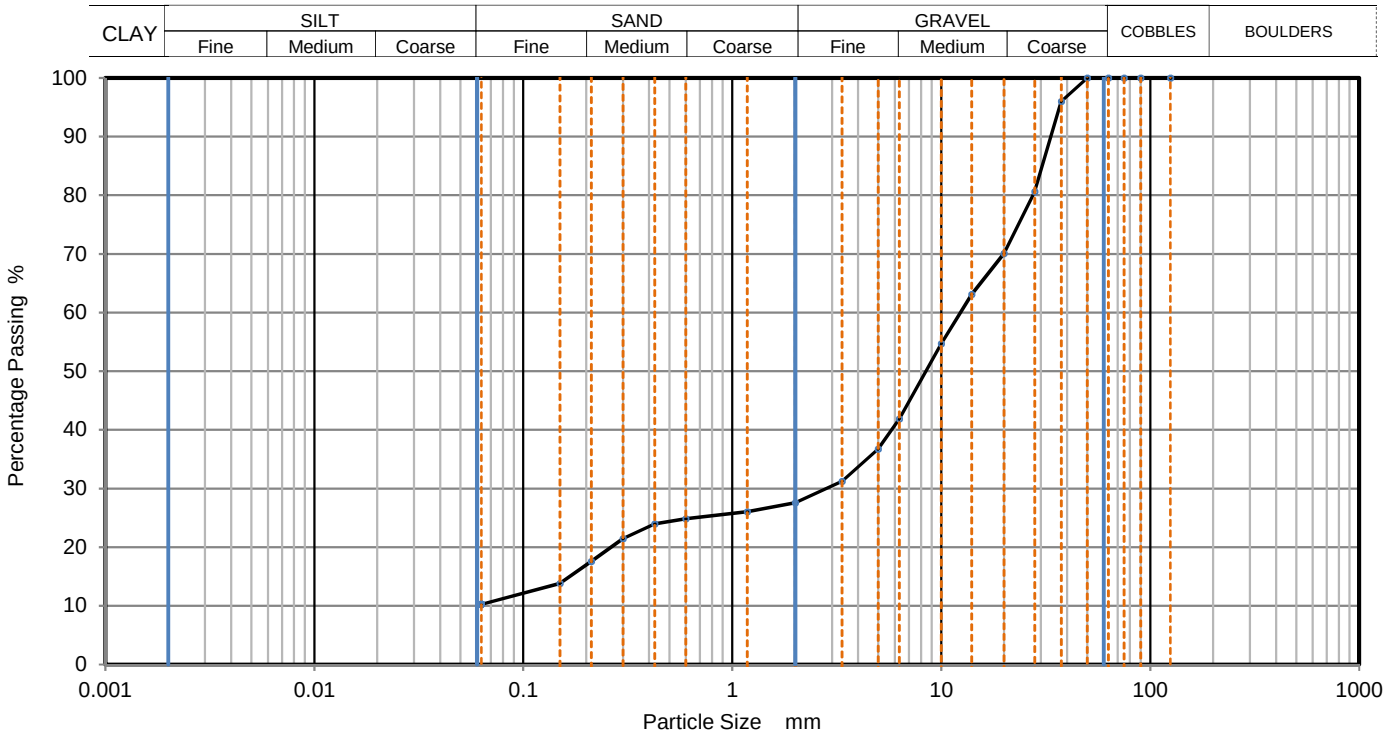
PARTICLE SIZE DISTRIBUTION

				Job Ref	CCG-C-18-10350
				Borehole/Pit No.	BH3
Site Name	WATERLOO DOCK			Sample No.	2
Specimen Description	Brown silty sandy GRAVEL. (MADE GROUND)			Depth, m	1.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	96		
28	81		
20	70		
14	63		
10	55		
6.3	42		
5	37		
3.35	31		
2	28		
1.18	26		
0.6	25		
0.425	24		
0.3	21		
0.212	18		
0.15	14		
0.063	10		

Dry Mass of sample, g	2618

Sample Proportions	% dry mass
Very coarse	0
Gravel	72
Sand	18
Fines <0.063mm	10

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
JE	DK	DK	25/09/2018 09:33	Sheet

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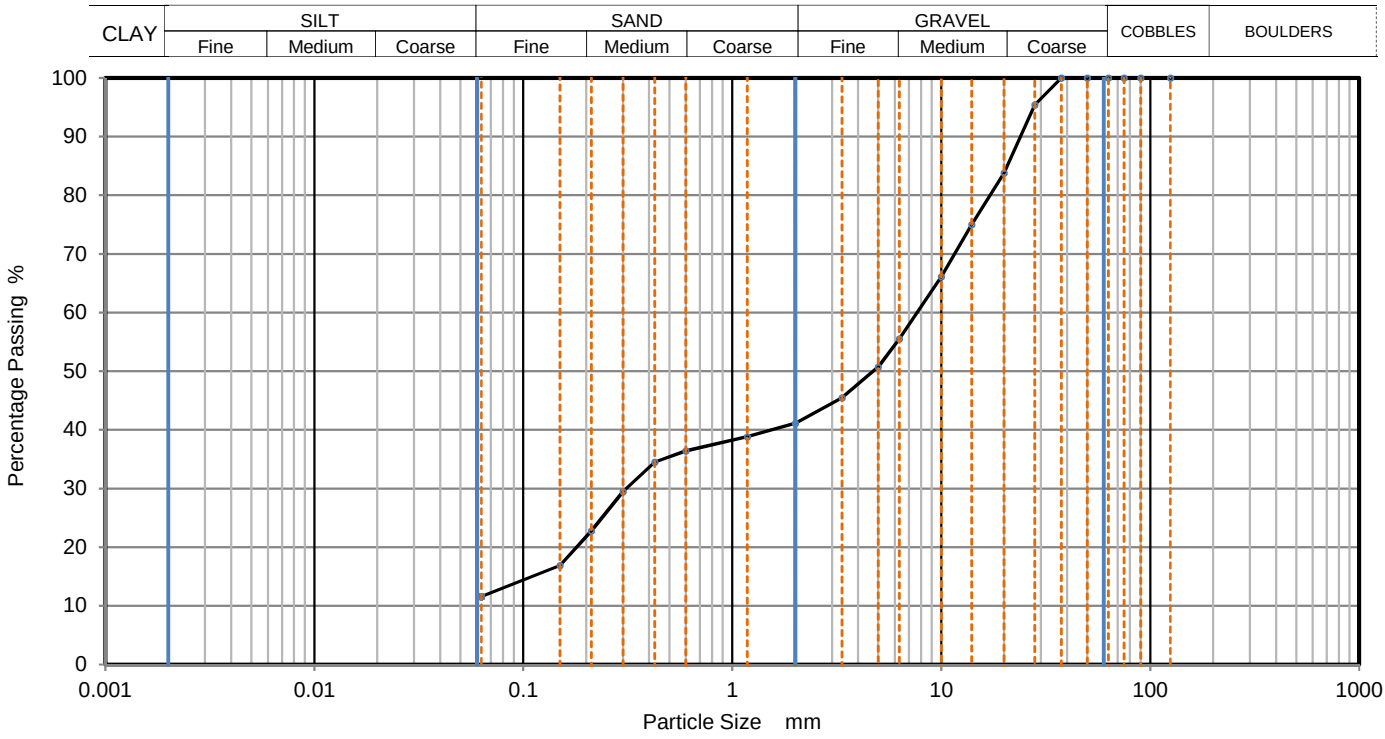
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH3
Site Name	WATERLOO DOCK			Sample No.	4
Specimen Description	Brown very sandy silty GRAVEL. (MADE GROUND)			Depth, m	2.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	84		
14	75		
10	66		
6.3	56		
5	51		
3.35	46		
2	41		
1.18	39		
0.6	36		
0.425	35		
0.3	30		
0.212	23		
0.15	17		
0.063	12		

Dry Mass of sample, g: 1720

Sample Proportions	% dry mass
Very coarse	0
Gravel	59
Sand	29
Fines <0.063mm	12

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
JE	DK	DK	25/09/2018 09:38	Sheet

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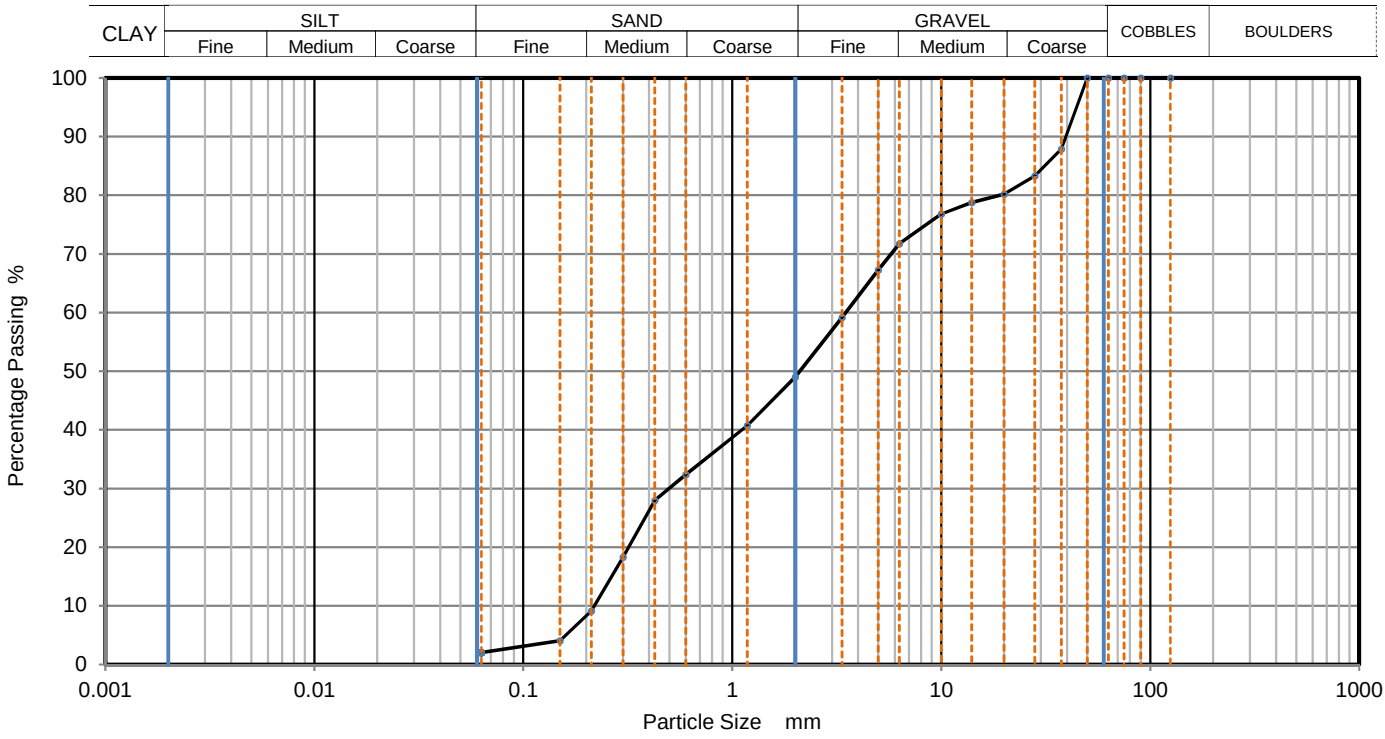
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH3
Site Name	WATERLOO DOCK			Sample No.	5
Specimen Description	Brown slightly silty SAND & GRAVEL. (MADE GROUND)			Depth, m	3.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	88		
28	83		
20	80		
14	79		
10	77		
6.3	72		
5	67		
3.35	59		
2	49		
1.18	41		
0.6	32		
0.425	28		
0.3	18		
0.212	9		
0.15	4		
0.063	2		

Dry Mass of sample, g	1672

Sample Proportions	% dry mass
Very coarse	0
Gravel	51
Sand	47
Fines <0.063mm	2

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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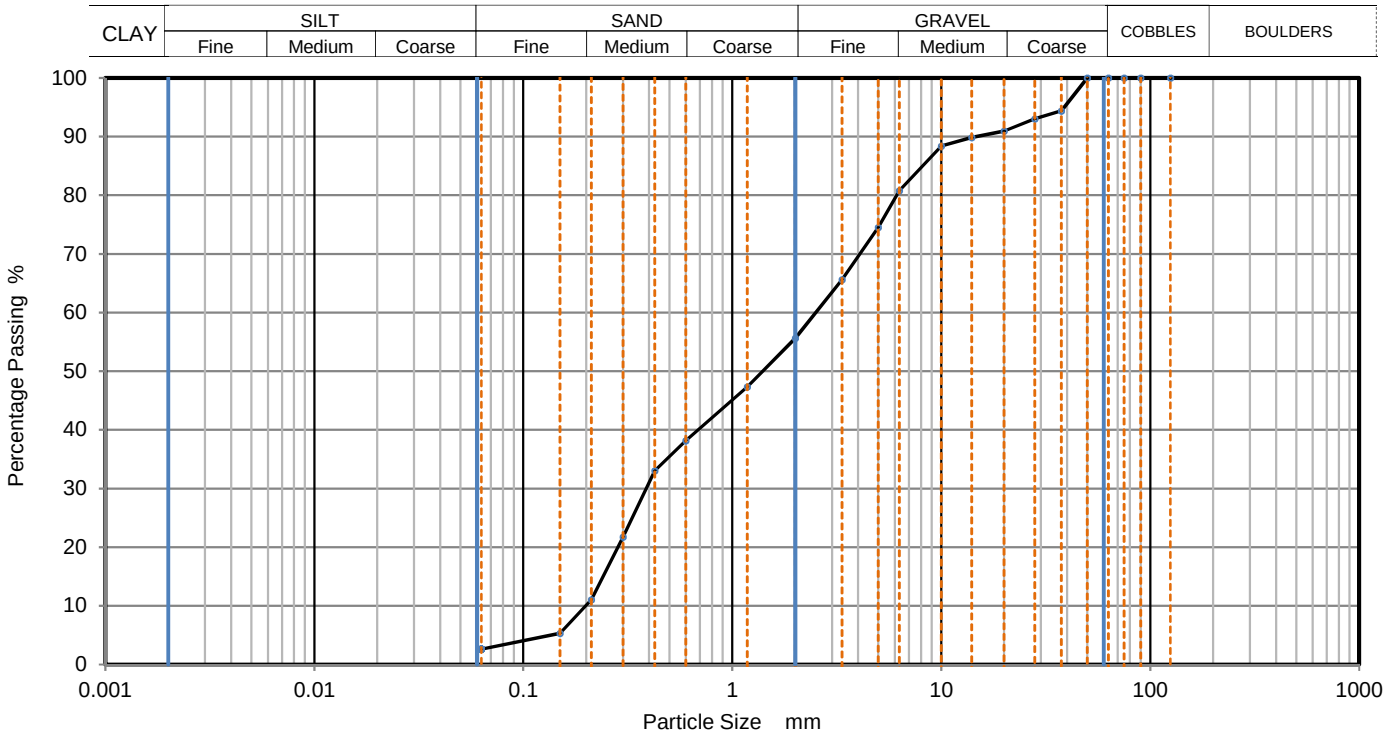
PARTICLE SIZE DISTRIBUTION

Job Ref					CCG-C-18-10350
Borehole/Pit No.					BH3
Site Name	WATERLOO DOCK			Sample No.	6
Specimen Description	Brown very gravelly slightly silty SAND. (MADE GROUND)			Depth, m	4.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	94		
28	93		
20	91		
14	90		
10	88		
6.3	81		
5	74		
3.35	66		
2	56		
1.18	47		
0.6	38		
0.425	33		
0.3	22		
0.212	11		
0.15	5		
0.063	3		

Dry Mass of sample, g: 1671

Sample Proportions	% dry mass
Very coarse	0
Gravel	44
Sand	53
Fines <0.063mm	3

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
JE	DK	DK	25/09/2018 09:42	Sheet

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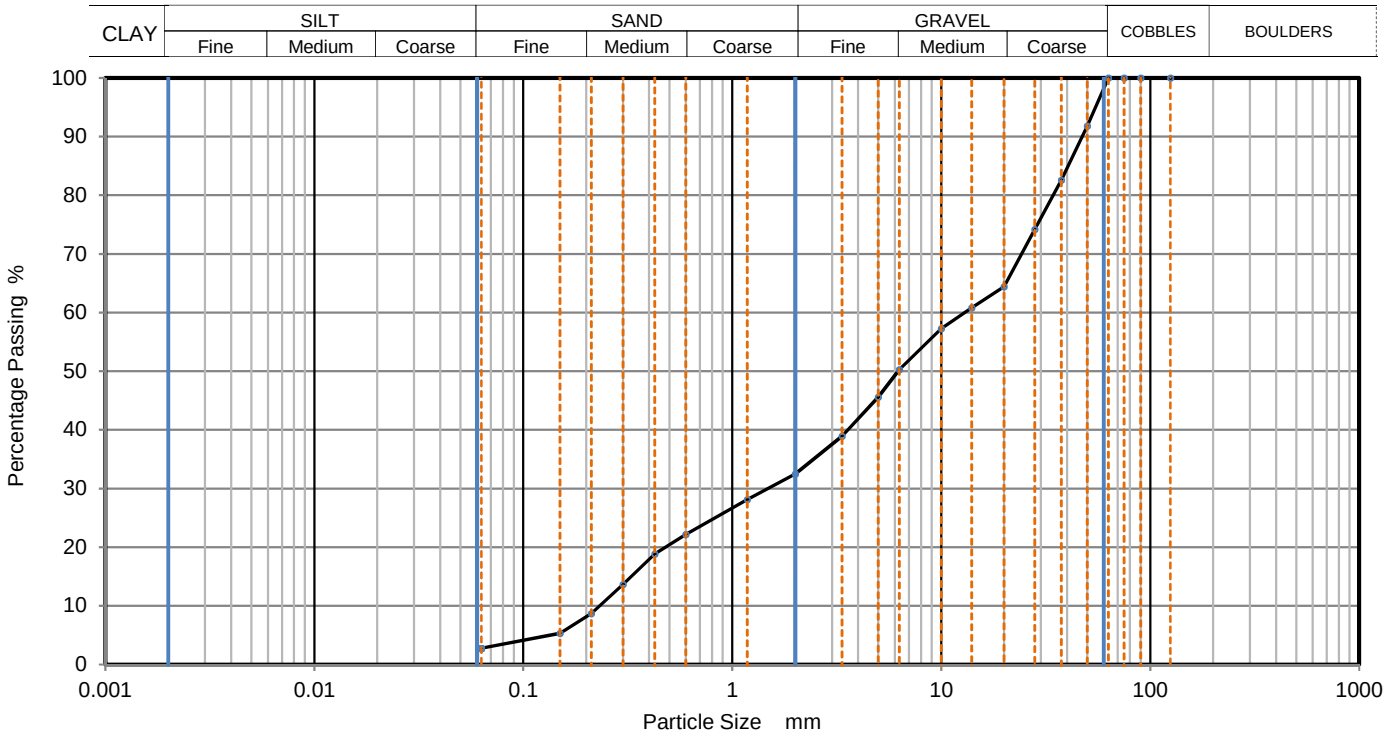
PARTICLE SIZE DISTRIBUTION

Job Ref	CCG-C-18-10350				
Borehole/Pit No.	BH3				
Site Name	WATERLOO DOCK			Sample No.	7
Specimen Description	Dark brown very sandy slightly silty GRAVEL. (MADE GROUND)			Depth, m	6.00
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	92		
37.5	83		
28	74		
20	64		
14	61		
10	57		
6.3	50		
5	46		
3.35	39		
2	32		
1.18	28		
0.6	22		
0.425	19		
0.3	14		
0.212	9		
0.15	5		
0.063	3		

Dry Mass of sample, g: 2976

Sample Proportions	% dry mass
Very coarse	0
Gravel	68
Sand	29
Fines <0.063mm	3

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
JE	DK	DK	25/09/2018 09:45	Sheet

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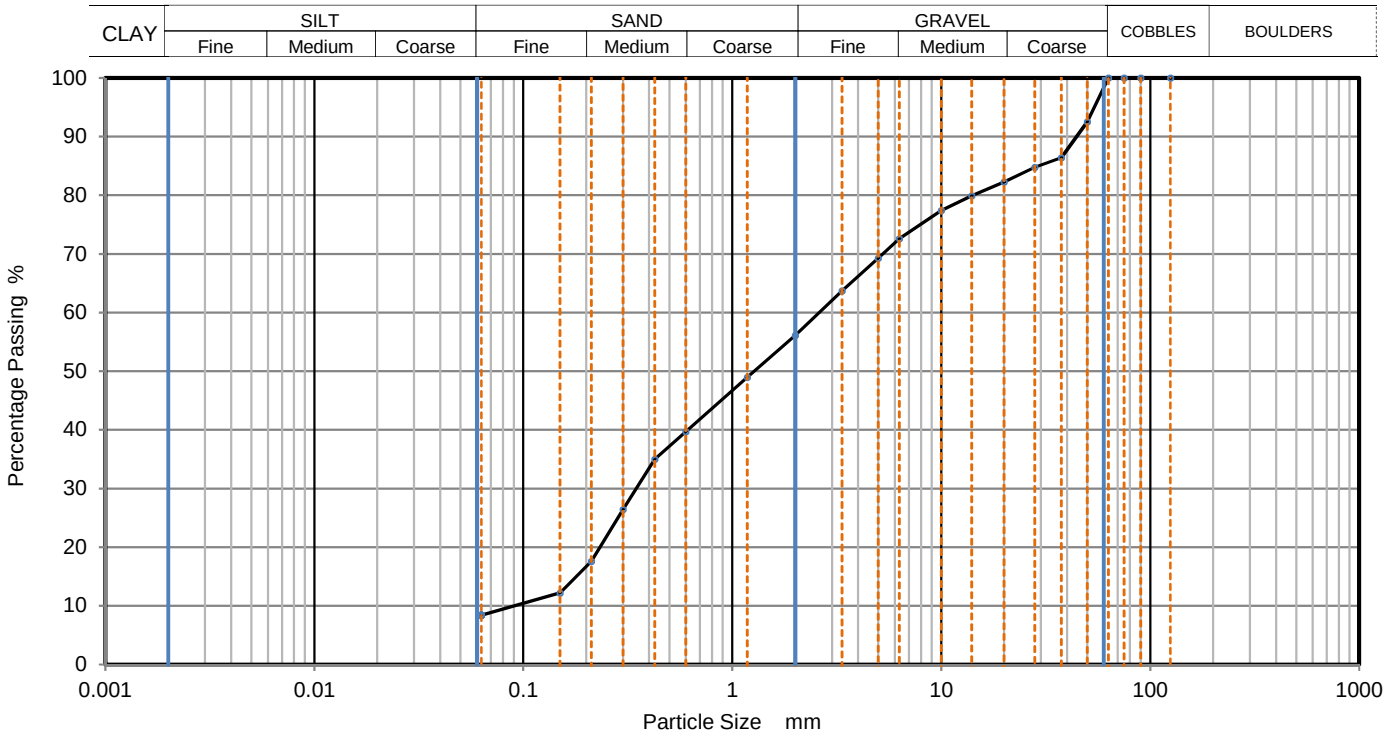
PARTICLE SIZE DISTRIBUTION

Job Ref	CCG-C-18-10350				
Borehole/Pit No.	BH3				
Site Name	WATERLOO DOCK			Sample No.	8
Specimen Description	Dark brown silty SAND & GRAVEL. (MADE GROUND)			Depth, m	7.50
Specimen Reference		Specimen Depth	m	Sample Type	B
Test Method	WET SIEVE			KeyLAB ID	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	93		
37.5	86		
28	85		
20	82		
14	80		
10	77		
6.3	73		
5	69		
3.35	64		
2	56		
1.18	49		
0.6	40		
0.425	35		
0.3	26		
0.212	18		
0.15	12		
0.063	8		

Dry Mass of sample, g: 2241

Sample Proportions	% dry mass
Very coarse	0
Gravel	44
Sand	48
Fines <0.063mm	8

Grading Analysis		
D_{100}	mm	
D_{60}	mm	
D_{30}	mm	
D_{10}	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	Approved	Sheet printed	Fig
JE	DK	DK	25/09/2018 09:46	Sheet

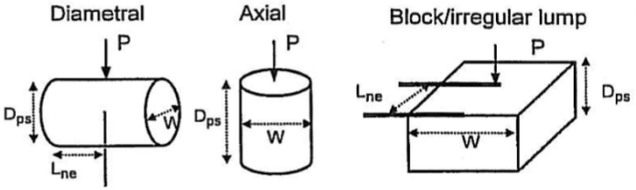
POINT LOAD TEST RESULTS

Int. J. Rock Mech. Sci. & Geomech. Abstr. Vol.22, No.2, pp. 51 - 60, 1985

PROJECT No.:- CCG-C-18-10350 SITE:- CO2, WEST WATERLOO DOCK, LIVERPOOL

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH3	8.40	a			85.91	47	2.90	72	0.56	1.18	0.66	13.27	NAT	P
BH3	8.75		d		51	86	2.10	-	0.28	1.28	0.36	7.25	NAT	L
BH3	8.80	a			85.80	51	2.80	75	0.50	1.20	0.60	12.04	NAT	P
BH3	9.20	a			85.77	49	4.00	73	0.75	1.19	0.89	17.74	NAT	P
BH3	9.60	a			85.78	44	4.20	69	0.87	1.16	1.01	20.25	NAT	P
BH3	10.40	a			85.92	45	3.50	70	0.71	1.16	0.83	16.56	NAT	P
BH3	10.75	a			85.9	48	4.10	72	0.78	1.18	0.92	18.46	NAT	P
BH3	11.20	a			85.98	52	3.80	75	0.67	1.20	0.80	16.07	NAT	P
BH3	11.90		d		78	86	4.00	-	0.54	1.28	0.69	13.81	NAT	L
BH3	12.20	a			85.78	60	3.40	81	0.52	1.24	0.64	12.89	NAT	P
BH3	12.80	a			85.87	40	3.70	66	0.85	1.13	0.96	19.19	NAT	P
BH3	13.30	a			85.69	60	3.80	81	0.58	1.24	0.72	14.42	NAT	P

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)



DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**CO2, WEST WATERLOO DOCK, LIVERPOOL**
CLIENT:	**ROMAL CAPITAL**
CCG REF:	**CCG-C-18-10350**
Sample ref:	BH3 9.40mbgl
Date of coring:	11/09/2018
Sampled by:	KM/JD SB/IO
Sample description:	Sandstone

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	4m 11s
Maximum load at failure (kN):	48.8
Compressive strength (N/mm2):	**8.6**
Test date:	11/10/2018
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**CO2, WEST WATERLOO DOCK, LIVERPOOL**
CLIENT:	**ROMAL CAPITAL**
CCG REF:	**CCG-C-18-10350**
Sample ref:	BH3 11.40mbgl
Date of coring:	11/09/2018
Sampled by:	KM/JD SB/IO
Sample description:	Sandstone

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	4m 8s
Maximum load at failure (kN):	51.2
Compressive strength (N/mm2):	**9.0**
Test date:	11/10/2018
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

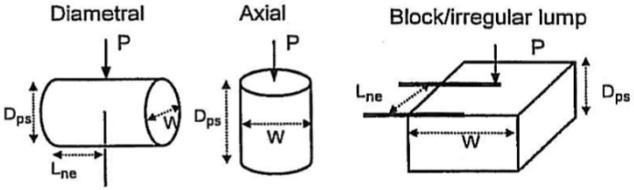
POINT LOAD TEST RESULTS

Int. J. Rock Mech. Sci. & Geomech. Abstr. Vol.22, No.2, pp. 51 - 60, 1985

PROJECT No.:- CCG-C-18-10350 SITE:- CO2, WEST WATERLOO DOCK, LIVERPOOL

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH5	21.60	a			86.65	55	3.50	78	0.58	1.22	0.70	14.08	NAT	p
BH5	22.10	a			86.74	45	1.90	70	0.38	1.17	0.45	8.92	NAT	p
BH5	22.65		d		58	87	2.70	-	0.36	1.28	0.46	9.15	NAT	l
BH5	23.20	a			86.34	44	3.10	70	0.64	1.16	0.74	14.87	NAT	p
BH5	23.35	a			86.41	53	5.50	76	0.94	1.21	1.14	22.82	NAT	p
BH5	23.80	a			86.48	40	4.00	66	0.91	1.14	1.03	20.63	NAT	p
BH5	24.50		d		71	87	5.60	-	0.74	1.28	0.95	18.99	NAT	l
BH5	25.10	a			86.5	59	4.00	81	0.62	1.24	0.76	15.26	NAT	p
BH5	25.65	a			86.38	42	3.00	68	0.65	1.15	0.75	14.91	NAT	p
BH5	26.00	a			86.58	46	3.70	71	0.73	1.17	0.86	17.11	NAT	p
BH5	26.20	a			86.64	57	3.60	79	0.57	1.23	0.70	14.09	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)



DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

CCG-CMS-FO-249 (2)

CONCRETE CORE COMPRESSIVE STRENGTH

BS EN 12504-1:2009

CCG REF	CCG-C-18-10350
SITE	WEST WATERLOO DOCK
CLIENT	ROMAL CAPITAL
SAMPLE	BH5 19.00mbgl
DATE	16.10.18

SAMPLE DIMENSIONS (mm)

HEIGHT	174
DIAMETER	87
DATE OF CORING	14.10.18
LENGTH/DIAMETER RATIO	2:1
SURFACE MOISTURE CONDITION	DRY
MASS (kg)	2.56
DENSITY (kg/m^3) to nearest 10 (kg/m3)	2470

PREPARATION

Capping by Sulphur Mixture Method BS EN 12390-3:2009

MAXIMUM LOAD AT FAILURE (kN)	178.3
COMPRESSIVE STRENGTH (N/mm2)	29.9
SATISFACTORY FAILURE	YES

TESTED BY JE

Test in accordance with BS EN 12504-1:2009
Density calculated in accordance with BS EN 12390-7:2009 5.1.2.b

SIGNED DK

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**CO2, WEST WATERLOO DOCK, LIVERPOOL**
CLIENT:	**ROMAL CAPITAL**
CCG REF:	**CCG-C-18-10350**
Sample ref:	BH5 23.60mbgl
Date of coring:	14/10/2018
Sampled by:	CB
Sample description:	Sandstone

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	5m 12s
Maximum load at failure (kN):	54.9
Compressive strength (N/mm2):	**9.7**
Test date:	16/10/2018
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

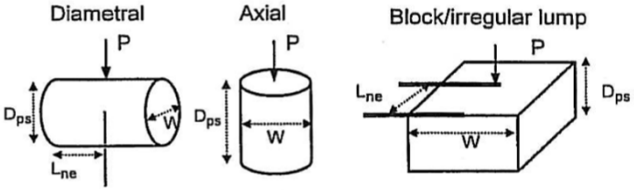
POINT LOAD TEST RESULTS

Int. J. Rock Mech. Sci. & Geomech. Abstr. Vol.22, No.2, pp. 51 - 60, 1985

PROJECT No.:- CCG-C-18-10350 SITE:- CO2, WEST WATERLOO DOCK, LIVERPOOL

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH6	20.60		d		61	85	3.80	-	0.53	1.27	0.67	13.36	NAT	l
BH6	20.60	a			86.84	60	3.70	81	0.56	1.25	0.69	13.89	NAT	p
BH6	21.80		d		56	86	3.20	-	0.43	1.28	0.55	11.05	NAT	l
BH6	21.80	a			85.28	50	4.00	74	0.74	1.19	0.88	17.54	NAT	p
BH6	22.40	a			85.05	53	3.20	76	0.56	1.21	0.67	13.44	NAT	p
BH6	23.90	a			85.69	43	2.90	68	0.62	1.15	0.71	14.24	NAT	p
BH6	24.90	a			85.84	62	1.90	82	0.28	1.25	0.35	7.02	NAT	p
BH6	25.10	a			85.83	75	2.50	91	0.31	1.31	0.40	7.97	NAT	p
BH6	26.30	a			85.92	59	3.40	80	0.53	1.24	0.65	13.04	NAT	p
BH6	26.30	a			85.82	46	2.30	71	0.46	1.17	0.54	10.71	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)



DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**CO2, WEST WATERLOO DOCK, LIVERPOOL**
CLIENT:	**ROMAL CAPITAL**
CCG REF:	**CCG-C-18-10350**
Sample ref:	BH6 21.30mbgl
Date of coring:	15/10/2018
Sampled by:	CB
Sample description:	Sandstone

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	4m 57s
Maximum load at failure (kN):	64.8
Compressive strength (N/mm2):	**11.4**
Test date:	18/10/2018
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

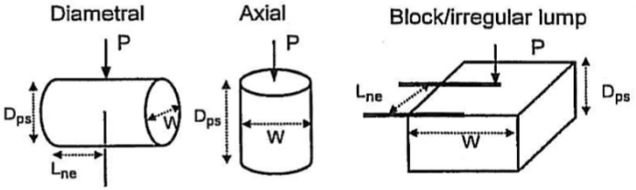
POINT LOAD TEST RESULTS

Int. J. Rock Mech. Sci. & Geomech. Abstr. Vol.22, No.2, pp. 51 - 60, 1985

PROJECT No.:- CCG-C-18-10350 SITE:- CO2, WEST WATERLOO DOCK, LIVERPOOL

Borehole Number	Depth (m)	Type of Test* a	d	i	Width (W) (mm)	Platen Separation (D) (mm)	Failure Load (P) (kN)	Equivalent Diameter (D_e) (mm)	Point Load (I_s) (MPa)	Size Factor (F)	Point Load Index ($I_{s(50)}$) (MPa)	Estimated Uniaxial Compressive Strength (MPa)	Water Content (NAT/SAT)	Orientation to plane of weakness
BH7	15.80		d		65	86	2.50	-	0.34	1.28	0.43	8.63	NAT	l
BH7	15.80	a			85.64	73	3.70	89	0.46	1.30	0.60	12.06	NAT	p
BH7	16.10	a			86.17	38	1.00	65	0.24	1.12	0.27	5.38	NAT	p
BH7	16.90	a			86.12	52	3.50	76	0.61	1.20	0.74	14.78	NAT	p
BH7	17.30	a			85.21	57	1.60	79	0.26	1.23	0.32	6.34	NAT	p
BH7	18.00	a			85.95	50	3.60	74	0.66	1.19	0.78	15.69	NAT	p
BH7	18.40	a			85.77	70	4.60	87	0.60	1.29	0.77	15.48	NAT	p
BH7	18.70		d		68	85	3.60	-	0.50	1.27	0.63	12.65	NAT	l
BH7	18.70	a			85.1	57	5.60	79	0.91	1.23	1.11	22.23	NAT	p
BH7	19.30	a			86.01	57	4.30	79	0.69	1.23	0.85	16.93	NAT	p
BH7	19.90	a			85.77	72	5.20	89	0.66	1.29	0.86	17.12	NAT	p
BH7	20.40	a			86.11	38	4.00	65	0.96	1.12	1.08	21.54	NAT	p
BH7	21.20	a			85.97	73	4.30	89	0.54	1.30	0.70	13.98	NAT	p
BH7	21.50	a			85.79	70	5.50	87	0.72	1.29	0.93	18.50	NAT	p

*NOTE- a = axial ; d = diametral ; i = irregular lump or block (see diagrams, right, for details)



DIA. KEY- P = load ; Dps = platen seperation ;
W = width of shortest dimension perpendicular to load ;
Lne = length from platens to nearest free end

TEST REPORT

UNIAXIAL COMPRESSIVE STRENGTH

In accordance with ISRM Vol 16 No 2, pp 135-140 (1979)

PROJECT:	**CO2, WEST WATERLOO DOCK, LIVERPOOL**
CLIENT:	**ROMAL CAPITAL**
CCG REF:	**CCG-C-18-10350**
Sample ref:	BH7 19.80mbgl
Date of coring:	17/10/2018
Sampled by:	CB
Sample description:	Sandstone

TEST DATA

Specimen Height (mm):	170
Specimen Diameter (mm):	85
L/D ratio:	2:1
Mode of failure:	AXIAL CLEAVAGE
Test duration:	4m 49s
Maximum load at failure (kN):	57.5
Compressive strength (N/mm2):	**10.1**
Test date:	18/10/2018
Tested by:	**JE**
Report prepared by:	**DK**
Report approved by:	**DK**

APPENDIX J

SOIL AND GROUNDWATER CONTAMINATION TEST RESULTS

Unit A2
Windmill Road
Ponswood Industrial Estate
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info@elab-uk.co.uk

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	18-20082
Issue:	1
Date of Issue:	19/10/2018
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	18/10350
Date Received:	16/10/2018
Date Approved:	19/10/2018
Details:	West Waterloo Dock, Liverpool
Approved by:	

John Wilson, Operations Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 18-20082

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
153571	BH1 1.50	11/10/2018	16/10/2018	Loamy sand + stones	
153572	BH2 2.50	11/10/2018	16/10/2018	Sandy loam+ stones	
153573	BH3 2.50	11/10/2018	16/10/2018	Sandy loam+ stones	
153574	Grab 1 0.20	11/10/2018	16/10/2018	Sandy loam+ stones	
153575	Grab 2 0.10	11/10/2018	16/10/2018	Sandy loam+ stones	

Results Summary

Report No.: 18-20082

			ELAB Reference	153571	153572	153573	153574	153575
			Customer Reference					
			Sample ID					
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	BH1	BH2	BH3	Grab 1	Grab 2
			Sample Depth (m)	1.50	2.50	2.50	0.20	0.10
			Sampling Date	11/10/2018	11/10/2018	11/10/2018	11/10/2018	11/10/2018
Determinand	**Codes**	**Units**	**LOD**					
Metals								
Arsenic	M	mg/kg	1	^ 15.0	^ 11.3	^ 13.3	^ 10.9	^ 11.8
Cadmium	M	mg/kg	0.5	^ < 0.5	^ 0.6	^ < 0.5	^ < 0.5	^ < 0.5
Chromium	M	mg/kg	5	^ 24.4	^ 19.3	^ 25.7	^ 22.3	^ 23.7
Copper	M	mg/kg	5	^ 36.1	^ 59.6	^ 53.5	^ 51.7	^ 56.3
Lead	M	mg/kg	5	^ 87.1	^ 179	^ 176	^ 78.6	^ 195
Mercury	M	mg/kg	0.5	^ < 0.5	^ < 0.5	^ < 0.5	^ < 0.5	^ < 0.5
Nickel	M	mg/kg	5	^ 21.8	^ 17.7	^ 22.4	^ 20.8	^ 20.0
Selenium	M	mg/kg	1	^ < 1.0	^ < 1.0	^ < 1.0	^ < 1.0	^ < 1.0
Zinc	M	mg/kg	5	^ 95.7	^ 125	^ 143	^ 113	^ 142
Anions								
Water Soluble Sulphate	M	g/l	0.02	^ 0.46	^ 0.40	^ 0.48	^ 0.47	^ 0.44
Inorganics								
Free Cyanide	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Total Sulphide	N	mg/kg	2	< 2	< 2	14	5	< 2
Acid Soluble Sulphate (SO4)	U	%	0.02	0.10	0.11	0.10	0.09	0.14
Water Soluble Boron	N	mg/kg	0.5	1.1	0.8	1.3	1.5	1.0
Miscellaneous								
pH	M	pH units	0.1	^ 9.9	^ 9.9	^ 9.5	^ 9.2	^ 9.3
Soil Organic Matter	U	%	0.1	1.6	3.0	2.4	2.1	3.2
Polyaromatic hydrocarbons								
Naphthalene	M	mg/kg	0.1	^ 0.1	^ 0.2	^ 0.2	^ 0.7	^ < 0.1
Acenaphthylene	M	mg/kg	0.1	^ 0.1	^ 0.2	^ < 0.1	^ 0.1	^ < 0.1
Acenaphthene	M	mg/kg	0.1	^ 0.3	^ 0.7	^ 0.3	^ 0.8	^ 0.2
Fluorene	M	mg/kg	0.1	^ 0.3	^ 0.5	^ 0.2	^ 0.6	^ 0.1
Phenanthrene	M	mg/kg	0.1	^ 1.1	^ 1.4	^ 1.5	^ 2.8	^ 0.8
Anthracene	M	mg/kg	0.1	^ 0.3	^ 0.4	^ 0.4	^ 0.9	^ 0.2
Fluoranthene	M	mg/kg	0.1	^ 1.7	^ 2.1	^ 2.6	^ 5.7	^ 1.3
Pyrene	M	mg/kg	0.1	^ 1.5	^ 2.0	^ 2.4	^ 4.7	^ 1.4
Benzo(a)anthracene	M	mg/kg	0.1	^ 0.7	^ 0.8	^ 1.4	^ 2.7	^ 0.7
Chrysene	M	mg/kg	0.1	^ 0.8	^ 1.1	^ 1.6	^ 3.0	^ 0.9
Benzo (b) fluoranthene	M	mg/kg	0.1	^ 0.6	^ 0.7	^ 1.7	^ 2.6	^ 0.8
Benzo(k)fluoranthene	M	mg/kg	0.1	^ 0.7	^ 1.1	^ 1.6	^ 2.2	^ 0.6
Benzo (a) pyrene	M	mg/kg	0.1	^ 0.7	^ 1.1	^ 1.7	^ 2.6	^ 0.7
Indeno (1,2,3-cd) pyrene	M	mg/kg	0.1	^ 0.9	^ 1.4	^ 1.4	^ 1.7	^ 0.6
Dibenzo(a,h)anthracene	M	mg/kg	0.1	^ 0.2	^ 0.5	^ 0.3	^ 0.3	^ 0.2
Benzo[g,h,i]perylene	M	mg/kg	0.1	^ 0.8	^ 1.9	^ 1.1	^ 1.6	^ 0.5
Total PAH(16)	M	mg/kg	0.4	^ 11.0	^ 16.4	^ 18.5	^ 33.1	^ 9.1

Tests marked N are not UKAS accredited.

Results Summary

Report No.: 18-20082

			ELAB Reference	153571	153572	153573	153574	153575
			Customer Reference					
			Sample ID					
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	BH1	BH2	BH3	Grab 1	Grab 2
			Sample Depth (m)	1.50	2.50	2.50	0.20	0.10
			Sampling Date	11/10/2018	11/10/2018	11/10/2018	11/10/2018	11/10/2018
Determinand	**Codes**	**Units**	**LOD**					
BTEX								
Benzene	M	ug/kg	10	^ < 10.0	^ < 10.0	^ < 10.0	^ < 10.0	^ < 10.0
Toluene	M	ug/kg	10	^ < 10.0	^ < 10.0	^ < 10.0	^ < 10.0	^ < 10.0
Ethylbenzene	M	ug/kg	10	^ < 10.0	^ < 10.0	^ < 10.0	^ < 10.0	^ < 10.0
Xylenes	M	ug/kg	10	^ < 10.0	^ < 10.0	^ < 10.0	^ < 10.0	^ < 10.0
TPH CWG								
>C5-C6 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C6-C8 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C10-C12 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C12-C16 Aliphatic	N	mg/kg	1	7.2	3.5	< 1.0	1.8	< 1.0
>C16-C21 Aliphatic	N	mg/kg	1	11.5	12.7	< 1.0	4.4	< 1.0
>C21-C35 Aliphatic	N	mg/kg	1	130	192	9.3	55.7	9.9
>C35-C40 Aliphatic	N	mg/kg	1	48.4	79.1	< 1.0	7.8	< 1.0
>C5-C7 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C7-C8 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aromatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C10-C12 Aromatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C12-C16 Aromatic	N	mg/kg	1	8.9	5.8	1.3	2.0	< 1.0
>C16-C21 Aromatic	N	mg/kg	1	18.6	22.1	4.3	6.4	1.4
>C21-C35 Aromatic	N	mg/kg	1	179	279	36.7	74.7	23.6
>C35-C40 Aromatic	N	mg/kg	1	78.9	121	8.0	16.5	5.4
Total (>C5-C40) Ali/Aro	N	mg/kg	1	482	715	59.6	169	40.4

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
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Results Summary

Report No.: 18-20082

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
153571	1.50	BH1	Brown sandy soil,Stones,pottery,clinker,concrete	No asbestos detected	n/t	n/t	n/t	n/t
153572	2.50	BH2	Brown sandy soil,Stones,brick	No asbestos detected	n/t	n/t	n/t	n/t
153573	2.50	BH3	Brown sandy soil,Stones	No asbestos detected	n/t	n/t	n/t	n/t
153574	0.20	Grab 1	Brown sandy soil,Stones,brick,clinker	No asbestos detected	n/t	n/t	n/t	n/t
153575	0.10	Grab 2	Brown sandy soil,Stones,clinker	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 18-20082

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Free cyanide	N	As submitted sample	17/10/2018	107	Colorimetry
Sulphide	N	As submitted sample	17/10/2018	109	Colorimetry
Hexavalent chromium	N	As submitted sample	17/10/2018	110	Colorimetry
pH	M	Air dried sample	18/10/2018	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	18/10/2018	115	Ion Chromatography
Aqua regia extractable metals	M	Air dried sample	17/10/2018	118	ICPMS
PAH (GC-FID)	M	As submitted sample	17/10/2018	133	GC-FID
Water soluble anions	M	Air dried sample	17/10/2018	172	Ion Chromatography
Low range Aliphatic hydrocarbons soil	N	As submitted sample	17/10/2018	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	17/10/2018	181	GC-MS
BTEX in solids	M	As submitted sample	17/10/2018	181A	GC-MS
Water soluble boron	N	Air dried sample	17/10/2018	202	Colorimetry
Aliphatic hydrocarbons in soil	N	As submitted sample	17/10/2018	214	GC-FID
Aliphatic/Aromatic hydrocarbons in soil	N	As submitted sample	19/10/2018	214	GC-FID
Aromatic hydrocarbons in soil	N	As submitted sample	17/10/2018	214	GC-FID
Soil organic matter	U	Air dried sample	18/10/2018	BS1377:P3	Titrimetry
Asbestos identification	U	Air dried sample	17/10/2018	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 18-20082

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
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TN38 9BY
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THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	18-20081
Issue:	1
Date of Issue:	19/10/2018
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	18/10350
Date Received:	16/10/2018
Date Approved:	19/10/2018
Details:	West Waterloo Dock, Liverpool
Approved by:	

John Wilson, Operations Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 18-20081

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
153564	TP1 1.50	15/10/2018	16/10/2018	Sandy silty loam	
153565	TP2 0.50	15/10/2018	16/10/2018	Sandy silty loam	
153566	TP2 2.50	15/10/2018	16/10/2018	Silty loam	
153567	TP3 1.50	15/10/2018	16/10/2018	Silty clayey loam	
153568	TP3 4.50	15/10/2018	16/10/2018	Sandy loam	
153569	TP4 1.00	15/10/2018	16/10/2018	Sandy loam	
153570	TP5 1.50	15/10/2018	16/10/2018	Sandy loam+ stones	

Results Summary

Report No.: 18-20081

			ELAB Reference	153564	153565	153566	153567	153568	153569	153570
			Customer Reference							
			Sample ID							
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	TP1	TP2	TP2	TP3	TP3	TP4	TP5
			Sample Depth (m)	1.50	0.50	2.50	1.50	4.50	1.00	1.50
			Sampling Date	15/10/2018	15/10/2018	15/10/2018	15/10/2018	15/10/2018	15/10/2018	15/10/2018
Determinand	**Codes**	**Units**	**LOD**							
Metals										
Arsenic	M	mg/kg	1	15.7	13.5	20.4	9.5	12.8	40.5	^ 17.9
Cadmium	M	mg/kg	0.5	0.6	0.6	0.6	< 0.5	< 0.5	< 0.5	^ < 0.5
Chromium	M	mg/kg	5	26.2	30.5	56.6	46.2	36.2	25.1	^ 17.0
Copper	M	mg/kg	5	61.1	53.8	37.6	21.5	104	67.1	^ 31.3
Lead	M	mg/kg	5	219	177	70.2	13.1	222	73.2	^ 49.0
Mercury	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	^ < 0.5
Nickel	M	mg/kg	5	22.7	27.9	44.7	40.2	28.4	47.0	^ 19.1
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	^ < 1.0
Zinc	M	mg/kg	5	181	194	151	67.2	151	125	^ 72.0
Anions										
Water Soluble Sulphate	M	g/l	0.02	0.08	0.09	0.03	0.03	0.05	0.10	^ 0.28
Inorganics										
Free Cyanide	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Total Sulphide	N	mg/kg	2	< 2	< 2	< 2	< 2	17	< 2	26
Acid Soluble Sulphate (SO4)	U	%	0.02	0.07	0.06	0.04	0.05	0.05	0.07	0.14
Water Soluble Boron	N	mg/kg	0.5	0.9	0.6	1.0	< 0.5	0.9	< 0.5	0.7
Miscellaneous										
pH	M	pH units	0.1	8.6	8.4	8.0	8.2	8.6	10.5	^ 10.4
Soil Organic Matter	U	%	0.1	2.7	2.2	1.7	0.6	1.1	4.1	1.0
Polyaromatic hydrocarbons										
Naphthalene	M	mg/kg	0.1	0.7	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	^ < 0.1
Acenaphthylene	M	mg/kg	0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	^ < 0.1
Acenaphthene	M	mg/kg	0.1	1.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	^ < 0.1
Fluorene	M	mg/kg	0.1	0.7	0.1	< 0.1	< 0.1	< 0.1	< 0.1	^ < 0.1
Phenanthrene	M	mg/kg	0.1	4.6	1.3	0.4	< 0.1	< 0.1	< 0.1	^ < 0.1
Anthracene	M	mg/kg	0.1	1.0	0.3	0.2	< 0.1	< 0.1	< 0.1	^ < 0.1
Fluoranthene	M	mg/kg	0.1	5.3	2.1	0.8	< 0.1	0.3	0.3	^ 0.2
Pyrene	M	mg/kg	0.1	5.2	2.1	0.7	< 0.1	0.3	0.3	^ 0.2
Benzo(a)anthracene	M	mg/kg	0.1	2.5	1.0	0.4	< 0.1	0.2	0.2	^ 0.1
Chrysene	M	mg/kg	0.1	3.1	1.2	0.4	< 0.1	0.2	0.2	^ 0.2
Benzo (b) fluoranthene	M	mg/kg	0.1	2.5	1.1	0.3	< 0.1	0.3	0.2	^ 0.2
Benzo(k)fluoranthene	M	mg/kg	0.1	2.4	1.0	0.3	< 0.1	0.2	0.2	^ 0.2
Benzo (a) pyrene	M	mg/kg	0.1	2.6	1.2	0.4	< 0.1	0.2	0.2	^ 0.2
Indeno (1,2,3-cd) pyrene	M	mg/kg	0.1	1.7	0.8	0.3	< 0.1	0.2	0.2	^ 0.1
Dibenzo(a,h)anthracene	M	mg/kg	0.1	0.5	0.3	< 0.1	< 0.1	< 0.1	< 0.1	^ < 0.1
Benzo[g,h,i]perylene	M	mg/kg	0.1	2.1	0.8	0.2	< 0.1	0.2	0.2	^ 0.1
Total PAH(16)	M	mg/kg	0.4	36.0	13.6	4.7	< 0.4	2.1	2.1	^ 1.6

Results Summary

Report No.: 18-20081

			ELAB Reference	153564	153565	153566	153567	153568	153569	153570
			Customer Reference							
			Sample ID							
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	TP1	TP2	TP2	TP3	TP3	TP4	TP5
			Sample Depth (m)	1.50	0.50	2.50	1.50	4.50	1.00	1.50
			Sampling Date	15/10/2018	15/10/2018	15/10/2018	15/10/2018	15/10/2018	15/10/2018	15/10/2018
Determinand	**Codes**	**Units**	**LOD**							
BTEX										
Benzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	^ < 10.0
Toluene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	^ < 10.0
Ethylbenzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	^ < 10.0
Xylenes	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	^ < 10.0
TPH CWG										
>C5-C6 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C6-C8 Aliphatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C10-C12 Aliphatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C12-C16 Aliphatic	N	mg/kg	1	4.6	< 1.0	3.2	< 1.0	< 1.0	< 1.0	< 1.0
>C16-C21 Aliphatic	N	mg/kg	1	5.3	< 1.0	< 1.0	< 1.0	1.3	< 1.0	< 1.0
>C21-C35 Aliphatic	N	mg/kg	1	64.1	2.3	9.7	< 1.0	7.8	< 1.0	< 1.0
>C35-C40 Aliphatic	N	mg/kg	1	19.9	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C5-C7 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C7-C8 Aromatic	N	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
>C8-C10 Aromatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C10-C12 Aromatic	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
>C12-C16 Aromatic	N	mg/kg	1	5.1	< 1.0	3.0	< 1.0	< 1.0	< 1.0	< 1.0
>C16-C21 Aromatic	N	mg/kg	1	9.0	< 1.0	2.1	< 1.0	2.7	< 1.0	< 1.0
>C21-C35 Aromatic	N	mg/kg	1	101	8.9	23.6	2.3	12.8	< 1.0	< 1.0
>C35-C40 Aromatic	N	mg/kg	1	38.0	1.8	4.1	< 1.0	< 1.0	< 1.0	< 1.0
Total (>C5-C40) Ali/Aro	N	mg/kg	1	247	13.0	45.6	2.3	24.5	< 1.0	< 1.0

Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 18-20081

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #)
in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
153564	1.50	TP1	Brown sandy soiul,Stones,brick	No asbestos detected	n/t	n/t	n/t	n/t
153565	0.50	TP2	Brown sandy	No asbestos detected	n/t	n/t	n/t	n/t
153566	2.50	TP2	Brown sandy soil,Stones,clinker	No asbestos detected	n/t	n/t	n/t	n/t
153567	1.50	TP3	Brown sandy soil,Stones	No asbestos detected	n/t	n/t	n/t	n/t
153568	4.50	TP3	Brown sandy soil,Stones,brick	No asbestos detected	n/t	n/t	n/t	n/t
153569	1.00	TP4	Brown sandy soil,Stones,clinker	No asbestos detected	n/t	n/t	n/t	n/t
153570	1.50	TP5	Brown sandy	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 18-20081

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Free cyanide	N	As submitted sample	17/10/2018	107	Colorimetry
Sulphide	N	As submitted sample	17/10/2018	109	Colorimetry
Hexavalent chromium	N	As submitted sample	17/10/2018	110	Colorimetry
pH	M	Air dried sample	18/10/2018	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	18/10/2018	115	Ion Chromatography
Aqua regia extractable metals	M	Air dried sample	17/10/2018	118	ICPMS
PAH (GC-FID)	M	As submitted sample	17/10/2018	133	GC-FID
Water soluble anions	M	Air dried sample	17/10/2018	172	Ion Chromatography
Low range Aliphatic hydrocarbons soil	N	As submitted sample	17/10/2018	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	17/10/2018	181	GC-MS
BTEX in solids	M	As submitted sample	17/10/2018	181A	GC-MS
Water soluble boron	N	Air dried sample	17/10/2018	202	Colorimetry
Aliphatic hydrocarbons in soil	N	As submitted sample	17/10/2018	214	GC-FID
Aliphatic/Aromatic hydrocarbons in soil	N	As submitted sample	19/10/2018	214	GC-FID
Aromatic hydrocarbons in soil	N	As submitted sample	17/10/2018	214	GC-FID
Soil organic matter	U	Air dried sample	18/10/2018	BS1377:P3	Titrimetry
Asbestos identification	U	Air dried sample	17/10/2018	PMAN	Microscopy

Tests marked N are not UKAS accredited

Report Information

Report No.: 18-20081

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

Soil sample results are expressed on an air dried basis (dried at < 30°C)
ELAB are unable to provide an interpretation or opinion on the content of this report.
The results relate only to the items tested
PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

Unit A2
Windmill Road
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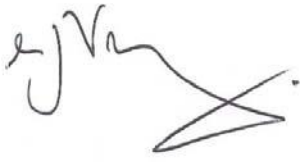
UKAS TESTING 2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	18-20080
Issue:	1
Date of Issue:	19/10/2018
Contact:	Daniel O'Regan
Customer Details:	CC Geotechnical Ltd Unit 1 & 2 Deltic Place Deltic Way Liverpool Merseyside L33 7BA
Quotation No:	Q14-00045
Order No:	Not Supplied
Customer Reference:	18/10350
Date Received:	16/10/2018
Date Approved:	19/10/2018
Details:	West Waterloo Dock, Liverpool
Approved by:	

Mike Varley, Technical Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

Sample Summary

Report No.: 18-20080

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
153562	River	15/10/2018	16/10/2018		
153563	Dock	15/10/2018	16/10/2018		

Results Summary

Report No.: 18-20080

			ELAB Reference	153562	153563
			Customer Reference		
			Sample ID		
			Sample Type	WATER	WATER
			Sample Location	River	Dock
			Sample Depth (m)		
			Sampling Date	15/10/2018	15/10/2018
Determinand	**Codes**	**Units**	**LOD**		
Dissolved Metals					
Arsenic	U	ug/l	5	6	< 5
Boron	N	ug/l	5	3950	3380
Calcium	U	ug/l	100	488000	366000
Cadmium	U	ug/l	1	< 1	< 1
Chromium	U	ug/l	5	< 5	< 5
Copper	U	ug/l	5	< 5	< 5
Mercury	U	ug/l	0.1	< 0.1	< 0.1
Magnesium	U	ug/l	100	1370000	1060000
Nickel	U	ug/l	5	< 5	< 5
Lead	U	ug/l	1	< 1	< 1
Selenium	U	ug/l	5	88	77
Zinc	U	ug/l	5	16	11
Anions					
Sulphate	U	mg/l	0.5	1950	1660
Inorganics					
Free Cyanide	N	ug/l	5	< 5	< 5
Miscellaneous					
Dissolved organic carbon	U	mg/l	1.5	4.9	3.7
Hardness (CaCO3)	N	mg/l CaCO3	0.1	6880	5270
pH	U	pH units	0.1	7.6	7.7
Polyaromatic hydrocarbons					
Naphthalene GCMS	N	ug/l	0.01	0.02	0.02
Acenaphthylene GCMS	N	ug/l	0.01	< 0.01	< 0.01
Acenaphthene GCMS	N	ug/l	0.01	< 0.01	< 0.01
Fluorene GCMS	N	ug/l	0.01	0.01	< 0.01
Phenanthrene GCMS	N	ug/l	0.01	0.08	0.04
Anthracene GCMS	N	ug/l	0.01	0.01	< 0.01
Fluoranthene GCMS	N	ug/l	0.01	0.09	0.04
Pyrene GCMS	N	ug/l	0.01	0.07	0.03
Benzo (a) anthracene GCMS	N	ug/l	0.01	0.04	0.01
Chrysene GCMS	N	ug/l	0.01	0.04	0.02
Benzo (b) fluoranthene GCMS	N	ug/l	0.01	0.04	0.02
Benzo (k) fluoranthene GCMS	N	ug/l	0.01	0.03	0.02
Benzo (a) pyrene GCMS	N	ug/l	0.01	0.03	0.02
Indeno (1,2,3-cd) pyrene GCMS	N	ug/l	0.01	0.02	0.01
Dibenzo(a,h)anthracene GCMS	N	ug/l	0.01	< 0.01	< 0.01
Benzo(ghi)perylene GCMS	N	ug/l	0.01	0.03	0.01
Total PAH(16) GCMS	N	ug/l	0.01	0.53	0.25

Tests marked N are not UKAS accredited.

Results Summary

Report No.: 18-20080

			ELAB Reference	153562	153563
			Customer Reference		
			Sample ID		
			Sample Type	WATER	WATER
			Sample Location	River	Dock
			Sample Depth (m)		
			Sampling Date	15/10/2018	15/10/2018
Determinand	**Codes**	**Units**	**LOD**		
BTEX					
Benzene	U	ug/l	1	< 1.00	< 1.00
Toluene	U	ug/l	1	< 1.00	< 1.00
Ethylbenzene	U	ug/l	1	< 1.00	< 1.00
Xylenes	U	ug/l	1	< 1.00	< 1.00
MTBE	U	ug/l	1	< 1.00	< 1.00
TPH CWG					
>C5-C6 Aliphatic	N	ug/l	1	< 1.0	< 1.0
>C6-C8 Aliphatic	N	ug/l	1	< 1.0	< 1.0
>C8-C10 Aliphatic	N	ug/l	5	< 5.0	< 5.0
>C10-C12 Aliphatic	N	ug/l	5	< 5.0	< 5.0
>C12-C16 Aliphatic	N	ug/l	5	< 5.0	6.7
>C16-C21 Aliphatic	N	ug/l	5	< 5.0	< 5.0
>C21-C35 Aliphatic	N	ug/l	5	< 5.0	< 5.0
>C35-C40 Aliphatic	N	ug/l	5	< 5.0	< 5.0
Total (>C5-C40) Aliphatic	N	ug/l	5	< 5.0	6.7
>C5-C7 Aromatic	N	ug/l	1	< 1.0	< 1.0
>C7-C8 Aromatic	N	ug/l	1	< 1.0	< 1.0
>C8-C10 Aromatic	N	ug/l	5	< 5.0	< 5.0
>C10-C12 Aromatic	N	ug/l	5	< 5.0	< 5.0
>C12-C16 Aromatic	N	ug/l	5	< 5.0	< 5.0
>C16-C21 Aromatic	N	ug/l	5	< 5.0	< 5.0
>C21-C35 Aromatic	N	ug/l	5	< 5.0	< 5.0
>C35-C40 Aromatic	N	ug/l	5	< 5.0	< 5.0
Total (>C5-C40) Aromatic	N	ug/l	5	< 5.0	< 5.0
Total (>C5-C40) Ali/Aro	N	ug/l	5	< 5.0	6.7

Method Summary

Report No.: 18-20080

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Water					
Aliphatic/Aromatic hydrocarbons in water	N		19/10/2018		GC-FID
Aromatic hydrocarbons in water	N		19/10/2018		GC-FID
Dissolved metals by ICP in waters	U		17/10/2018	101	ICPMS
Dissolved organic carbon	U		18/10/2018	102	IR
pH of waters	U		17/10/2018	113	Electromeric
Cyanide in waters	N		17/10/2018	132	Colorimetry
PAHs and/or PCBs in waters	N		17/10/2018	135	GC-MS
BTEX in waters	U		19/10/2018	200	GC-MS
Low range Aliphatic hydrocarbons water	N		19/10/2018	200	GC-MS
Low range Aromatic hydrocarbons water	N		19/10/2018	200	GC-MS
Aliphatic hydrocarbons in water	N		17/10/2018	215	GC-FID
Aromatic hydrocarbons in water	N		17/10/2018	215	GC-FID
Anions	U		17/10/2018	270	Ion Chromatography
Hardness in waters	N		19/10/2018	APHA	ICPMS

Tests marked N are not UKAS accredited

Report Information

Report No.: 18-20080

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PCB congener results may include any coeluting PCBs
Uncertainty of measurement for the determinands tested are available upon request

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APPENDIX K

RISK ASSESSMENT SUMMARY TABLES

CURRENT CONTAMINATED LAND LEGISLATION / GUIDANCE & ENVIRONMENTAL RISK ASSESSMENT METHODLOGY

LEGISLATION OVERVIEW

This report includes hazard identification and risk assessment in line with the risk-based methods referred to in relevant UK legislation and guidance. Government environmental policy is based upon a "suitable for use approach". When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment given the current use and circumstances of the land.

Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:

(a) Significant harm is being caused or there is a significant possibility of such harm being caused;
or
(b) Pollution of controlled waters is being, or is likely to be, caused."

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

*"the entry into controlled waters of **any** poisonous, noxious or polluting matter or **any** solid waste matter"*.

In order to assist in establishing if there is a "significant possibility of significant harm" there must be a "significant pollutant linkage" for potential harm to exist. That means there must be a source(s) of contamination, sensitive receptors present and a connection or pathway between the two. This combination of source-pathway-receptor is termed a "pollutant linkage or SPR linkage."

Part IIA of The Environmental Protection Act 1990 is supported by a substantial quantity of guidance and other Regulations, especially DEFRA Circular 01/2006 Contaminated Land (this replaces DETR Circular 02/2000). Part IIA defines the duties of Local Authorities in dealing with it. With the exception of situations of very high pollution risk, Part IIA places contaminated land responsibility on thee planning and redevelopment process. In situations where there is very high pollution risk direct action from the Local Authority is usually necessary. Planning Policy Statement 23 (PPS23) provides guidance on the planning process and requires that sites which have been developed shall not be capable of being determined "contaminated land" under Part IIA.

The criteria for assessing levels of pollutants and hence determining whether a site represents a hazard are based on a range of techniques, models and guidance. Within this context it is relevant to note that Government objectives are:

(a) to identify and remove unacceptable risks to human health and the environment;
(b) to seek to bring damaged land back into beneficial use;
(c) to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable.

These three objectives underlie the "suitable for use" approach to remediation of contaminated land. The "suitable for use" approach focuses on the risks caused by land contamination. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Risks therefore should be assessed on a site-by-site basis.

The "suitable for use" approach then consists of three elements:

(a) ensuring that land is suitable for its current use - in other words, identifying any land where contamination is causing unacceptable risks to human health and the environment, assessed on the basis of the current use and circumstances of the land, and returning such land to a condition where such risks no longer arise; the contaminated land regime provides the regulatory mechanisms to achieve this;

(b) ensuring that land is made suitable for any new use, as planning permission is given for that new use - in other words, assessing the potential risks from contamination, on the basis of the proposed future use and circumstances, before official permission is given for the development and, where necessary to avoid unacceptable risks to human health and the environment, remediating the land before the new use commences; this is the role of the town and country planning and building control regimes; and

(c) limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought - in other words, recognising that the risks from contaminated land can be satisfactory assessed only in the context of specific uses of the land (whether current or proposed), and that any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby running the risk of distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources).

The mere presence of pollutants does not therefore necessarily warrant action, and consideration must be given to the scale of risk involved for the current and proposed end use of the site.

RISK ASSESSMENT METHODOLOGY

Current practice recommends that the determination of potential liabilities that could arise from land contamination be carried out using the process of risk assessment, whereby "risk" is defined as:

"(a) The probability, or frequency, or occurrence of a defined hazard; and
(b) The magnitude (including the seriousness) of the consequences."

The UK's approach to the assessment of environmental risk is set out in by the Department of the Environment (2000) publication "A Guide to Risk Assessment and Risk Management for Environmental Protection." This established an iterative, systematic staged process which comprises:

(a) Hazard identification
(b) Hazard assessment
(c) Risk estimation
(d) Risk evaluation
(e) Risk Assessment

At each stage during the investigation process the above steps are repeated as more detailed information becomes available for the site.

CLR11- 'Model Procedures for the Management of Land Contamination', a document published by the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) outlines a tiered approach to the assessment of risks posed by contaminated land, as summarised hereunder:

Tier 1: Preliminary Risk Assessment

A Preliminary Risk Assessment is usually undertaken as part of a desk study, outlines potential risks posed by potential contamination to all receptors by defining plausible "pollution linkages" and developing a preliminary conceptual model (PCM). The purpose of this model is to define all possible complete pollution linkages, where the requisite source – pathway – target elements are present, and these elements being defined as:

- a contaminant (source) is a hazardous substance or agent, present at levels that have the potential to cause harm or damage a receptor
- a pathway is the means by or through which a contaminant comes into contact with, or otherwise affects, the receptor
- a receptor (target) is an entity (human being, aquatic environment, flora and fauna etc) that is vulnerable to the adverse effects of the contaminant

This relationship is termed a "pollution linkage". It should be recognised that for a health or environmental risk to exist, all three elements of the relationship or linkage must be present, i.e.

- if there is no contaminant, or contaminant present at levels below those considered to be harmful or damaging to a receptor, then there can be no adverse effect on a receptor
- if there is no receptor present that can be adversely affected by a contaminant, no harm or damage can arise
- even where both a contaminant and a receptor are present, no harm or damage will occur if there is no pathway by or through which a linkage between the two can be established

The absence of one or more of each component (source, pathway, receptor) would prevent a pollutant linkage being established and there would be no significant environmental risk.

The PCM is subject to continual refinement as additional data becomes available. As part of a Phase I Investigation (Desk Study and site walk over) a PCM is formed. Based on the PCM, potential pollutant linkages can be assessed. If the PCM and hazard assessment indicate that a pollution linkage is not of significance then no further assessment or action is required due to this linkage. For each significant and possible linkage a risk assessment is carried out. The linkages which potentially pose significant risks may require a variety of responses ranging from immediate remedial action or risk management or, more commonly, further investigation and risk assessment. This next stage is usually termed a Phase II Main Site Investigation and should provide additional data to allow refinement of the PCM and assess the level of risk from each pollutant linkage. Risk assessment will usually include Tier 2 Generic Quantitative Risk Assessment and / or, if necessary, a Tier 3 Detailed Quantitative Risk Assessment.

Tier 2: Generic Quantitative Risk Assessment (GQRA)

GQRA requires an intrusive investigation in order to characterise the site assisting in the re-assessment of the source-pathway receptor linkage. The conceptual model should be refined accordingly.

Upon completion of an intrusive investigation a it must be decided whether Generic Assessment Criteria (GAC) are suitable for assessing the risk posed by potential contaminantion at the site. If GAC are deemed unacceptable for risk assessment purposes or cannot be developed a Tier 3 Detailed Quantitative Risk Assessment (DQRA) is required.

If GQRA reveals that unnacceptable risks are not present then no further action is required. If GQRA identifies a possibility of risk, a decision must be made whether further work is required or necessary for the purposes of risk assessment. If further risk assessment is is deemed not suitable not required an Options Appraisal should be undertaken. If further risk assessment is required, the scope nature of further risk assessment must be decided – it is possible that a Tier 3 DQRA will be undertaken in this scenario.

Where the Environment Agency have published an SGV for a contaminant, this will be used in lieu, if the SGV is suitable for the subject site, of the GAC derived by ***CC GEOTECHNICAL LTD.*** For contaminants where an SGV has not been published

and a GAC has been published by LQM, then this GAC will be used. In house derived GAC's will only be used for contaminants where there is no SGV or LQM GAC.

Tier 3: Detailed Quantitative Risk Assessment (DQRA)
DQRA is used when pollutant linkages require further assessment. DQRA is often undertaken for pollutant linkages where GAC are unavailable or inappropriate for or more conservative than the actual circumstances of the site. Site specific data is used to create Site Specific Assessment Criteria (SSAC) and enable a more accurate assessment of the risks. Further investigation may or may not be required to formulate SSAC depending on the site specific conditions and information alrerady obtained.

If DQRA reveals that unnacceptable risks are not present then no further action is required. If DQRA identifies a possibility of risk, a decision must be made whether further work is required or necessary for the purposes of risk assessment. If further risk assessment is is deemed not suitable not required an Options Appraisal should be undertaken. If further risk assessment is required, the scope and nature of further risk assessment must be decided at this point.

NOTE: A Tier 1 Preliminary Risk Assessment is undertaken as part of a Desk Study Report and a Preliminary Conceptual Model is devloped for all pollutant linkages. However, the methodologies for assessing the risks to human health, risks to controlled waters and risk posed by ground gas using quantative techniques vary considerably, therefore GQRA and DQRA for human health, controlled waters and ground gas must be undertaken seperately. The risk assessment methodologies where quantative assessment is used for risks to human health, risks to controlled waters and risks posed by ground gas, if relevant, are described hereunder.

BACKGROUND INFROMATION, CURRENT GUIDANCE AND RISK ASSESSMENT METHODOLOGY FOR RISKS POSED TO HUMAN HEALTH

Background
In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the EA published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. These reports (CLR7-10) together with associated "SGV" documents have since been withdrawn (August 2008) and the following documents have been published as revised guidance to the CLEA assessment:

- Environment Agency : 2008: Updated Technical Background to the CLEA model Science Report SC050021/SR3
- Environment Agency : 2008: Human Health Toxicological Assessment of Contaminants in Soil SC050021/SR2

Additional guidance on statistical assessment replacing CLR 7 is provided in:

- CL:AIRE :2008 Guidance on Comparing Data With a Critical Concentration

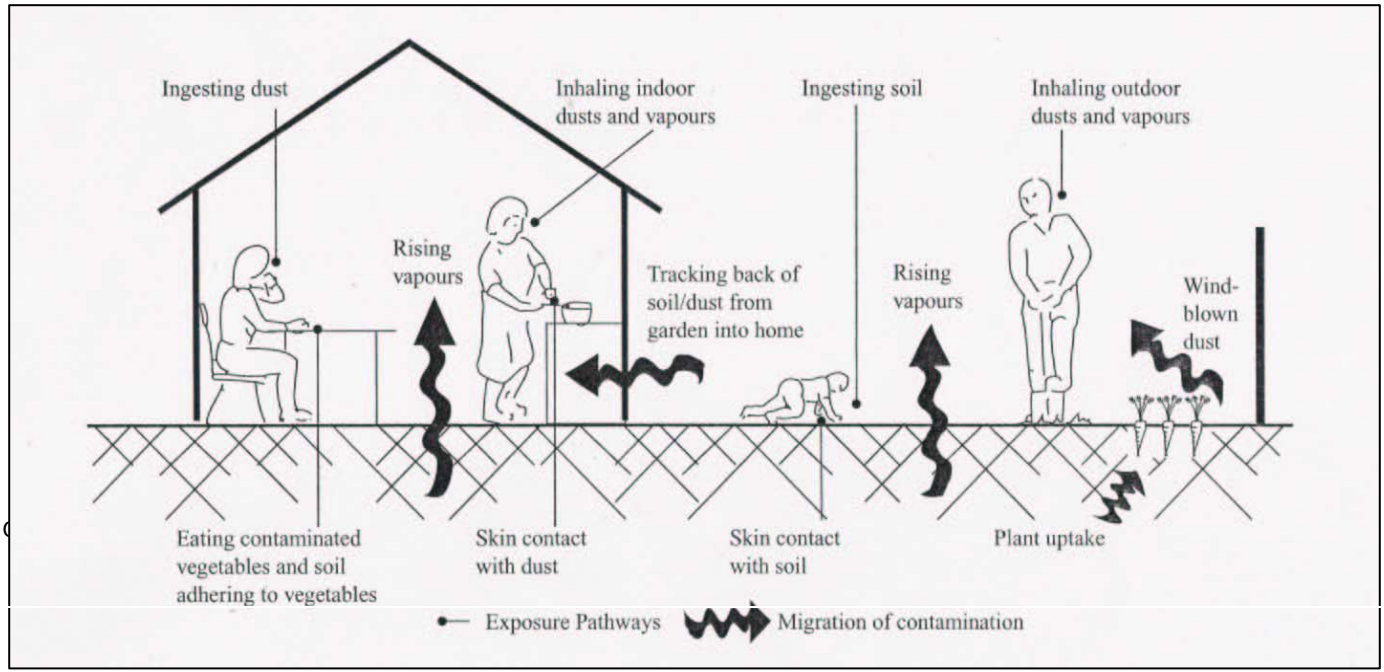
Other guidance/software used in spatial / statistical assessment is provided in:

- USEPA 2006: Data Quality Assessment: Statistical Methods for Practitioners
- Spatial Analysis and Decision Assistance (SADA) – The University of Tennessee

A different approach to the statistical appraisal of data is required depending on whether the assessment of risk is to assess whether land is Contaminated Land in accordance with regulations, or whether the assessment is to determine whether the site is suitable for new development in according with Planning guidance. This is discussed further in CL:AIRE :2008 "Guidance on Comparing Data With a Critical Concentration".

A program for the derivation of GAC`s based on the above guidance is provided by the Environment Agency and is entitled "CLEA Software Version 1.06".

The CLEA model has been developed to calculate an estimated tolerable daily soil intake (TDSI) for site users given a set 'default' exposure pathways. Ten human exposure pathways are covered in the CLEA model as presented below:



Ingestion
- ingestion of outdoor soil
- ingestion of indoor dust
- ingestion of home grown produce
- ingestion of soil attached to home grown produce

Dermal Contact
- dermal contact with outdoor soil
- dermal contact with indoor dust

Inhalation
- inhalation of outdoor dust
- inhalation of indoor dust
- inhalation of outdoor soil vapour
- inhalation of indoor soil vapour

It should be noted that there are other potential exposure pathways on some sites not included in the CLEA model e.g. certain organic compounds can pass through plastic water pipes into drinking water supply.

Where contaminated water is present at a depth less than 2.00mbgl and there is a potential risk of inhalation of vapours (only when volatile compounds are present) the risk from inhalation of vapours from soil water will be assessed using a UK compliant version of BP Risc v4.02.

The presence and/or significance of each of the above exposure pathways are dependent on the type of land use being considered and the nature of the contaminant under scrutiny. Accordingly, the CLEA model considers for principle 'default' land use types and makes a series of 'default' assumptions with regard to human exposure frequency, duration and critical human target groups for each land use considered:

- residential
- allotments
- commercial / industrial land use

The above land use categories defined in the CLEA are detailed below:

Residential: This generic scenario assumes a typical residential property consisting of a two-storey house built on a ground-bearing slab with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden area.

Allotments: This generic scenario assumes a plot of open space (about 250 m2), commonly made available by the local authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than a hectare. The tenants are assumed to be parents or grandparents and that young children make occasional accompanied visits to the plot.

Commercial / Industrial: There are many different kinds of workplace and work-related activities. This generic scenario assumes a typical commercial or light industrial property consisting of a threestorey building at which employees spend most time indoors and are involved in officebased or relatively light physical work.

Human Health Risk Assessment Methodolgy
Assessment of risk for the protection of human health is undertaken using the methodology as outlined previously, and summarised hereunder:

- Tier 1 Preliminary Risk Assessmnent
- Tier 2 Generic Quantitative Risk Assessment
- Tier 3 Detailed Quantitative Risk Assessment

The Tier 1 Preliminary Risk Assessment is undertaken as part of the desk study report and includes the development of a Preliminary Conceptuel Model. Tier 2 and Tier 3 Quantitative Risk Assessments are undertaken in order to develop and refine the Preliminary Conceptual Model aiding a more detailed assessment of the risk posed by contaminants revelaed by site investigation and soil / soil water chemical analyses.

The methods used by ***CC GEOTECHNICAL LTD*** to derive assessment criteria, to statistically analyse chemical data and to compare chemical data to the derived assessment criteria are discussed herunder.

Derivation of Generic Assessment Criteria (GAC) and Site Specific Assessment Criteria (SSAC)
GAC`s are derived on the basis of the proposed land use and the associated applicable exposure pathways. It should be noted that there are difficulties in establishing soil concentrations of contaminants beyond which risks from exposure to these contaminants would be 'unacceptable' and the GAC value does not necessarily equate to the level for "significant possibility of significant harm" as defined in Part IIA of The Environmental Protection Act (1990) to determine whether land is "contaminated." This ultimately requires detailed 'toxicological' information of the health effects of individual contaminants and also a scientific judgement on what constitutes an 'unacceptable' risk. The primary purpose of the CLEA derived GAC's are as 'minimal risk thresholds' for the assessment of human health risks in relation to land use.

Minimal risk thresholds calculated using generic input parameters for each of the above land uses are termed Generic Assessment Criteria (GAC) and are used for Generic Quanatative Risk Assessment (GQRA). However, further assessment may be required taking into consideration site specific factors such as the way the land is used, the soil type, the building

characteristics and the exact nature of the receptor, to determine whether there is a significant possibility of risk to human health to site users. Such an assessment is known as a Detailed Quantitative Risk Assessment (DQRA) and the resultant threshold concentrations are known as Site Specific Assessment Criteria (SSAC). Such assessments should be conducted with the agreement of the local authority (or the Environment Agency) since it is the authority that determines whether land is Contaminated Land or whether Planning Permission for a new development may be granted.

For the purposes of this report, assessment criteria have been derived in accordance with current guidance based on the conceptual model for the proposed land use using the CLEA v1.06 software. These criteria are not intended to indicate whether the site may be contaminated land nor do they replace any published soil guideline values. However, the values are intended to provide guidance for the local authority on whether the site may be considered uncontaminated. If, based on the site's proposed future use, the site would be considered by the local authority to be uncontaminated and therefore, on the basis of soil concentrations, fit for purpose, then no further risk assessment based on soil concentrations and the risk to human health would be necessary. However, should these criteria be exceeded or the conceptual site model vary from the model used in the risk assessment to derive these values then the risk assessment should be updated accordingly.

For contaminants routinely analysed where inhalation is a significant pathway (naphthalene, phenanthrene, Aromatic EC5-EC7, Aromatic EC7-EC8, Aromatic EC8-EC10, Aromatci EC10-EC12, Aromatic EC12-EC16, Aliphatic EC5-EC6, Aliphatic EC8_EC10, Aliphatic EC10-EC12, Aliphatic EC12-EC16), plots of the GAC as a function of Soil Organic Matter (SOM) are used to determine if they pose a potential risk to human health, which are presented hereunder. Where there is an exceedance further assessment may be undertaken.

Statistical Assessment of Soil Contamination Data & Comparison of Contamination Data to Threshold Values

In any site investigation only a small fraction of the soil on the site is analysed. Therefore the mean derived from the contamination data for a contaminant may not be the same as the true mean for the contaminant distribution on the site. To improve the reliability of any assessment a statistical analyses is undertaken in line with the CL:AIRE document "Guidance on Comparing Soil Contamination Data with a Critical Concentration".

Statistical assessment of soil data is undertaken using programs based on the guidance in the CL:AIRE document or the USEPA software ProUCL v4.0.

Where the number of results in a dataset is less than four, a statistical assessment is not undertaken, and the assessment is performed by comparison of the maximum value(s) with a Health Criteria Value (HCV), such as Generic Assessement Criteria value(s).

For the Planning situation, the regulator needs to check whether the concentration of contaminants is low compared to the HCV. This decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is lower than the HCV.

For the Part IIA scenario the regulator needs to determine whether the concentration of contaminants is greater than the HCV. This decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is higher than the HCV. However, the regulator may proceed with determination if there is just a 51% probability, "on the balance of probabilities".

The Outlier Test used in the statistical assessment may not be able identify separate populations if numerous populations are present. Inorder to ensure that this is not the case a spatial assessment of the data will be undertaken using SADA.

If the screening levels are exceeded then more sophisticated quantitative risk assessment or remedial action may be undertaken. The benefits of undertaking a quantitative risk assessment must be weighed against the likelihood that it will bring about cost savings in the proposed remediation.

BACKGROUND INFORMATION, CURRENT GUIDANCE AND RISK ASSESSMENT METHODOLOGY FOR RISKS POSED TO CONTROLLED WATER

Definition of Controlled Waters

The term 'controlled waters' is defined in Section 104 of the Water Resources Act 1991 as:

"Territorial Waters…which extend seawards for three miles…, coastal waters…, inland freshwaters, waters in any relevant lake or pond or of so much of any relevant river or watercourse as is above the freshwater limit, and ground waters, that is to say, any waters contained in underground strata."

Note that the definition of groundwater under the Water Resources Act 1991 includes all water within underground strata (including soil / pore water in the unsaturated zone). The definition of groundwater under the Groundwater Directive however is limited to water in the saturated zone. For the purposes of Part IIA of the Environmental Protection Act 1990, the Environment Agency recommends that the groundwater within the saturated zone only is considered as the receptor (rather than soil / pore water).

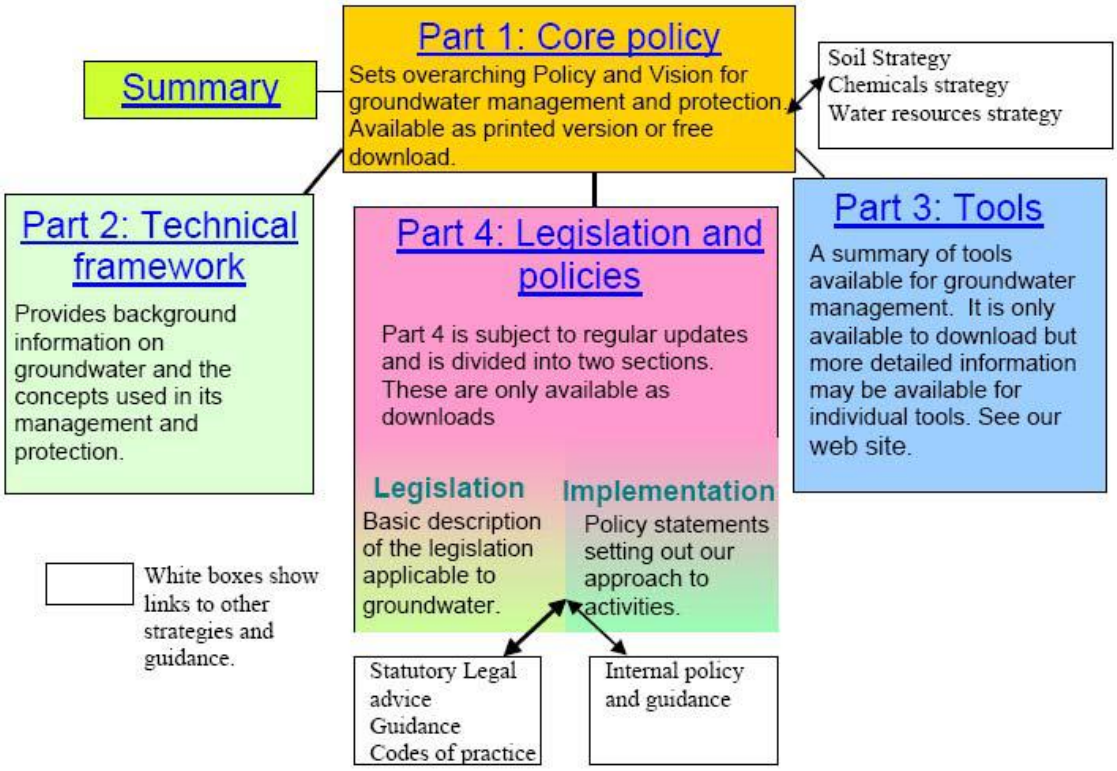
Environment Agency Guidance

Legislation and guidance surrounding the protection of controlled waters in the UK is abundant and can be complex. The Environment Agency's overall position on groundwater is *"To protect and manage groundwater resources for present and future generation in ways that are appropriate for the risks that we identify"* (Groundwater Protection : Policy and Practice GP3, 2006). In brief, the core objectives of the existing legislation serve to enforce this position.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document was influential as it provided a focus for key developments such as Source Protection Zones (SPZs) and

Groundwater Vulnerability Maps. The Policy was then revised in 1998, since which there have been substantial changes in legislation, driven by Europe. Key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991. Further to legislative changes, gaps identified in the 1998 PPPG required addressing. These changes are reflected in the forthcoming Environment Agency Policy document entitled *Groundwater Protection : Policy and Practice (GP3)*, a draft version of which was available for public consultation (Parts 1 to 3) ending July 2006 with Part 4 issued in March 2008. Part 4 includes a section on key groundwater legislation and the Environment Agency's interpretation of it.

The following gives a breakdown of the structure of the document (taken from the Environment Agency GP3 draft consultation document, 2006)



Controlled Water Risk Assessment Methodology

The risk posed to controlled water is assessed by ***CC GEOTECHNICAL*** in accordance with current guidance as outlined hereunder.

In order for a developer of a potentially contaminated site to fulfil their obligations under the legislation, a site assessment would be required to be undertaken in order to identify any potential risks to controlled waters and to derive suitable clean-up criteria if necessary to ensure the protection of controlled waters. The general approach for Groundwater Protection is detailed further in Part 3 of GP3.

When assessing groundwater impact the Environment Agency advocate the application of their framework methodology "Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination" Environment Agency (2006). The methodology has four levels of assessment as described below:

- **Level 1** considers whether contaminant concentrations in "pore water" in contaminated soil are sufficient to impact on the receptor, ignoring dilution, dispersion and attenuation along the pathway. The "pore water" concentration is determined from:

  i) measured "pore water" concentrations or perched water quality
  ii) soil leaching tests
  iii) theoretical calculations based on soil/water partitioning equations

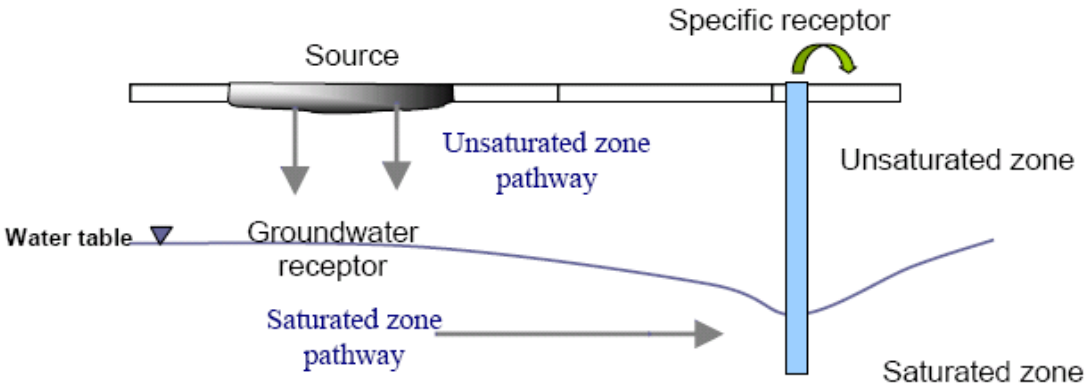
- **Level 2** considers dilution by the receiving groundwater or surface water body and whether this is sufficient to reduce contaminant concentrations to acceptable levels. The remedial target is defined as the target concentration multiplied by a dilution factor (DF).

- **Levels 3 and 4** consider whether natural attenuation (including dispersion, retardation and degradation) of the contaminant as it moves through the unsaturated and saturated zones to the receptor are sufficient to reduce contaminant concentrations to acceptable levels. The remedial target is defined as target concentration multiplied by a dilution factor (DF) and attenuation factor (AF). In **Level 3** simple analytical models are used to calculate the significance of attenuation. The Environment Agency has released a "Remedial targets worksheet v3.1" to carry out basic calculations using a conservative approach up to **Level 3** using basic principles assuming a simple migration of contaminants from the

source zone into the aquifer receptor. **Level 4** assessment uses more sophisticated numerical models, and allows for the introduction of additional geological horizons and is used mainly to determine whether soil contaminants will reach their target within a specified timeframe. Use of such software should only be used once agreement has been obtained from the Environment Agency.

Three main stages apply to any risk assessment of controlled waters, these are:

1. **Risk Screening (Tier 1 Preliminary Risk Assessment):** The understanding of the Conceptual Site Model (CSM) is the key to assessing any site. Using a robust CSM, potential pathways or receptors may be screened out from any further assessment at an early stage. For example if the pathway through the unsaturated zone is blocked by the presence of a significant thickness of low permeability clay. A greater understanding of the CSM is achieved with each tier of risk assessment. An example of a basic CSM is given below (taken from the Environment Agency GP3 draft consultation document, 2006):



2. **Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Level 1):** When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with screening criteria. Published values of screening criteria with which chemical test results can be compared are published in the following guidance:

   - Water Supply (Water Quality) Regulations 2000
   - The Private Water Supplies Regulations 1991
   - Environmental Quality Standards for surface waters based on The EC Dangerous Substnaces Directive (76/464/EEC and Daughter Directives)
   - The Surface Waters(Abstraction for Drinking Water Classification) Reguslations 1996
   - World Health Organisation Drinking Water Standards 2004

   Should the Level 1 assessment indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

   - To devise suitable remedial solutions
   - To carry out more investigation, sampling and analysis
   - To conduct a site specific Detailed Quantitative Risk Assessment (DQRA) to determine determine if the materials are suitable for thair proposed use, or devise site specific clean-up level

3. **Detailed Quantitative Risk Assessment (EA Remedial Targets Methodology Levels 2 to 4):** The decision to carry out a DQRA will be dependant on the extent and implications of the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the previous levels of assessment. The conceptual model will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment, the remainder having been screened out.

   Additional site specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

   Remediation criteria, if derived, will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or *compliance point*. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

BACKGROUND INFORMATION, CURRENT GUIDANCE AND RISK ASSESSMENT METHODOLOGY FOR RISKS POSED BY GROUND GAS

Background

Origin of Ground and Landfill Gases

When carrying out a ground gas risk assessment, the origin or source of the gases is important as potential risks will vary depending on the source. This Appendix relates to the risk of the two main ground gases of concern; methane and carbon dioxide, and does not apply to other ground gases (e.g. radon or vapours from hydrocarbon spills). Methane and carbon dioxide are major constituents of landfill gas but can also occur from a variety of anthropogenic and natural sources, as summarised in Table 5 below:

Gas	Source	Comments
Landfill Gas	Anaerobic decomposition of degradable waste within landfill sites. Typically 60% methane and 40% carbon dioxide during methanogenic phase.	Composition varies over time, particularly in early stages. Contains a range of minor constituents (particularly carbon monoxide and hydrogen sulphide).
Landfill Associated Gases	- Anaerobic degradation of leachate external to the site; - Degassing of dissolved gases in groundwater; - Evolution of gases following interaction between leachate and groundwater	Can result in secondary (external) production of methane or carbon dioxide.
Made Ground	Anaerobic degradation of organic components	Very variable depending on source
Sewer Gas, Cess Pits	Anaerobic degradation of organic components of sewage producing methane and carbon dioxide.	Often characterised by hydrogen sulphide odour.
Mains Gas	Leakage from underground pipework or storage tanks. Mainly methane but often contains higher alkanes.	An odouriser is added to permit detection of leaks. Typically 90% CH_4, but 1 to 27% C_2-C_4 alkanes, May also contain other trace gases e.g. CO, helium and CO_2 (from degradation of CH_4 in the ground).
Other Anthropogenic Sources	- Degradation of leaked or spilled hydrocarbons or other industrial chemicals; - Anaerobic degradation of organic contaminants in groundwaters (e.g. silage liquor); - Reactions between monitoring well construction components and environment; - Burial grounds/cemeteries.	Hydrocarbon spillages often have an 'oily' odour. Fuel spillages common – Petrol or Diesel and can contain a wide range of VOC's. Can degrade to produce methane / carbon dioxide.
Alluvium / Marsh / Peat Gas	Anaerobic microbial degradation of organic material (usually waterlogged vegetation / peat). Often associated with the presence of alluvial deposits or dredgings.	
Geogenic Gas	Natural seepages of carbon dioxide and hydrocarbon gases derived from geologic sources such as coal seams and deep oil / gas source formations. Can be present in solution in groundwaters.	Methane most common but can contain carbon dioxide and higher alkanes.
Mine Gases	Various types. Most common is "fire damp" with high methane, produced by the desorption of gas trapped in coal. "Black damp" (Stythe gas) with high carbon dioxide and denser than air. "White damp" is high in carbon monoxide.	Methane most common. Can contain higher alkanes, carbon dioxide and carbon monoxide. Often low in oxygen.
Natural Shallow Ground Gas	Various types - high carbon dioxide formed by subsurface aerobic activity leading to depleted oxygen and elevated carbon dioxide; - chemical degradation of rocks (e.g. carbonates) producing carbon dioxide; - carbon dioxide production in root zone of soils by plants.	Gases can be emitted from ground under falling barometric pressure conditions.

Table 5. Potential Sources of Ground Gases

This Appendix does not provide guidance for the assessment of risk when other gases are present due to 'Other Sources' from the above table (particularly organic compounds such as BTEX and VOC's or for the risk from radon or hydrogen sulphide).

To determine the origin of the gas a range of factors must be considered together, including;

1. Proximity of likely sources
2. Ground conditions (geology, hydrogeology, anthropogenic pathways etc)
3. Properties of gases present including:
   - Chemical composition
   - Physical properties
   - Ratios of components e.g. methane : carbon dioxide
4. Timeframe of activities such as infilling periods, capping works, installation of gas control systems etc

Identification of the originating source may be problematic given that there may be more than one source present and trace gas analysis may be required. Identification of the sources of the gases encountered during monitoring is usually carried out through a process of eliminating the most unlikely potential sources (given the site setting) and selecting those which are most likely.

Hazards Associated with Presence of Methane

Methane gas is combustible and potentially explosive. When the concentration of methane in air is between the limits of 5.0%v/v and 15.0%v/v an explosive mixture is formed. The Lower Explosive Limit (LEL) of methane is 5.0%v/v, which is equivalent to 100% LEL. The 15.0%v/v limit is known as the Upper Explosive Limit (UEL), but concentrations above this level cannot be assumed to represent safe concentrations. Further, the LEL and UEL will vary (up and down) depending upon the proportion of other gases (including oxygen). However, the fact that methane is a colourless, odourless gas means that there

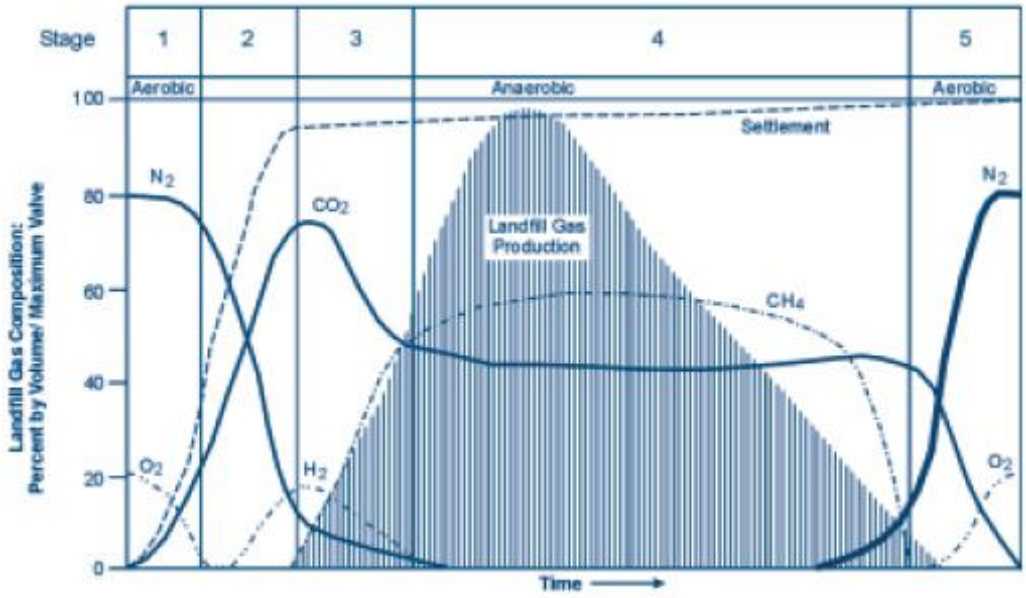
is no simple indicator of the presence of the gas until such a time as explosive limits are reached and an incident occurs. Methane is lighter than air and has a low toxicity. However, at high concentrations it can result in asphyxiation due to oxygen displacement.

Hazards Associated with Presence of Carbon Dioxide

Carbon dioxide is a colourless, odourless gas, which, although non-flammable, is both toxic and an asphyxiant. As carbon dioxide is denser than air, it will collect in low points and depressions. The UK Health & Safety Executive (HSE) has published information relating to concentrations of carbon dioxide that humans may be exposed to, which uses concentrations contained in the Control of Substances Hazardous to Health Regulations 2002 (as amended). These are the Long Term Occupational Exposure Limit (LTOEL, 8 hour period) and the Short Term Occupational Exposure Limit (STOEL, 15 minute period), which are 0.5% and 1.5% carbon dioxide, respectively.

Parameters Influencing the Rate of Ground Gas Production

The figure below is taken from EA guidance document LFTGN 03 illustrates typical ground gas generation curves from biodegradable materials:



The production of methane and carbon dioxide at a landfill site may be expected to be considerable and ongoing. Concentrations of methane will eventually decrease, followed by concentrations of carbon dioxide, but the duration and rate of gas production can vary markedly between sites. Five distinct phases of gas production occur during the process which are, in order of event as marked above, as follows:

1. An aerobic phase involving oxygen depletion and temperature increase through aerobic respiration;
2. The establishment of anaerobic conditions and the evolution of carbon dioxide and hydrogen through acidogenic activity;
3. Commencement of methanogenic activity; the establishment of populations of methanogenic bacteria;
4. A phase of stable methanogenic activity, which may go on for many tens of years;
5. A phase of decreasing methanogenic activity, representing depletion of the organic material and a return to aerobic conditions.

The time scale for the return to the normal ground gas concentrations will be highly variable, depending upon the types and quantities of materials present. In addition, the optimum parameters influencing the rate of decomposition and ground gas production within the ground at a site are as follows:

- High water content with adequate rainfall and water infiltration to provide moisture content between approximately 20 to 26%;
- Conditions that either are or are very close to anaerobic;
- High proportion of biodegradable materials;
- A pH between 6.5 and 8.5, ideally verging slightly on the acidic between pH 6 to 7;
- Temperature between 25°C and 55°C;
- The ratio of the biochemical and chemical oxygen demands (BOD:COD);
- High permeability;
- Small particle size, as finer subsurface materials possess a greater surface area to provide a growing 'face' for the micro-organisms but high fines levels reduces permeability and reduces decomposition rate.

For this reason, it is vital that sources of methane and carbon dioxide are identified prior to the commencement of any work on a construction site, and that the ground gas regime is characterised at the worst temporal conditions a site may experience. From this, a risk assessment is carried out to identify the risk at the site from ground gases so that suitable protection measures can be designed and incorporated into a development to prevent a dangerous build-up of gas occurring.

Factors Influencing the Migration and Behaviour of Ground Gases

CD37d

There are many factors that influence the migration of ground gases which can effect the risk from a gassing source:

- driving force – pressure differential along a pathway, diffusion and dissolved in solution;
- meteorological conditions – short term and seasonal conditions including atmospheric pressure changes (e.g. rapidly falling pressure causes gas to expand increasing emission rates), rainfall, frozen ground and thawing, temperature;
- geological and groundwater conditions – these can have the over riding influence on the direction/pathways and quantity of migrating gas;
- anthropogenic influences – man-made pathways include mine shafts, service runs/drains, foundation piles, underground voids/pits/basements, foundation/building design/construction

Current Guidance
Previous versions of Building Regulations Approved Document C provided statutory guidance stating that consideration should be given to appropriate action and / or specific solutions in situations where methane concentration exceeded 1%v/v or carbon dioxide concentrations exceeded 5%v/v. The latest Building Regulations Approved Document C (DoE 2004) no longer endorses this approach and recommends the use of a risk based approach to interpreting a gas monitoring survey. This is in line with current EA guidance for landfill gas (LFTGN 03, 2004) which recommends the use of a structured risk based approach similar to that outlined in CLR 11. On this basis, recent guidance has been produced in 2006 and 2007 with the aim of providing up to date advice in relation to residential and commercial development. The guidance does not address issues associated with gas derived from landfills, for this refer to *"Guidance on the Management of Landfill Gas"* (Environment Agency 2004) for an overview.

Recent guidance relevant to gas assessments for residential and commercial development includes;

- **Wilson *et al.* (CIRIA C665, December 2007) *"Assessing Risks Posed by Hazardous Ground Gases for Buildings."***
  This document provides up to date advice on all aspects of ground gas risk assessment such as investigation, monitoring programmes, data collection and interpretation. The guidance presents separate methodologies for the characterisation of:
  - All development types except low rise housing with gardens (Situation A)
  - Low rise housing with gardens (Situation B)

- **Boyle and Witherington (NHBC / RSK Group, Report 10627-R01(04) January 2007) *"Guidance on the Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present."***
  This document presents the "Traffic Lights System" detailed below and is relevant only for low rise properties (e.g. bungalows and town houses) that have a ventilated sub-floor void (i.e. Situation B as described in CIRIA C665).

- **British Standard (BS 8485, December 2007) *"Code of Practice for the Characterization and Remediation from Ground Gas in Affected Developments"***
  This document provides an overview of gas characterisation and assessment. The Standard is intended to be used by designers of gas protection measures and regulators involved in the assessment of design solutions.

Further guidance, **Wilson and Card (CIEH) *"Ground Gas Handbook for Designers and Regulators"*** providing practical guidance on ground gas assesments and the design and evaluation of protection measures, is expected to be published in March 2009.

Each of these documents continues to highlight the importance of, and give further guidance towards, carrying out a tiered risk-based decision-making process in accord with government policy on dealing with contamination from historic or natural sources and highlight the importance of the Conceptual Model in site characterisation.

Ground Gas Risk Assessment Methodology
Assessment of risk posed by ground gas is undertaken using the methodology as outlined previously, and summarised hereunder:

- Tier 1 Preliminary Risk Assessmnent
- Tier 2 Generic Quantitative Risk Assessment
- Tier 3 Detailed Quantitative Risk Assessment

The methodology used in each of the above assessments with concern to ground gas is discussed hereunder.

<u>Tier 1 Preliminary Risk Assessment</u>
All potential sources of methane and carbon dioxide are identified in the Preliminary Conceptual Model and the generation potential determined. The background information discussed earlier is referred to in order to determine the potential for a source to generate ground gas.

CIRIA C665 provides idealised monitoring frequency / period dependant upon generation potential of gas source and sensitivity of the proposed land use as below:

Idealised Frequency and Period of Monitoring (after Table 5.5a and 5.5b, CIRIA C665)

		Generation Potential of Source				
		Very Low	**Low**	**Moderate**	**High**	**Very High**
Sensitivity of Development	**Low** (Commercial)	4/1	6/2	6/3	12/6	12/12
	Moderate (Flats)	6/2	6/3	9/6	12/12	24/24
	High (Residential with Gardens)	6/3	9/6	12/6	24/12	24/24

Notes
1. First number is the number of readings and the second is the minimum period in months (e.g. 6/2 – six sets of readings over two months).
2. At least two sets of readings must be at low (preferably under 1,000 mb) and falling pressure.

The monitoring programme is decided using the above table prior to the intrusive site investigation. However, if the intrusive investigation reveals that a the potential source is better or worse than anticipated the monitoring programme should be modified accordingly. For example, if the made ground contains no evidence of organic material and comprises entirely granular brick fill, the potential for that made ground to generate ground gas is reduced considerably.

Tier 2 Generic Quantitative Risk Assessment
Generic Quantitiative Risk Assessment is undertaken upon completion of the required gas monitoring period.

All three current guidance documents propose that both ground gas concentrations and flow rates are used to calculate the limiting gas well gas volume flow rates for methane and carbon dioxide, based on the ground gas conditions monitored for during the worse-case temporal conditions. This limiting gas well volume flow rate is termed the Gas Screening Value (GSV, note that this was termed borehole gas volume flow), and is calculated as follows:

$$\textbf{GSV}\ (\text{l/hr}) = \frac{[\text{gas well gas concentration (\%v/v)}] \times [\text{gas well flow rate (l/hr)}]}{100}$$

GSV's are compared to typical max concentrations and limiting gas screening values derived for either Situation A - All development except low rise housing with gardens, or Situation B low rise housing with gardens (NHBC Traffic Light System). Table 8.5 from CIRIA C665 is used for comparison of gas screening values for "Situation A Developments" and is presented hereunder:

Characteristic Situation (CIRIA R149)	Comparable Partners in Technology gas Regime (see Box 8.2)	Risk Classification	Gas Screening Value (CH_4 or CO_2) (l/hr)[1]	Additional Factors	Typical Source of Generation
1	A	Very low risk	<0.07	Typically methane ≤ 1% and/or carbon dioxide ≤ 5%. Otherwise consider increase to Situation 2	Natural soils with low organic content "Typical" made ground
2	B	Low risk	<0.7	Borehole air flow rate not to exceed 70l/hr. Otherwise consider increase to characteristic Situation 3	Natural soil, high peat/organic content. "Typical" made ground
3	C	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
4	D	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures.	Mineworking susceptible to flooding, completed landfill (WMP 26B criteria)
5	E	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
6	F	Very high risk	>70		Recent landfill site

Table 8.5 from CIRIA C665 Modified Wilson and Card Classification

Table 8.7 is used for comparison of gas screening values for "Situation B Developments" and is presented herunder:

Traffic Light	Methane[1]		Carbon Dioxide[2]	
	Typical max concentration[3] (% by volume)	Gas screening value[2,4] (litres/hour)	Typical max concentration[3] (% by volume)	Gas screening value[2,4] (litres/hour)
Green	1	0.13	5	0.78
Amber 1	5	0.63	10	1.60
Amber 2	20	1.60	30	3.10
Red				

Notes:
1. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter will be the decoder as to what Traffic Light is allocated;
2. Borehole Gas Volume Flow Rate, in litres per hour as defined in Wilson and Card (1999), is the borehole flow rate multiplied by the concentration in the air stream of the particular gas being considered;
3. The Typical Maximum Concentration can be exceeded in certain circumstances should the Conceptual Site Model indicate it is safe to do so;
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

Table 8.7 from CIRIA C665 - NHBC Traffic light system for 150 mm void

Dependant on the outcome of the assessment of risk posed by ground gas it is determined whether gas protection measures are required for the proposed development, and or whether a detailed quantitative risk assessment is required for the site.

Selection & Design of Protective Measures
Table 8.6 and Box 8.4 of CIRIA C665 contain information on the detailed design of protection measures and were initially intended for the purposes of determining then level of protection measures a development requires. These tables and related text include some useful information on the design of gas protection measures, however BS84845:2007, which supersedes the guidance included within CIRIA C665, is used for selection of gas protection measures.

BS8485: 2007 uses a scoring system dependant on the Characteristic Situation / NHBC Traffic Light and proposed end use of the site. The scoring system is summarised in BS8485:2007 Table 2 as presented hereunder:

Characteristic gas situation, CS	NHBC traffic light	Required gas protection			
		Non-managed property e.g. private housing	Public building (a)	Commercial buildings	Industrial buildings (b)
1	*Green*	0	0	0	0
2	*Amber 1*	3	3	2	1 (c)
3	*Amber 2*	4	3	2	2
4	*Red*	6 (d)	5(d)	4	3
5			6(e)	5	4
6				7	6

***NOTE** Traffic light indications are taken from NHBC Report no.:10627-RO1 (04) and are mainly applicable to low-rise residential housing[1]. These are for comparative purposes but the boundaries between the traffic light indications and CS values do not coincide.*

a) Public buildings include, for example, managed apartments, schools and hospitals.
b) Industrial buildings are generally open and well ventilated. However, areas such as office pods might require a separate assessment and may be classified as commercial buildings and require a different scope of gas protection to the main building.
c) Maximum methane concentration 20% otherwise consider and increase to CS3.
d) Residential building on higher traffic light/CS sites is not recommended unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.
e) Consideration of issues such as ease of evacuation and how false alarms will be handled are needed when completing the design specification of any gas protection scheme

[1] The NHBC guidance and CIRIA C665 guidance refers to low rise housing (which is up to three storeys without lifts) that is constructed with a 150mm ventilated sub-floor void.

BS8485:2007 Table 2 Required gas protection by characteristic gas situation and type of building

Once a score is assigned, a combination of protection systems / elements is chosen from BS8485:2007 Table 3 shown below:
CD37d

PROTECTION ELEMENT / SYSTEM		SCORE	COMMENTS
a) Venting / dilution (See Annex A BS8485)			
Passive sub floor ventilation (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.)[A]	Very good performance	2.5	*Ventilation performance in accordance with Annex A (BS8485)*
	Good performance	1	*If passive ventilation is poor this is generally unacceptable and some form of active system will be required.*
Subfloor ventilation with active abstraction/pressurization (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.)[A]		2.5	*There have to be robust management systems in place to ensure the continued maintenance of any ventilation system. Active ventilation can always be designed to meet good performance.*
Ventilated car park (basement or undercroft)		4	*Mechanically assisted systems come in two forms: extraction and positive pressurization.*
b) Barriers			
Floor slabs			
Block and beam floor slab		0	*It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum. Breaches in floor slabs such as joints have to be effectively sealed against gas ingress in order to maintain these performances.*
Reinforced concrete ground bearing slab		0.5	
Reinforced concrete ground bearing foundation raft with limited service penetrations that are cast into slab		1.5	
Reinforced concrete cast in situ suspended floor slab with minimal service penetrations and water bars around all slab penetrations and at joints		1.5	
Fully tanked basement		2	
c) Membranes			
Taped and sealed membrane to reasonable levels of workmanship/in line with current good practice with validation [B,C]		0.5	*The performance of membranes is heavily dependent on the quality of design of the installation, resistance to damage after installation, and the integrity of joints.*
Proprietary gas resistant membrane to reasonable levels of workmanship /in line with good practice under independent inspection (CQA)[B,C]		1	
Proprietary gas resistant membrane installed to reasonable levels of workmanship/in line with current good practice under CQA with integrity testing and independent validation		2	
d) Monitoring and detection (not applicable to non-managed property, or in isolation)			
Intermittent monitoring using hand held equipment		0.5	*Where fitted, permanent monitoring systems ought to be installed in the underfloor venting/dilution system in the first instance but can also be provided within the occupied space as a fail safe.*
Permanent monitoring and alarm system [A]	Installed in the underfloor venting/dilution system	2	
	Installed in the building	1	
e) Pathway Intervention			
Pathway intervention		-	*This can consist of site protection measures for off-site or on-site sources (see Annex A, BS8485)*
NOTE In practice the choice of materials might well rely on factors such as construction method and the risk of damage after installation. It is important to ensure that the chosen combination gives an appropriate level of protection			
A) It is possible to test ventilation systems by installing monitoring probes for post installation validation.			
B) If a 1 200g DPM material is to function as a gas barrier it should be installed according to BRE 212 /BRE 414 being taped and sealed to all penetrations			
C) Polymeric Materials> 1200 g (proportional to thickness) but their physical properties mean that they are more robust and resistant to damage.			

BS8485:2007 Table 3 Solution Scores

Where the gas situation is 4 or more (and for NHBC Red situations) the site requires a comprehensive risk assessment to confirm the scope of protection measures. These are higher risk sites and reliance on Table 2 and 3 alone is not sufficient.

For a site which is impacted by migratory gases from an off site source, the development may be protected by imposing pathway intervention methods, which if successfully validated, could also remove the need for further analysis. It is essential that the gas regime in these circumstances has been fully characterised and that the only source impacting the site is located off site and that the pathway is clearly defined and its interception equally proven before construction commences. Pathway intervention methods may include vertical membrane installations, venting trenches, rows of stone columns, activated trenches and various proprietary systems. These systems are particularly relevant to domestic housing where there is limited scope for foundation type solutions.

CURRENT GUIDANCE ON REMEDIATION

When risk assessment of the site has been completed and it indicates that remedial works are required, the main guidance in managing this process is set out in the DEFRA/EA publication CLR11 (2004) "Model Procedures for the Management of Land Contamination." The stages of managing remediation are as follows:

(a) Options Appraisal and develop Remediation Strategy;
(b) Develop Implementation Plan and Verification Plan;
(c) Remediation, Verification and Monitoring.

The Remediation Strategy sets out the remediation targets, identifies technically feasible remedial solutions and presents an evaluation of the options so that these can be assessed enabling that the most suitable solution is adopted. An outline of the proposed remedial method should be presented. Agreement should be sought of the appropriate statutory bodies for the Remediation Strategy before proceeding to the next stage.

The Implementation Plan is a detailed method statement setting out how the remediation is to be carried out including stating how the site will be managed, welfare procedures, health and safety considerations together with practical measures such as details of temporary works, programme of works, waste management licences and regulatory consents required. Agreement should again be sought of the appropriate statutory bodies for this Plan.

The Verification Plan sets out the requirements for gathering data to demonstrate that the remediation has met the required remediation objectives and criteria. The Verification Plan presents the requirements for a wide range of issues including the level of supervision, sampling and testing regimes for treated materials, waste and imported materials, required monitoring works during and post remediation, how compliance with all licenses and consents will be checked etc. Agreement should again be sought of the appropriate statutory bodies for the Verification Plan. On completion of the remediation a Verification Report should be produced to provide a complete record of all remediation activities on site and the data collected as required in the Verification Plan. The Verification Report should demonstrate that the remediation has met the remedial targets to show that the site is suitable for the proposed use.

APPENDIX L

PRELIMINARY WASTE CLASSIFICATION REPORT

HazWasteOnline™

Waste Classification Report

YWDZQ-NP5W3-9JMYA

Job name

18/10350

Description/Comments

Project

CO2

Site

WEST WATERLOO DOCK, LIVERPOOL

Related Documents

#	Name	Description
None		

Waste Stream Template

CCG SOIL A 2018

Classified by

Name:
Daniel O'Regan
Date:
25 Oct 2018 09:59 GMT
Telephone:
0151 545 2750

Company:
CC Geotechnical Limited
Unit 1 and 2, Deltic Place
Deltic Way, Knowsley Industrial Estate
Liverpool
L33 7BU

Report

Created by: Daniel O'Regan
Created date: 25 Oct 2018 09:59 GMT

Job summary

Classification of sample: BH1

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH1
Sample Depth:
1.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**
2		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8 mg/kg	1.923	<1.538 mg/kg	<0.000154 %		<**LOD**
3		boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1.1 mg/kg	3.22	3.542 mg/kg	0.000354 %		
4		TPH (C6 to C40) petroleum group			TPH		482 mg/kg		482 mg/kg	0.0482 %		
									Total:	0.0489 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because OBSERVED CONCENTRATIONS TOO LOW TO BE CATEGORIZED AS VIABLE FLAMMABLE RISK

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0482%)

Classification of sample: BH2

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH2
Sample Depth:
2.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
2		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8	mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<**LOD**
3		boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.8	mg/kg	3.22	2.576	mg/kg	0.000258 %		
4		TPH (C6 to C40) petroleum group			TPH		715	mg/kg		715	mg/kg	0.0715 %		
											Total:	0.0721 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because OBSERVED CONCENTRATIONS TOO LOW TO BE CATEGORIZED AS VIABLE FLAMMABLE RISK

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0715%)

Classification of sample: BH3

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
BH3
Sample Depth:
2.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**
2		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8 mg/kg	1.923	<1.538 mg/kg	<0.000154 %		<**LOD**
3		boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1.3 mg/kg	3.22	4.186 mg/kg	0.000419 %		
4		TPH (C6 to C40) petroleum group			TPH		59.6 mg/kg		59.6 mg/kg	0.00596 %		
									Total:	0.00672 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because OBSERVED CONCENTRATIONS TOO LOW TO BE CATEGORIZED AS VIABLE FLAMMABLE RISK

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00596%)

Classification of sample: Grab 1

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
Grab 1
Sample Depth:
0.20 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number / EC Number / CAS Number							
1		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex } 006-007-00-5		<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**
2		chromium in chromium(VI) compounds { chromium(VI) oxide } 024-001-00-0 / 215-607-8 / 1333-82-0		<0.8 mg/kg	1.923	<1.538 mg/kg	<0.000154 %		<**LOD**
3		boron { diboron trioxide; boric oxide } 005-008-00-8 / 215-125-8 / 1303-86-2		1.5 mg/kg	3.22	4.83 mg/kg	0.000483 %		
4		TPH (C6 to C40) petroleum group TPH		169 mg/kg		169 mg/kg	0.0169 %		
						Total:	0.0177 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because OBSERVED CONCENTRATIONS TOO LOW TO BE CATEGORIZED AS VIABLE FLAMMABLE RISK

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0169%)

Classification of sample: Grab 2

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
Grab 2	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
0.10 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**
2		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8 mg/kg	1.923	<1.538 mg/kg	<0.000154 %		<**LOD**
3		boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1 mg/kg	3.22	3.22 mg/kg	0.000322 %		
4		TPH (C6 to C40) petroleum group			TPH		40.4 mg/kg		40.4 mg/kg	0.00404 %		
									Total:	0.0047 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because OBSERVED CONCENTRATIONS TOO LOW TO BE CATEGORIZED AS VIABLE FLAMMABLE RISK

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00404%)

Classification of sample: TP1

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP1
Sample Depth:
1.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		15.7	mg/kg	1.32	20.729	mg/kg	0.00207 %		
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.6	mg/kg	1.142	0.685	mg/kg	0.0000685 %		
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		26.2	mg/kg	1.462	38.293	mg/kg	0.00383 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		61.1	mg/kg	1.126	68.792	mg/kg	0.00688 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	219	mg/kg	1.56	341.6	mg/kg	0.0219 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.5	mg/kg	1.353	<0.677	mg/kg	<0.0000677 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		22.7	mg/kg	2.976	67.561	mg/kg	0.00676 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3				181	mg/kg	2.774	502.121	mg/kg	0.0502 %		
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
11	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8	mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<**LOD**
12	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.9	mg/kg	3.22	2.898	mg/kg	0.00029 %		
13	pH			PH		8.6	pH		8.6	pH	8.6 pH		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		naphthalene				0.7	mg/kg		0.7	mg/kg	0.00007 %		
		601-052-00-2	202-049-5	91-20-3									
15	●	acenaphthylene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			205-917-1	208-96-8									
16	●	acenaphthene				1.1	mg/kg		1.1	mg/kg	0.00011 %		
			201-469-6	83-32-9									
17	●	fluorene				0.7	mg/kg		0.7	mg/kg	0.00007 %		
			201-695-5	86-73-7									
18	●	phenanthrene				4.6	mg/kg		4.6	mg/kg	0.00046 %		
			201-581-5	85-01-8									
19	●	anthracene				1	mg/kg		1	mg/kg	0.0001 %		
			204-371-1	120-12-7									
20	●	fluoranthene				5.3	mg/kg		5.3	mg/kg	0.00053 %		
			205-912-4	206-44-0									
21	●	pyrene				5.2	mg/kg		5.2	mg/kg	0.00052 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				2.5	mg/kg		2.5	mg/kg	0.00025 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				3.1	mg/kg		3.1	mg/kg	0.00031 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				2.5	mg/kg		2.5	mg/kg	0.00025 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				2.4	mg/kg		2.4	mg/kg	0.00024 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				2.6	mg/kg		2.6	mg/kg	0.00026 %		
		601-032-00-3	200-028-5	50-32-8									
27	●	indeno[123-cd]pyrene				1.7	mg/kg		1.7	mg/kg	0.00017 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				0.5	mg/kg		0.5	mg/kg	0.00005 %		
		601-041-00-2	200-181-8	53-70-3									
29	●	benzo[ghi]perylene				2.1	mg/kg		2.1	mg/kg	0.00021 %		
			205-883-8	191-24-2									
30		benzene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-021-00-3	203-625-9	108-88-3									
32	●	ethylbenzene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34	●	TPH (C6 to C40) petroleum group				247	mg/kg		247	mg/kg	0.0247 %		
				TPH									
										Total:	0.125 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because OBSERVED CONCENTRATIONS TOO LOW TO BE CATEGORIZED AS VIABLE FLAMMABLE RISK

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0247%)

Classification of sample: TP2

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP2
Sample Depth:
0.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13.5	mg/kg	1.32	17.824	mg/kg	0.00178 %		
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.6	mg/kg	1.142	0.685	mg/kg	0.0000685 %		
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		30.5	mg/kg	1.462	44.577	mg/kg	0.00446 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		53.8	mg/kg	1.126	60.573	mg/kg	0.00606 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	177	mg/kg	1.56	276.087	mg/kg	0.0177 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.5	mg/kg	1.353	<0.677	mg/kg	<0.0000677 %		<LOD
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		27.9	mg/kg	2.976	83.038	mg/kg	0.0083 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
9	zinc { zinc chromate }	024-007-00-3				194	mg/kg	2.774	538.184	mg/kg	0.0538 %		
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
11	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8	mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<LOD
12	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.6	mg/kg	3.22	1.932	mg/kg	0.000193 %		
13	pH			PH		8.4	pH		8.4	pH	8.4 pH		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		naphthalene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
15	●	acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-917-1	208-96-8									
16	●	acenaphthene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
			201-469-6	83-32-9									
17	●	fluorene				0.1	mg/kg		0.1	mg/kg	0.00001 %		
			201-695-5	86-73-7									
18	●	phenanthrene				1.3	mg/kg		1.3	mg/kg	0.00013 %		
			201-581-5	85-01-8									
19	●	anthracene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
			204-371-1	120-12-7									
20	●	fluoranthene				2.1	mg/kg		2.1	mg/kg	0.00021 %		
			205-912-4	206-44-0									
21	●	pyrene				2.1	mg/kg		2.1	mg/kg	0.00021 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				1	mg/kg		1	mg/kg	0.0001 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				1.2	mg/kg		1.2	mg/kg	0.00012 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				1.1	mg/kg		1.1	mg/kg	0.00011 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				1	mg/kg		1	mg/kg	0.0001 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				1.2	mg/kg		1.2	mg/kg	0.00012 %		
		601-032-00-3	200-028-5	50-32-8									
27	●	indeno[123-cd]pyrene				0.8	mg/kg		0.8	mg/kg	0.00008 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
		601-041-00-2	200-181-8	53-70-3									
29	●	benzo[ghi]perylene				0.8	mg/kg		0.8	mg/kg	0.00008 %		
			205-883-8	191-24-2									
30		benzene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
32	●	ethylbenzene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34	●	TPH (C6 to C40) petroleum group				13	mg/kg		13	mg/kg	0.0013 %		
				TPH									
										Total:	0.0997 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because OBSERVED CONCENTRATIONS TOO LOW TO BE CATEGORIZED AS VIABLE FLAMMABLE RISK

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0013%)

Classification of sample: TP2[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP2[1]
Sample Depth:
2.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		20.4	mg/kg	1.32	26.935	mg/kg	0.00269 %		
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.6	mg/kg	1.142	0.685	mg/kg	0.0000685 %		
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		56.6	mg/kg	1.462	82.724	mg/kg	0.00827 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		37.6	mg/kg	1.126	42.333	mg/kg	0.00423 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	70.2	mg/kg	1.56	109.499	mg/kg	0.00702 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.5	mg/kg	1.353	<0.677	mg/kg	<0.0000677 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		44.7	mg/kg	2.976	133.039	mg/kg	0.0133 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3				151	mg/kg	2.774	418.896	mg/kg	0.0419 %		
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
11	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8	mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<**LOD**
12	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1	mg/kg	3.22	3.22	mg/kg	0.000322 %		
13	pH			PH		8	pH		8	pH	8pH		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		naphthalene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
		601-052-00-2	202-049-5	91-20-3									
15		acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
			205-917-1	208-96-8									
16		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
			201-469-6	83-32-9									
17		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
			201-695-5	86-73-7									
18		phenanthrene				0.4	mg/kg		0.4	mg/kg	0.00004 %		
			201-581-5	85-01-8									
19		anthracene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
			204-371-1	120-12-7									
20		fluoranthene				0.8	mg/kg		0.8	mg/kg	0.00008 %		
			205-912-4	206-44-0									
21		pyrene				0.7	mg/kg		0.7	mg/kg	0.00007 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.4	mg/kg		0.4	mg/kg	0.00004 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.4	mg/kg		0.4	mg/kg	0.00004 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.4	mg/kg		0.4	mg/kg	0.00004 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
			205-883-8	191-24-2									
30		benzene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-021-00-3	203-625-9	108-88-3									
32		ethylbenzene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34		TPH (C6 to C40) petroleum group				45.6	mg/kg		45.6	mg/kg	0.00456 %		
				TPH									
										Total:	0.0875 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because OBSERVED CONCENTRATIONS TOO LOW TO BE CATEGORIZED AS VIABLE FLAMMABLE RISK

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00456%)

Classification of sample: TP3

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP3
Sample Depth:
1.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9.5	mg/kg	1.32	12.543	mg/kg	0.00125 %		
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.5	mg/kg	1.142	<0.571	mg/kg	<0.0000571 %		<**LOD**
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		46.2	mg/kg	1.462	67.524	mg/kg	0.00675 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		21.5	mg/kg	1.126	24.207	mg/kg	0.00242 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	13.1	mg/kg	1.56	20.434	mg/kg	0.00131 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.5	mg/kg	1.353	<0.677	mg/kg	<0.0000677 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		40.2	mg/kg	2.976	119.646	mg/kg	0.012 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3				67.2	mg/kg	2.774	186.423	mg/kg	0.0186 %		
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
11	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8	mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<**LOD**
12	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		<0.5	mg/kg	3.22	<1.61	mg/kg	<0.000161 %		<**LOD**
13	pH			PH		8.2	pH		8.2	pH	8.2 pH		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		naphthalene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
15	●	acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-917-1	208-96-8									
16	●	acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-469-6	83-32-9									
17	●	fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
18	●	phenanthrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-581-5	85-01-8									
19	●	anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-371-1	120-12-7									
20	●	fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-912-4	206-44-0									
21	●	pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-927-3	129-00-0									
22		benzo[a]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
27	●	indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
29	●	benzo[ghi]perylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-883-8	191-24-2									
30		benzene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
32	●	ethylbenzene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34	●	TPH (C6 to C40) petroleum group				2.3	mg/kg		2.3	mg/kg	0.00023 %		
				TPH									
										Total:	0.0476 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because OBSERVED CONCENTRATIONS TOO LOW TO BE CATEGORIZED AS VIABLE FLAMMABLE RISK

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00023%)

Classification of sample: TP3[1]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP3[1]
Sample Depth:
4.50 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12.8	mg/kg	1.32	16.9	mg/kg	0.00169 %		
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.5	mg/kg	1.142	<0.571	mg/kg	<0.0000571 %		<**LOD**
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		36.2	mg/kg	1.462	52.908	mg/kg	0.00529 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		104	mg/kg	1.126	117.092	mg/kg	0.0117 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	222	mg/kg	1.56	346.279	mg/kg	0.0222 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.5	mg/kg	1.353	<0.677	mg/kg	<0.0000677 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		28.4	mg/kg	2.976	84.526	mg/kg	0.00845 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3				151	mg/kg	2.774	418.896	mg/kg	0.0419 %		
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
11	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8	mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<**LOD**
12	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.9	mg/kg	3.22	2.898	mg/kg	0.00029 %		
13	pH			PH		8.6	pH		8.6	pH	8.6 pH		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		naphthalene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
		601-052-00-2	202-049-5	91-20-3									
15		acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
			205-917-1	208-96-8									
16		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
			201-469-6	83-32-9									
17		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
			201-695-5	86-73-7									
18		phenanthrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
			201-581-5	85-01-8									
19		anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
			204-371-1	120-12-7									
20		fluoranthene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
			205-912-4	206-44-0									
21		pyrene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-032-00-3	200-028-5	50-32-8									
27		indeno[123-cd]pyrene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
29		benzo[ghi]perylene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
			205-883-8	191-24-2									
30		benzene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-021-00-3	203-625-9	108-88-3									
32		ethylbenzene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<10	mg/kg		<10	mg/kg	<0.001 %		**<LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34		TPH (C6 to C40) petroleum group				24.5	mg/kg		24.5	mg/kg	0.00245 %		
				TPH									
										Total:	0.099 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because OBSERVED CONCENTRATIONS TOO LOW TO BE CATEGORIZED AS VIABLE FLAMMABLE RISK

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00245%)

Classification of sample: TP4

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP4
Sample Depth:
1.00 m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		40.5	mg/kg	1.32	53.473	mg/kg	0.00535 %		
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.5	mg/kg	1.142	<0.571	mg/kg	<0.0000571 %		<**LOD**
3	chromium in chromium(III) compounds { chromium(III) oxide }		215-160-9	1308-38-9		25.1	mg/kg	1.462	36.685	mg/kg	0.00367 %		
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		67.1	mg/kg	1.126	75.547	mg/kg	0.00755 %		
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	73.2	mg/kg	1.56	114.178	mg/kg	0.00732 %		
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.5	mg/kg	1.353	<0.677	mg/kg	<0.0000677 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		47	mg/kg	2.976	139.884	mg/kg	0.014 %		
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3				125	mg/kg	2.774	346.768	mg/kg	0.0347 %		
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<**LOD**
11	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8	mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<**LOD**
12	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		<0.5	mg/kg	3.22	<1.61	mg/kg	<0.000161 %		<**LOD**
13	pH			PH		10.5	pH		10.5	pH	10.5 pH		

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		naphthalene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
15	●	acenaphthylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-917-1	208-96-8									
16	●	acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-469-6	83-32-9									
17	●	fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
18	●	phenanthrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-581-5	85-01-8									
19	●	anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-371-1	120-12-7									
20	●	fluoranthene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
			205-912-4	206-44-0									
21	●	pyrene				0.3	mg/kg		0.3	mg/kg	0.00003 %		
			204-927-3	129-00-0									
22		benzo[a]anthracene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-033-00-9	200-280-6	56-55-3									
23		chrysene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-048-00-0	205-923-4	218-01-9									
24		benzo[b]fluoranthene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-034-00-4	205-911-9	205-99-2									
25		benzo[k]fluoranthene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-036-00-5	205-916-6	207-08-9									
26		benzo[a]pyrene; benzo[def]chrysene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
		601-032-00-3	200-028-5	50-32-8									
27	●	indeno[123-cd]pyrene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
			205-893-2	193-39-5									
28		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
29	●	benzo[ghi]perylene				0.2	mg/kg		0.2	mg/kg	0.00002 %		
			205-883-8	191-24-2									
30		benzene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
31		toluene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
32	●	ethylbenzene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
33		xylene				<10	mg/kg		<10	mg/kg	<0.001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
34	●	TPH (C6 to C40) petroleum group				<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
				TPH									
										Total:	0.0778 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP5

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
TP5	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	
1.50 m	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }	006-007-00-5				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %		<**LOD**
2		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.8 mg/kg	1.923	<1.538 mg/kg	<0.000154 %		<**LOD**
3		boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.7 mg/kg	3.22	2.254 mg/kg	0.000225 %		
4		TPH (C6 to C40) petroleum group			TPH		<1 mg/kg		<1 mg/kg	<0.0001 %		<**LOD**
									Total:	0.00066 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection

Appendix A: Classifier defined and non CLP determinands

- **salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex**

CLP index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Data source: Commission Regulation (EC) No 790/2009 - 1st Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP1)
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s)/Risk Phrase(s):
14 Dec 2015 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

- **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Aquatic Chronic 2 H411 , Repr. 2 H361d , Carc. 1B H350 , Muta. 1B H340 , STOT RE 2 H373 , Asp. Tox. 1 H304 , Flam. Liq. 3 H226

- **chromium(III) oxide** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462
Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Repr. 1B H360FD , Skin Sens. 1 H317 , Resp. Sens. 1 H334 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302 , Acute Tox. 4 H332

- **pH** (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 1 H310 , Acute Tox. 1 H330 , Acute Tox. 4 H302

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 2 H411 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Carc. 2 H351 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Acute Tox. 4 H302

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Skin Irrit. 2 H315

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s)/Risk Phrase(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

Appendix B: Rationale for selection of metal species

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide] (edit as required)

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments (edit as required)

boron {diboron trioxide; boric oxide}

Reasonable case CLP species based on hazard statements/ molecular weight, physical form and low solubility. Industrial sources include: fluxing agent for glass/enamels; additive for fibre optics, borosilicate glass (edit as required)

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(III) compounds {chromium(III) oxide}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil. (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2018.279.3663.7481 (09 Oct 2018)
HazWasteOnline Database: 2018.279.3663.7481 (09 Oct 2018)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

APPENDIX M

IMPORTED MATERIALS ASSESSMENT CRITERIA

SUMMARY OF THRESHOLD AND PROPOSED ACCEPTANCE CTITERIA FOR IMPORTED SOILS

CONTAMINANT	IMPORTED SOILS ACCEPTANCE THRESHOLD (mg/kg)	SOURCE
Arsenic	40	LQM CIEH S4ULs
Boron	11,000	LQM CIEH S4ULs
Cadmium	85	LQM CIEH S4ULs
Chromium	910	LQM CIEH S4ULs
Chromium VI	6	LQM CIEH S4ULs
Copper	7,100	LQM CIEH S4ULs
Lead	310	DEFRA C4UL
Mercury	1.2	LQM CIEH S4ULs
Nickel	180	LQM CIEH S4ULs
Zinc	40,000	LQM CIEH S4ULs
Acenapthene	3,000	LQM CIEH S4ULs
Acenapthylene	2,900	LQM CIEH S4ULs
Anthracene	31,000	LQM CIEH S4ULs
Benz[a]anthracene	11	LQM CIEH S4ULs
Benzo[a]pyrene	3.2	LQM CIEH S4ULs
Benzo[b]fluoranthene	3.9	LQM CIEH S4ULs
Benzo[ghi]perylene	360	LQM CIEH S4ULs
Benzo[k]fluoranthene	110	LQM CIEH S4ULs
Chrysene	30	LQM CIEH S4ULs
Dibenzo[ah]anthracene	0.31	LQM CIEH S4ULs
Fluoranthene	1,500	LQM CIEH S4ULs
Fluorene	2,800	LQM CIEH S4ULs
Indeno[123-cd]pyrene	45	LQM CIEH S4ULs
Naphthalene	2.3	LQM CIEH S4ULs
Phenanthrene	1,300	LQM CIEH S4ULs
Pyrene	3,700	LQM CIEH S4ULs
Aromatic EC5-7	370	LQM CIEH S4ULs
Aromatic EC7-8	860	LQM CIEH S4ULs
Aromatic EC8-10	47	LQM CIEH S4ULs
Aromatic EC10-12	250	LQM CIEH S4ULs
Aromatic EC12-16	1,800	LQM CIEH S4ULs
Aromatic EC16-21	1,900	LQM CIEH S4ULs
Aromatic EC21-35	1,900	LQM CIEH S4ULs
Aliphatic EC5-6	42	LQM CIEH S4ULs
Aliphatic EC6-8	100	LQM CIEH S4ULs
Aliphatic EC8-10	27	LQM CIEH S4ULs
Aliphatic EC10-12	130	LQM CIEH S4ULs
Aliphatic EC12-16	1,100	LQM CIEH S4ULs
Aliphatic EC16-35	65,000	LQM CIEH S4ULs
Asbestos	No Detection	N/A

Notes

- Values based on Residential without homegrown produce scenario
- Values based on 1% SOM (assumed)

TIER 1 WATER ENVIRONMENT SCREENING CRITERIA (ENGLAND AND WALES)

The Water Quality Standards (WQS) employed as Tier 1 Water Environment screening criteria are given in **Tables 1 and *2***. The more conservative values of the UK Drinking Water Standards (UK DWS) and Environmental Quality Standards (EQS) (Freshwater) have been selected as the primary Tier 1 Screening Values (shown in bold and shaded grey). The EQS Saltwater values are applied when saline water receptors are considered. In the absence of appropriate UK specific WQS, World Health Organisation (WHO) guideline values have been selected (e.g. for banded Total Petroleum Hydrocarbons).

The EQS values listed in Tables 1 and 2 are the EQS 1 'Annual Average' (AA) standards1. EQS 1 values have been derived to protect the most sensitive aquatic life, while higher EQS 2 values have been derived to protect the less sensitive aquatic life.

Table 1: Inorganic Tier 1 water Environment Screening Criteria

Contaminant	Units	Hardness Banding ($CaCO_3$ mg/l)	AA-EQS (Freshwater)	AA-EQS (Saltwater)	UK DWS	WHO
Inorganics						
Arsenic	µg/l	-	50	25	**10**	10
Boron	µg/l	-	2000	7000	**1000**	0.3
Cadmium	µg/l	-	5	2.5	**5**	3
Chromium	µg/l	0-50	**5**	15	50	50
		50-100	**10**			
		100-150	**20**			
		150-200	**20**			
		200-250	**50**			
Copper	µg/l	1-10	**0.5**	5	2000	2000
		10-50	**0.5**			
		50-200	**3**			
		200-250	**8**			
		>250	**12**			
Cyanide (Free)	µg/l	-	**1**	-	-	-
Cyanide	µg/l	-	-	-	**50**	70
Iron	µg/l	-	1000	1000	**200**	300
Lead	µg/l	0-50	**4**	25	10	10
		50-150	**10**			
		150-250	**20**			
		>250	**20**			
Mercury	µg/l	-	1	0.3	**1**	1
Nickel	µg/l	0-50	8	30	20	70
		50-100	20			
		100-150	20			
		150-250	40			
		>250	40			
Selenium	µg/l	-	-	-	**10**	10
Sulphate (SO_4)	mg/l	-	400	-	**250**	250
Zinc	µg/l	0-50	**8**	40	5000	3000
		50-150	**15**			
		150-250	**50**			
		>250	**50**			
pH	-	-	6-9	6-8.5	-	-

Table 2: Organic Tier 1 Water Environment Screening Criteria

Contaminant	Units		EQS (Freshwater)	EQS (Saltwater)	UK DWS	WHO
Organics						
Phenol (total)	µg/l		30	30	**0.5**	-
MTBE	µg/l		30	30	-	1.5
Total Petroleum Hydrocarbons (TPH)						
Aliphatic C5-C6	µg/l		-	-	-	**15000**
Aliphatic C6-C8	µg/l		-	-	-	**15000**
Aliphatic C8-C10	µg/l		-	-	-	**300**
Aliphatic C10-C12	µg/l		-	-	-	**300**
Aliphatic C12-C16	µg/l		-	-	-	**300**
Aliphatic C16-21	µg/l		-	-	-	(300)*
Aliphatic C21-35	µg/l		-	-	-	(300)*
Aromatic C6-C7	µg/l		-	-	1 (benzene)	10 (benzene)
Aromatic C7-C8	µg/l		**50 (toluene)**	-	-	700 (toluene)
Aromatic C8-C10	µg/l		**20 (ethylbenzene)**	-	-	300 (ethylbenzene)
Aromatic C10-12	µg/l		-	-	-	**100**
Aromatic C12-C16	µg/l					**100**
Aromatic C16-C21	µg/l					**90**
Aromatic C21-C35	µg/l					**90**
Hydrocarbons (dissolved/emulsions)	µg/l		-	-	**10* (revoked)**	300

Contaminant	Units		EQS (Freshwater)	EQS (Saltwater)	UK DWS	WHO
BTEX Compounds						
Benzene	µg/l		30	30	1	10
Toluene	µg/l		**50**	40	-	-
Ethylbenzene	µg/l		**20**	-	-	-
Xylene	µg/l		**30**	30	-	-
Contaminant	**Units**		**EQS (Freshwater)**	**EQS (Saltwater)**	**UK DWS**	**WHO**
Polycyclic Aromatic Hydrocarbons (PAHs)						
Anthracene	µg/l		**0.02**	0.02	-	-
Benzo(a)pyrene	µg/l		0.03	0.03	-	**0.01**
Fluoranthene	µg/l		**0.02**	0.02	-	-
Naphthalene	µg/l		**10**	-	-	-
PAHs (Sum of Four – benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, indeno(1,2,3-c,d)pyrene)	µg/l		-	-	**0.1**	-

* There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300<g/l) has been applied.

" Maximum Concentration (MAC)" values are also provided in EQS literature, for contaminants including the BTEX compounds, PAHs (anthracene, fluoranthene, benzo(a)pyrene, naphthalene), phenol and cyanide. The MAC values may be applied on a site-specific basis if justifiable.

Several of the EQS values listed above in Tables 1 and 2 are derived from Scottish regulations and therefore these values should only apply to the assessment of sites located in Scotland.

The WHO Guideline Values for petroleum products in drinking water3 have been applied in the absence of a current UK specific TPH water quality standard. However, for the aromatic TPH bandings of C6-C7, C7-C8 and C8-C10 the more conservative UK specific WQS for benzene, toluene and ethylbenzene have been selected as the Tier 1 screening criteria.

In the absence of WHO Guideline Values for the TPH Aliphatic C16-C21 and C21-C35 bands, the guideline value for TPH Aliphatic C8-C10 through to C12-C16 of 300<g/l has been applied. This is considered to be a conservative approach due to the increased stability and lower volatility of the longer chain aliphatics.

References:

The WQS listed in Tables 1 and 2 have been compiled from the following sources:

1. Technical Guidance Manual for Licensing Discharges to Water: Annex G

Environmental Quality Standards (EQS) List, Scottish Environmental Protection Agency, October 2004;

2. Hydrogeological Risk Assessment for Landfills, Appendix 8: Selected Water Quality Standards, Environment Agency, 2003;

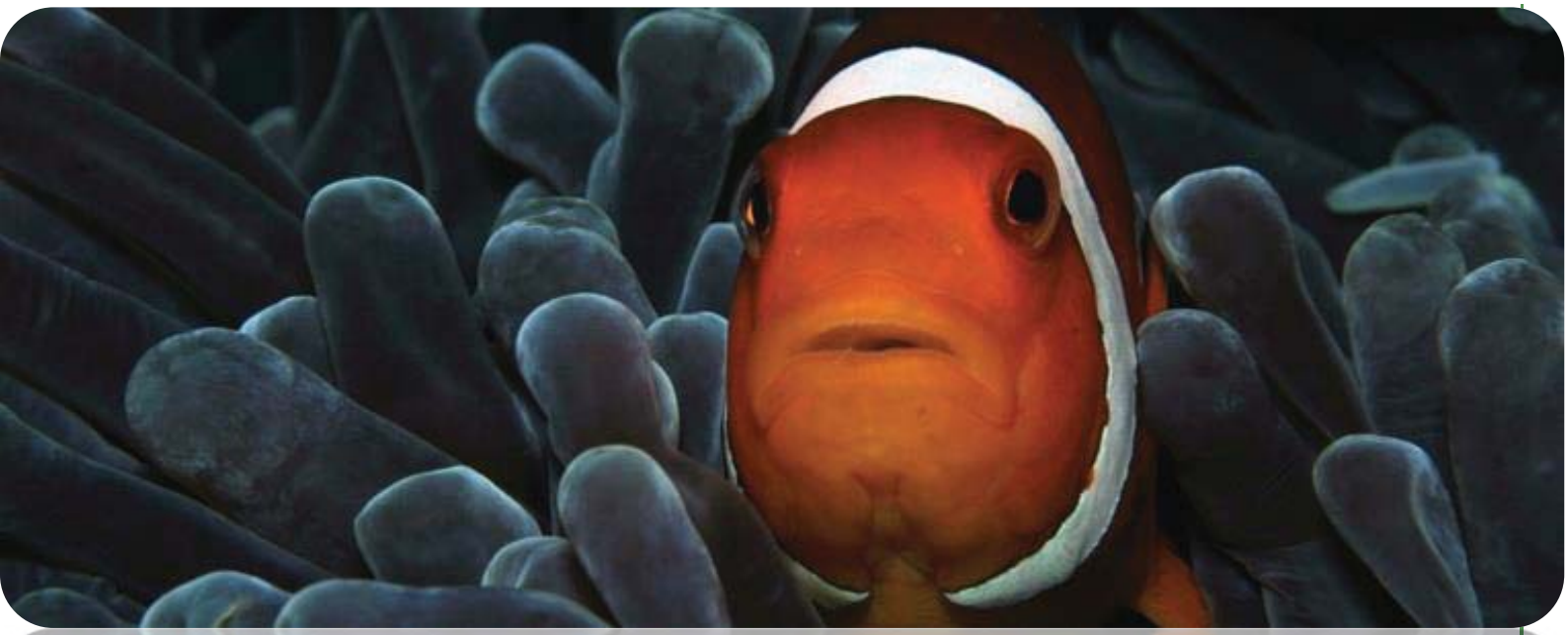
3. Petroleum Products in Drinking-water, Background document for development of WHO Guidelines for Drinking-water Quality, WHO (WHO/SDE/WSH/05.08/123);

4. Water Supply (Water Quality) Regulations 1989 (SI 1989/1147) (as amended); and,

5. Water Supply (Water Quality) Regulations 2000 (SI 2000/3184) (as amended).

APPENDIX N

UXO REPORT



EXPLOSIVE ORDNANCE (EO) THREAT ASSESSMENT (EOTA)

LIVERPOOL WATERS, LIVERPOOL, L3 7BX

This assessment draws together all the available information with regards to the site of concern in regard to potential Explosive Ordnance (EO) Contamination. It assigns an Explosive Ordnance Threat Level and proposes an appropriate Risk Management Strategy to reduce any associated risks.

This assessment has been produced in compliance with the Construction Industry Research and Information Association guidelines (Report CIRIA 681, dated Dec 08) for the preparation of detailed Risk Assessments in the management of UXO risks in the construction industry, for which PLANIT was an instrumental driver for improved UXO risk management and transparency.

BUILDER'S PROFILE

smas worksafe contractor as recognised by SSIP SAFETY SCHEMES IN PROCUREMENT

PLANIT RESTORING BALANCE

CHAS Accredited Contractor www.chas.co.uk

safecontractor APPROVED

CLIENT CONTACT DETAILS

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OUR CONTACT DETAILS

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Document Review	Name	Signature
Author Review:	Daniel WHELAN	
Peer Review:	Andrew HAMILTON	

EXECUTIVE SUMMARY

SITE DESCRIPTION	The site is located within the City centre of Liverpool on the east bank of the Mersey within the Crosby Channel. The site itself is located within the district of Vauxhall within the Trafalgar Dock at the east end of the Kingsway Tunnel. The site is bounded to the east by the A5036, to the west by the River Mersey, to the north by the docks adjacent to Victoria Tower and to the south by Princess Docks. National Grid Reference is centred on **SJ 334 916** and the nearest Post Code is **L3 7BE**.
POTENTIAL THREAT SOURCE	No items of ordnance, as far as can reasonably be known, are potentially present under the site of concern.
THREAT PATHWAY	For the purposes of this assessment, it has been assumed that site investigation works would include boreholes and excavations beyond WW2 ground levels. It is anticipated that personnel or key equipment may complete the risk pathway during excavation operations that may bring them into physical contact with potential threat items.
KEY FINDINGS	• There is no evidence that the site of concern was affected by bombing during WW2. • It is unlikely that other ordnance contamination events occurred at the site of concern. • There are no Abandoned Bombs or UXBs recorded that would affect the site of concern. • The Ordnance Threat Level does not vary across the site of concern.
THREAT LEVEL	Ground volumes that have been excavated post-War may be considered effectively free from the threat of Explosive Ordnance (EO). The ordnance Threat Level for these ground volumes is **NEGLIGIBLE**. the EO Threat Levels for volumes of ground that have either not been subjected to significant intrusive engineering (excavation and/ or piling) or are below existing engineered structures (including foundations) and shallower than the estimated Bomb Penetration Depth (BPD) are assessed as: British AAA, German 50kg, 250Kg and 500Kg HE Bombs — **NEGLIGIBLE**
THREAT MITIGATION	Considering the findings of this assessment, a UXO Threat Mitigation Strategy **IS NOT REQUIRED** to be in place prior to intrusive engineering works at this site of concern.
THREAT REVIEW	*A review of these recommendations must be undertaken considering any additional, relevant information being provided. Such a review may, if the EO Threat Level is deemed to have altered, make alternative recommendations from those made above to implement work safely.*
AIM & METHODOLOGY	The aim of this assessment is to identify any threats that may be posed by EO during the proposed engineering works at the site of concern and, where a threat is identified, to recommend a risk mitigation strategy that will reduce this threat to acceptable levels. This assessment follows the CIRIA 681 Guidelines, which were compiled using, as a main driver of change, PLANIT's innovative approach to EO risk assessment. The following key considerations are addressed in this assessment:

	• The risk that the site of concern was contaminated by EO. • The risk that EO remains on site. • The risk that EO may be encountered during the proposed engineering works. • The risk that EO may be initiated by proposed engineering works. • The consequences of encountering or initiating EO. If the likelihood of encountering EO is significant, information about the types and natures of that EO and the expected levels of contamination is considered within the source-pathway-receptor context of contamination. Should a confirmed pathway exist, the information is entered into our proprietary Threat Assessment Matrices in order to arrive at a valid and transparent Threat Level. The Threat Level allows relevant conclusions to be made about the EO Risk at the site of concern, which in turn allows an appropriate Risk Mitigation Strategy to be developed. The Threat Mitigation Strategy is intended to give the Client a best-fit, safe solution that will allow the level of risk from EO to be reduced to an acceptable level; providing maximum project planning flexibility. PLANITs approach to EO threat assessment has been fundamental in driving change throughout the UK Commercial EOD Industry and was instrumental in the drafting of CIRIA 681. PLANITs approach provides transparency to our EO risk assessment process allowing the Client to make valid decisions on what is a specialist activity; empowering them to maintain control over this vital aspect of their project - Where necessary, appropriate EO risk mitigation measures will be recommended. This assessment considers general and site specific factors, including: • Historical use of the site in relation to ordnance manufacturing, storage and disposal. • Historical use of the site in relation to Military training and related facilities. • Evidence of offensive aerial and naval bombardment during WW1 and WW2. • Evidence of Unexploded Bombs (UXBs). • Previous EO incidents and/or EO survey/clearance activities. • Extent of post-war redevelopment. • Proposed engineering works.
RELIABILITY OF HISTORICAL RECORDS	This assessment is drawn from detailed research into the available historical evidence. Every effort is made to gather all the relevant material; however, PLANIT cannot be held responsible for any changes to the assessed level of risk or proposed risk mitigation strategies due to subsequent information that may come to light later. The accuracy and detail of wartime historical records is difficult to verify, not least of which is due to the conditions under which much of this information was gathered and recorded. Additionally, recording of information was less formalised in the early days of the German air campaign against the UK mainland (Pre-Bomb Census Record) and much information recorded early on was lost during subsequent air raids. Records for rural, sparsely populated areas are not always reliable, being based on second-hand information in many cases; records of attacks on military installations was often recorded independently from general records and many such archives have been lost or remain undisclosed to the public. Consequently, the exact location, quantity and nature of the EO threat cannot be definitive but rather remains subjective and is based on the careful analysis by experts of the available information. PLANIT cannot accept liability for any gaps in the historical record.

CONTENTS

SITE LOCATION & DESCRIPTION	
SITE OF CONCERN	The site is located within the City centre of Liverpool on the east bank of the Mersey within the Crosby Channel. The site itself is located within the district of Vauxhall within the Trafalgar Dock at the east end of the Kingsway Tunnel. The site is bounded to the east by the A5036, to the west by the River Mersey, to the north by the docks adjacent to Victoria Tower and to the south by Princess Docks. The site is a former commercial dock which appears to be currently mostly disused, except for a large warehouse structure which dominates the SE corner of the site area, with attendant car parking and vehicle manoeuvre areas. The site is mostly covered in hard standing, which appears to be a mix of the historical dock and infilled areas where former wet docks existed. National Grid Reference is centred on **SJ 334 916** and the nearest Post Code is L3 7BE Maps showing the site location and layout are at Annex A.
SCOPE OF PROPOSED WORKS	The wider development works are unknown at the time of this assessment. The known intrusive engineering works are thought to comprise several borehole investigations to a depth of some 10m bgl. It is anticipated that any site investigation and/or redevelopment works are likely to involve deep engineering works including bulk excavation and piling below WW2 ground levels.
GEOLOGICAL ENVIRONMENT	The geological environment is not accurately known at the time of this assessment. However, the British Geological Survey maps (Sheet 96), Liverpool, Solid and Draft editions of 1974/ 75 indicate that the site is underlain by Artificial Ground/ Made Ground which is categorised as Worked Ground (Undivided) and Triassic bedrock (Helsby Sandstone Formation). Made Ground is most likely to comprise engineered fill, demolition rubble (brick, sandstone, gravel, concrete etc.) originating during construction.
REVIEW OF RELEVANT DATASETS	
SOURCES OF INFORMATION	PLANIT ensures that Explosive Ordnance Threat Assessments (EOTAs) are as comprehensive as possible and detailed research is undertaken to collate all the available EO-related information that relates to the site of concern. Information sources may include, but are not restricted to: • National Historic Archives. • Local Authority & Council Archives. • English Heritage National Monuments Record. • Ministry of Defence Archives • PLANITs extensive archives drawn from many years of detailed research and operational experience of UXO Risk Management activities in the UK and abroad. • Joint Service EOD Centre (JSEOD). • Historic Mapping and Aerial Photography. • Specific UXO-related documents such as military bombing and casualty records. • Local libraries and history groups. • Open sources such as published books and internet searches. • Anecdotal evidence from eye witnesses. *NB: The MoD information office that deals with requests for information relevant to EO clearance operations completed by the MoD is currently facing significant delays. Although a request has been submitted, any information that may be relevant has not yet been forwarded for timely inclusion in this assessment. However, if any relevant information comes to light from this source that affects the threat assessment, this will be notified to the client as a matter of urgency.*
SITE HISTORY	The earliest available mapping of **1851,** shows the entire site area turned over to docklands, encompassing Clarence, Trafalgar, Victoria and Waterloo docks. This site layout remains unchanged

	until at least as late as **1927**, when Clarence Dock in the north of the site area appears to have been filled in. The attendant buildings adjacent to Clarence Dock has been reduced to a High Tide Dock to the west of the original dock and a narrow canal has been constructed joining Salisbury Dock to the north with Trafalgar Dock to the south via a new lock. By **1967**, structures associated with the Power Station that comes to dominate the site area start to appear. Clarence High Tide Dock is amalgamated with Trafalgar Dock to the south, with the area immediately south of the power station being labelled the Trafalgar Branch Dock. By **1973**, Trafalgar Branch Dock and Victoria Dock have been filled and the warehouses attending East and West Waterloo Docks have been demolished. The Power Station is labelled as such for the first time. By **1982**, several significant structures have been built, primarily a large warehouse in the centre east of the site, a ferry terminal towards the centre and depot building north of the Kingsway Tunnel route. The site remains undisturbed until no later than 1990, except for the removal of the railway line that ran down the eastern edge of the site. By **2002**, the Power station has been removed and several small commercial properties have been erected on the western edge of East Waterloo Dock. By **2010**, the former Trafalgar Dock has been filled and all the structures across the site except for the 'Depot' have been removed. The site remains largely unchanged from then until now.
ORDNANCE MANUFACTURE & STORAGE	During WW1 and WW2, Liverpool housed several facilities involved in the manufacture, storage, filling and testing of ordnance, which are detailed below. None of these facilities pose a potential threat to the site of concern.

Facility	Operating Period	Nature of Ordnance
Cunard Company, Rimrose Road, National Shell Factory (NSF)	Jun 1915	8, 4.5 and 6in shells.
North Haymarket, NSF	Jun 1915	18 pdr, 4.5 and 6in shells.
Lambeth Road, Tramway Depot, NSF	Jun 1915	15, 18 pdr and 2.75, 4.5, 6in shells.
Aintree, National Filling Factory (NFF)	Jul 1915 – Jul 1918	Filling 8in shells.
Edge Lane, NSF	Sep 1915 – Feb 1916	4.5, 6in shells.
Clyde Street, Bootle, NSF	Nov 1915	Guages
Litherland, Liverpool, Her Majesty's Explosive Factory (HMEF)	Mar 1916	Tri-Nitrotoluene (TNT)

MILITARY HISTORY	There is no evidence to indicate that the site was ever used for military purposes.
CIVIL DEFENCE	Liverpool possessed a peak of 112 Heavy Anti-Aircraft Batteries during WW2, including 4.5, 3.7 and 3- inch Anti-Aircraft (AA) guns, sited in some 70 separate locations. None of these were sited on or near to the site of concern to have created a direct source of potential ordnance contamination. Due to the relatively high failure rate of Anti-Aircraft Ammunition (AAA) during this time, there remains the possibility that such ordnance fell back to earth creating additional UXO hazards. This type of ordnance had the potential to penetrate the ground to significant depths and cannot be entirely discounted as a potential threat source although its potential presence is impossible to determine with any quantifiable degree of certainty.

As would be expected, Liverpool had several Civil Defence ('Starfish') sites designed to protect the City from aerial attack. Liverpool's Starfish Sites were located at:

Decoy(s)	Grid	Distance from Site (Km)
Hale	SJ 454833	20
Ince	SJ 472767	25
Brimstage	SJ 297833	5
Wallasey	SJ 283914	5
Formby	SD 284048	10
Little Crosby	SD 307017	5
Heswall	SJ 245826	20
Moreton	SJ 247909	10
Llandegla	SJ 222535	50
Llanasa	SJ 096821	22
Fenn's Moss	SJ 491365	50
Little Hilber	SJ 189872	12
Burton Marsh	SJ 286749	18
Gayton	SJ 269796	16

Liverpool also had three RAF airfield decoy sites in its vicinity. These were referred to as 'Q' Sites, a name derived from the 'Q Ships' (warships mocked up to look like merchantmen), and consisted of lighting/fire installations designed to look like airfields to enemy bombers.

RAF Airfield Decoy(s)	Grid	Distance from Site (Km)
Betchton (Q Site)	SJ 787 602	60
Puddington (Q/QF Site)	SJ 313734	20
Bold Heath (QF Site)	SJ 546897	25

None of these sites would indicate the possibility that erroneous Luftwaffe bombing would have produced a consequent UXO risk on the site of concern.

WW1

Great Britain suffered several 'Zeppelin' aerial bombardments and aerial attacks by Gotha and Giant Bombers during WW1 as well as several naval bombardments from the sea. However, none of these are known to have dropped bombs near the site of concern and further, due to the limited number of bombs dropped then, the risks from WW1 unexploded ordnance from this source are negligible.

WW2 – GERMAN AERIAL BOMBING CAMPAIGN

At the outbreak of WW2, the site sat close to several viable Luftwaffe targets such as Railway lines, Docks, Manufacturing and other heavy industry; all infrastructure targets for the Luftwaffe with the local areas affected by several raids. The high-altitude area bombing during this period was notoriously inaccurate with areas surrounding specific targets suffering during attacks on the targets themselves.

Merseyside was the most important port in Britain outside London during the Second World War. It was a vital route for military equipment and supplies to the country, and so the 'Western Approaches Command' headquarters were transferred from Plymouth to Merseyside in February 1941. The headquarters were based deep underground beneath the Exchange Buildings. Western Approaches Command received intelligence information from the Admiralty and the Air Ministry, and was responsible for protecting supply ships as they entered the port. The docks were also home to important munitions factories and naval 'U-boat hunters' were stationed at Bootle. Heavy bombing had immobilised London's port facilities, and so the Mersey became even more important to the British war effort. The Luftwaffe (German air force) therefore began to target Merseyside.

The first German bombs landed on Merseyside on 9 August 1940 at Prenton, Birkenhead. In the following sixteen months, German bombs killed 2716 people in Liverpool, 442 people in Birkenhead, 409 people in Bootle and 332 people in Wallasey. The worst periods of bombing were the 'Christmas

Raids' of December 1940, and the 'May Blitz' of 1941. German bombing over Merseyside was unpredictable in the autumn of 1940. However, the attacks grew heavier towards the end of the year, and by 23 October Merseyside had suffered its 200th air raid. One of the worst single bombings occurred on 3 December 1940, when 180 people were killed in a direct hit on a packed air raid shelter in Liverpool. By 12 December 1940, Merseyside had suffered its 300th air raid.

In the three nights between 20 – 22 December 1940, 365 people throughout Merseyside were killed. On the first night, a bomb that had broken through the ground below two air raid shelters in Liverpool exploded. The force of the blast pinned many of the people inside the shelters against the roof. Although forty-eight people were rescued, forty-two people died in that incident. Another forty-two people were killed when a series of railway arches in Bentinck Street, Liverpool were directly hit. The arches were being used as unofficial air raid shelters. On 21 December, seventy-four people were killed in another direct hit on an air raid shelter.

The heaviest night of bombing was 3 May, with the biggest single incident of the night being the explosion of the cargo ship Malakand in Huskisson Dock No. 2, carrying one thousand tons of bombs and shells. A partly inflated barrage balloon (an inflatable device used to disrupt air raid attacks) came loose from its moorings and became tangled up in the Malakand's rigging. The balloon burst into flames and landed on the ship's deck. Although this fire was put out, flames from dock sheds that had been bombed soon spread to the Malakand, and the fire services struggled to fight the fire. A few hours after the 'all clear' signal had gone up around Merseyside, signalling the end of the air raids for that night, the Malakand exploded, destroying the entire Huskisson No. 2 dock and killing four people. It took seventy-four hours for the fire to burn out. The final bombs to be dropped on Merseyside during the War landed on 10 January 1942.

Liverpool 'Blitz' timeline:

- **1937** Civil Defence Services for the Merseyside Area established.
- **1939**
  - August - Evacuation preparations in Merseyside begin; children issued with gas masks and name tags.
  - 3rd August - Britain enters the Second World War; 95,000 children are evacuated from Merseyside.
- **1940**
  - 9th August - First bombs dropped on Merseyside at Prenton, Birkenhead. Liverpool's first casualty of the 'Blitz'.
  - 10th August - First bombs dropped on Wallasey.
  - 17th August - First bombs dropped on Liverpool. Liverpool Overhead railway damaged.
  - 19th August - Walton Gaol bombed killing 22 prisoners.
  - 5th September - Liverpool's Anglican Cathedral damaged by bomb blast.
  - 6th September - Children's Convalescent Home bombed, Birkenhead.
  - 26th September - Heavy raid on docks and warehouses. Argyle Theatre, Birkenhead, seriously damaged.
  - 23rd October - Merseyside suffers 200th air raid.
  - 28th November - Heaviest air raids to date; 200 people killed in total as the first land mines dropped on Merseyside. 164 people killed when a shelter underneath the Junior Technical School, Durning Road, collapsed.
  - 3rd December - 180 people killed in attack on a packed air raid shelter.
  - 12th December - Merseyside suffers its 300th air raid.
  - 20th December - Start of the 'The 'Christmas Raids' with 365 people killed over three nights. 42 people killed in a bomb attack on two air raid shelters; another 42 people killed when railway arches being used as unofficial shelters are hit; 1399 children evacuated out of Liverpool.
  - 21st December - 74 people killed in a direct hit on a large air raid shelter.
  - 22nd December - End of the 'Christmas Raids'.
- 1941
  - January - Bad flying weather results in just three air raids in the whole month.
  - 7th February - 'Western Approaches Command Headquarters transferred to Liverpool from Plymouth. Only two raids are carried out on Merseyside in February.

- 12/13th March - Heavy bombing resumes. Wallasey suffers its heaviest raids as 174 people are killed.
- 16th March - Baby girl found alive under debris in Wallasey, after being trapped for three and a half days.
- 25th April 1941 - Winston Churchill visits Liverpool to see the city and port. The Luftwaffe (German air force) limited the raids on Merseyside to just three this month, conserving their forces for the upcoming 'May Blitz'.
- 1st May - Beginning of the 'The 'May Blitz' 1741 people were killed and 114 people seriously injured by the end of the week.
- 3rd May - Worst night of the 'May Blitz', including the explosion of the cargo ship Malakand in Huskisson Dock.
- 7th May - Final night of the 'May Blitz'.
- 13th May - 550 'Unknown Warriors of the Battle of Britain' are buried in a common grave at Anfield Cemetery.
- 1st June - Heavy raids on Liverpool docks; East Gladstone Dock is badly damaged.
- 24th July - Light air raid on Merseyside.
- 1st November - A light air raid is the final attack on Merseyside in 1941.

- 1942
  - 10th January - Merseyside's final bombing raid of the Second World War sees houses in Upper Stanhope Street demolished.

The site of concern was placed within Region 10 (Manchester) for Civil Defence purposes and the figures for bombs falling in the area are well recorded. Region 10 received some **3 478.8 Tonnes** of HE bombs throughout the war. German aeroplanes dropped **2 315 high explosive bombs**, 119 land mines and countless smaller incendiary devices (fire bombs) during their attacks on Liverpool.

A summary of the bombs that fell on Region 10 Group 6D throughout WW2 is shown below:

Ordnance Type	No of Bombs	% of Total HE
High Explosive (HE)		
50Kg HE	576 (1)	
250Kg HE	368	
500Kg HE	57 (3)	
1000Kg HE	6	
1400Kg HE	-	
1800Kg HE	-	
Parachute Mine	592	
V1 'Doodlebug'	14	
V2 Long Range Rocket Bomb	-	
Anti-Personnel Bomb		
Incendiary		
50kg Phosphorus	Unknown	
Small IBs	Unknown	
Fire Pot	Unknown	
Oil Bomb	202	
Containers	Unknown	
Unclassified	10 658	

By May 1941, concentrated aerial attacks were diverted elsewhere and only sporadic bombing of London and the Southeast of England occurred.

UNEXPLODED BOMBS (UXBs)

Between 1940 and 1945, Bomb Disposal (BD) Teams cleared over 50,000 items of German air-dropped ordnance of 50Kg or larger, 7 000 anti-aircraft (AA) projectiles and more than 30 000 beach mines – This work claimed the lives of 394 Officer's and men. The War Office at the time stated that over 200 000 HE bombs exploded in Britain during WW2 with some 25 195 remaining a threat as UXBs i.e. 11%. Some 93% of all UXBs were 50Kg HE and 250Kg HE aerial bombs.

The types of ordnance discovered as UXBs give an indicator of the type of ordnance that may be encountered on or near the site of concern.

	There are no records of UXBs on the site of concern. There were several unexploded bombs (UXB) recorded in the area, from the attack of the 3/4 May 1941: • Outside the GPO in Oriel Road. • 16 Salisbury Road. • 14 Wallace Street. • 4 Wild Place. • 49 Orrell Lane. • The Junction of Marsh Street & Primrose Road. • Clifford Street. • Hawthorn Road. • Akenside Street. • Beattie Street. • Knowsley Road. • St Johns Road. • Regent Road. • Rimrose Road. • Nevada Street. • And a 1000kg UXB on the north side of No. 2 graving dock at Langton dock. These, as they are recorded on civil defence records, would have been dealt with, either at the time or in subsequent years after the war, as they do not appear on current Ministry of Defence records that detail known UXBs. There are no records of UXBs on or immediately adjacent to the site of concern.
ABANDONED BOMBS	A post-air raid search of damaged buildings and facilities would have included a specific search for bomb entry holes. If such evidence was discovered, then BD Teams would have been tasked (in order of strict priority from Category A, the highest priority, to category D, the lowest) to assess the potential UXB and to recommend a course of action. UXBs that were deemed to be a high enough priority, were tackled by the BD Teams who made strenuous efforts to recover and dispose of these items. However, it was not always possible to recover such bombs either through physical constraints, a lack of resources or a change in priority. Such UXBs were noted as 'Abandoned'. Due to the low priority of abandoned bombs, records that detail them are sketchy and sometimes contradictory. Others were subsequently recovered after the War when time and resources permitted and others remain 'abandoned'. It is worth remembering that 'abandoned' bombs may also include suspected UXBs that were reported but not confirmed, but simply efforts to locate the 'bomb' were exhausted. No Abandoned Bombs are recorded in the wider vicinity of the site of concern.
BOMB CENSUS MAPS	Unfortunately, detailed bomb census maps of the time did not survive the War and therefore cannot be examined for the purposes of this assessment. However, one reference map, the 'Hand Map of the City of Liverpool', produced by the City engineer T. Molyneux MInst CE survives. This map records 'serious HE damage' which equates to a High Explosive Bomb strike although it does not record the number of bombs that fell to create the damage. This map shows that no high explosive bombs were recorded as landing on the site of concern, although one was recorded to the east of the site. The relevant Bomb Census Summaries are at Annex B.
HISTORICAL STREEP MAPS	Historical street plans of the period are a useful indicator of whether an area may have suffered bomb damage. The street layout prior to WW2 is the start state and major changes to street layouts or building boundaries may indicate that the change was due to bomb damage.

	In this instance, there are no significant changes to the site layout between 1938 and 1950, which may indicate potential bomb damage. The relevant Historical Street Plans are at Annex C.
HISTORICAL AERIAL PHOTOGRAPHY	The same rational applies with historic aerial photography as it does when examining historical street plans – changes between pre-war and post-war images may indicate the possibility of damage caused by bombs falling on the site. Sometimes, detail is such that it allows bomb damage to be seen directly on sites of concern. In this instance, no RAF post-War aerial photography is available so no 'before and after' comparison can be made.
THREAT ANALYSIS	
IS THERE EVIDENCE THAT THE SITE WAS AFFECTED BY ANY EXPLOSIVE ORDNANCE CONTAMINATION EVENTS?	**No.** The historical record is acknowledged as being incomplete from a National perspective but there is no good evidence to show that the site of concern was directly affected by bombing during WW2; including large air-dropped bombs, and potentially including smaller anti-personnel bombs and/or incendiary bombs. The potential for large, air-dropped bombs to have landed within the wet docks on the site and remain unexploded at the bottom of those structures cannot be ignored especially considering that wet docks covered a significant area of the site at the time. The potential for British anti-aircraft artillery falling back to earth as UXBs and remaining on the site undiscovered cannot be entirely ruled out although it is very unlikely. The potential for *ad hoc* military or criminal activity to have generated explosive ordnance contamination at any site is generally unquantifiable but cannot be entirely ruled out although this possibility is extremely unlikely.
IF ENCOUNTERED, WHAT ORDNANCE TYPES ARE ANTICIPATED?	Of all the large bombs that were recorded as falling in Region 10; Less than 1% were 1000kg or larger, 4% were 500kg, 23% were 250kg, 34% were 50kg HE Bombs and the remainder were Parachute Mines. We must also consider the possibility, however remote, that Anti-Aircraft Artillery (AAA) projectiles or Explosive Ordnance (EO) because of military training could remain as a potential threat to the site from both WW1 and WW2. Therefore, the following items of EO may be anticipated to be potentially present on the site of concern: • Large, air-dropped, German HE Bombs including 50, 250, 500 and 1,000kg bombs (of WW2 vintage). • British AAA projectiles.
WHAT IS THE POTENTIAL EO/ UXB ENCOUNTER DEPTH?	**Ministry of Homeland Defence Security Bomb Penetration Studies**. A major study was completed by the Ministry of Homeland Security during WW2, during which the penetration depths of 1 328 air-dropped bombs (as reported by the BD Sections of the day and mostly in the Birmingham area) were recorded. It was concluded, not surprisingly, that the penetration depths of different sized bombs varied according to the geology into which they fell. The average Bomb Penetration Depth (BPD) of 430 x 50Kg HE bombs in London Clay was found to be 4.6m and that for a 250Kg bomb 6.1m. Also, they concluded that a 500Kg bomb, the largest common bomb dropped during the War, had a likely penetration depth of 6m in sand and 8.7m in clay – the maximum observed for a 500Kg was 10.2m and for a 1000Kg bomb was 12.7m. It should be remembered that these depths were achieved unencumbered by obstacles to penetration such as buildings, concrete and brickwork.

	The 'J' Curve. The 'J-curve' describes the path of a bomb (dropped from a normal altitude of about 5 000m) into homogenous ground will continue its line of flight (unless deflected by a substantial obstacle) but then turn upwards towards the surface before it stops. The horizontal distance (the 'offset') between the point of entry and final resting position was typically 1/3 of the ultimate penetration depth for a bomb. Therefore, if a bomb fell close to the exterior of a building or site and did not explode, the path that the bomb subsequently travelled beneath the ground, the "J-Curve", may have delivered it beneath the building or site footprint. The J-curve is often misunderstood, and used to describe the path taken by a bomb dropped from low flying aircraft to which it should not be applied. The final penetration depth of an air-dropped depends upon several factors; the velocity (as a function of the mass and speed) of the bomb, – PLANIT uses a standard velocity of 267m/s for assessment purposes – the angle of penetration of the bomb, the physical features through which the bomb travelled prior to impact with the ground, and the geology of the ground into which it entered - Generally, the softer the ground, the deeper the expected penetration depth of the bomb. Peat, alluvium and soft clays are easier to penetrate than gravels and/or sand and water content also plays a part. In addition, it must be remembered that 'barrier geology' such as very dense gravels or bedrock i.e. geology dense enough to stop the progress of a bomb underground, is an important factor in determining the median BPD. The physical characteristics of the site in this instance, would not act to retard the progress of UXBs underground by reducing their overall velocity prior to impact and therefore the maximum potential bomb penetration depths must be applied. The following UXO encounter depths *from WW2 ground levels* are estimated: • Small Incendiary and AP bombs – Surface (WW2 ground level) • Ad hoc legacy EO – Surface (WW2 ground level) • British AAA projectiles – 2m • 50kg HE – 4.5m • 250kg HE – 6m and • 500kg HE – 9m • 1000kg HE – 12m It must be remembered that UXBs can be found *at any depth* from WW2 ground level down to their maximum estimated depths.
HOW COULD AN UNCONTROLLED DETONATION BE BROUGHT ABOUT?	Unexploded Bombs rarely spontaneously explode. High Explosive (HE) requires a great deal of energy to create the necessary conditions for detonation to occur. In the case of WWII German bombs being disturbed during intrusive ground works, there are several scenarios to be considered: • **Direct impact onto the main body of the bomb**. Although this is a possibility, there is little chance of generating enough energy to detonate the explosive fill unless the fuse itself is directly struck. • **Re-starting the mechanical clock-timer in a bomb fuse**. This is a possibility. It is probable that environmental conditions have corroded the fuse sufficiently to prevent clockwork mechanisms from functioning. However, under some conditions, fuse elements will be in a good condition and additional movement of a bomb fuse may be sufficient to restart a previously 'jammed' mechanical clockwork mechanism. • **Induction of a static charge, creating a sufficient current to initiate an electric fuse**. This is an unlikely event. Environmental conditions are likely to have corroded the fuse, degrading its components sufficiently to prevent them from functioning. Any elements of the fuse capable of holding a charge would have dissipated in the time since the bomb failed to function. • **Friction impact initiating fuse elements causing bombs to detonate**. Although remote, this is the most likely scenario that may result in a bomb detonating. Weathering within the fuse pocket can cause the explosives within the fuse to breakdown, crystallize and exude from the fuse itself. Violent physical disturbance of this exuded material carries the remote possibility of initiating the fuse mechanism which in turn will initiate the bomb.

WHAT WOULD THE EFFECTS OF SUCH A DETONATION BE TO THE SITE?	The effects of WWII German bombs detonating have been the subject of several well recorded studies. The general effect of an explosive detonation will depend upon:
	
	• The size of the bomb and its Net Explosive Quantity (NEQ) (i.e. how much explosive material it contains).
	• The type of fill in the bomb (i.e. high explosive, incendiary, photoflash).
	• The physical location of the bomb. Whether it is:
	
	  ○ On the surface.
	  ○ Partially buried.
	  ○ Buried (A bomb can be considered 'buried' when it is more than 2½ times its own length below ground level *and* covered).
	
	• The locations of the bomb in relation to other structures.
	• The strength and design of structures near to the seat of an explosion.
	• The nature of the ground (i.e. sand, gravel, clay, marsh etc.).
	• The location of the bomb in relation to human and animal populations.
	
	There would be the potential for ground shock to damage important underground structures including sewers, communication cables, and foundations.
	
	The potential Damage Radii to various underground structures has been assessed by extrapolating from the Joint Service Publication 364 which is the MOD Manual for assessing bomb damage. Potential damage radii for underground structures are assessed as:
	
	• Brick Walls - 30m
	• Foundations - 60m
	• Cast Iron/ Concrete Pipes - 15m
	• Earthenware/ brisk Sewers - 25m
	• Electric Cables/ Steel Pipes - 12m

WOULD THE SITE CONDITIONS AFFECT THE BOMB FAILURE RATE?	There is no evidence to suggest that bomb failure rate at the site of concern would have been any different from that routinely experienced, i.e. **10-15% of all bombs dropped**.
WOULD UXBs HAVE BEEN DISCOVERED DURING WW2?	**Density of Bombing.** Liverpool received a relatively high density of bombing in WW2 and we know that the site itself did not likely receive any direct bomb strikes which would have not have created extensive blast damage to the area. This fact would have made data gathering at the time easier and the likelihood of overlooking UXBs lower. **Frequency of Access.** The site was a busy, industrial area at the time of the aerial bombing and given its strategic value, it is likely that it would have been subject to thorough post-air raid survey and clearance. Given this fact and that the site itself was affected by bombing, any post-raid survey activities would have been particularly thorough. This would have made the likelihood of identifying smaller items of EO (such as Incendiaries and AP bomblets) quite high whilst larger UXBs would have been more readily identified, even when you consider that UXB entry holes are diminutive. **Ground Cover.** The site of concern was predominantly covered by well-constructed, brick/concrete structures, open hard-standing and warehouses. These physical characteristics would act to retard the progress of UXBs underground by reducing their overall velocity prior to impact. Also, any damage caused by either detonating ordnance or UXBs travelling through hard standing structures would allow bomb damage to be readily identified and focus the post-air raid effort, which in turn would increase the chances of discovering UXBs. However, the wet docks across the site at the time would have been impossible to search effectively at the time even if a UXB was suspected of landing within them.

	Peripheral Bomb Damage. We know that the site of concern was probably not subject to direct bomb strikes during the War which decreases the possibility of post-air raid operations failing to identify entry holes of potential UXBs.
DOES THE SITE'S DEVELOPMENT HISTORY AFFECT THE POTENTIAL FOR UXO ENCOUNTER?	**Yes.** The fact a significant degree of post-War redevelopment has taken place at the site is worthy of note. Redevelopment of the immediate area and the site itself over the years would likely have encountered shallow UXO contamination at the time, which would have been dealt with. The major redevelopment in the late 60s associated with the construction snd subsequent removal of the Power station and the infilling of disused docks, would all have disturbed gro9und to significant depths. In particular, one must assume that the docks were emptied prior to infilling and therefore potential UXBs resting on the bottom of these facilities would likely have been identified prior to filling. It is worth noting that historical development either immediately post-War or in the 1960/ 70 and 80s would not have taken any account of the potential for UXBs at the site of concern nor would any effective technology be available to detect such potential threat items at depth. Modern structures tend to have foundation designs that go deeper than historic buildings and risk encountering UXBs at depths beyond existing historic foundation levels that were not detected by excavation or bomb survey. Remember, 'at risk' ground volumes may remain beneath post-War structures, between the maximum engineering depth achieved by the structure when built down the estimated maximum Bomb Penetration Depth (BPD) of 12m bgl. In addition, bombs may be found anywhere from the surface ***down to*** the estimated maximum BPD).
DOES THE UXO THREAT VARY ACROSS THE SITE?	**No.** Volumes of ground within the site already subjected to extensive redevelopment involving the displacement of earth, may be considered free from the threat of UXO/EO ***within the volumes of ground excavated/disturbed***. This would include foundations for post-War, multi-storey buildings and underground utility runs. Volumes of ground within the site already subjected to historical piling post-War may be considered a lower potential risk, ***within the ground volume occupied by the piles***, from large, air-dropped bombs than areas that have not been subjected to the same degree of intrusive engineering. ***This is not true for the remainder of the site or for ground volumes that are potentially at risk underneath modern structures***.
THREAT ASSESSMENT	
POTENTIAL EXPLOSIVE ORDNANCE THREAT ITEMS	Given the high degree and nature of post-War redevelopment, it is likely that UXBs with very shallow penetration depths such as small incendiary and anti-personnel bombs would have been disturbed and discovered by now, if present. By the same token, any Explosive Ordnance (EO) because of *ad hoc* military activity is likely to have been discovered, if present, also. However, there is no good evidence that any of these contamination events occurred and it is reasonable, therefore, to discount these potential threat items as likely to be present on the site of concern today. The potential for larger items of explosive ordnance to remain as UXBs does not exist across the wider site, given that we know that the site was likely not bombed in WW2 and given the degree of physical disturbance to the site since then. With that in mind, as far as can reasonably be anticipated, no items of explosive ordnance are thought to potentially be present within undisturbed ground volumes across the site of concern.

ENGINEERING WORKS	The following engineering processes are thought to be planned: • Site investigation. in relation to our boreholes which are to be positioned within old docks now infilled (post war era), I assume UXO risk would be limited to sediments/soils below the base of the dock infill (estimated at some 10mbgl).
RISK PATHWAY	For the purposes of this assessment, it has been assumed that site investigation works could include boreholes beyond WW2 ground levels. It is anticipated that personnel or key equipment may complete the risk pathway during intrusive engineering operations that may bring them into physical contact with potential threat items.
CURRENT EXPLOSIVE ORDNANCE THREAT LEVELS	Volumes of ground within the site already subjected to extensive redevelopment involving the displacement of earth, may be considered free from the threat of UXO/EO within the volumes of ground excavated or disturbed. The ordnance Threat Level for these ground volumes is **NEGLIGIBLE**. The Ordnance Threat Levels for the remainder of the site of concern from the Threat Assessment Matrices are assessed as: British AAA, 50kg, 250Kg and 500Kg HE Bombs — **NEGLIGIBLE**
WHAT ARE THE CONSEQUENCES OF AN UNCONTROLLED DETONATION?	The following consequences of an uncontrolled detonation are anticipated: For British AAA & 250kg HE Bombs: • People - Lost time injury <7 days • Plant - Item write off • Property - Major damage • Environment - Localised effect For 50 & 500kg HE Bombs: • People - Lost time injury >7 days • Plant - Unit level damage • Property - Major wider damage • Environment - Major effect

THREAT MATRICES

ORDNANCE CATEGORY

The 'Ordnance Category' is assessed for the different types of ordnance in terms of the 'Damage Radii' that may result were the ordnance subject to an uncontrolled explosion and is a function of the calibre of the ordnance and whether it is encountered on the 'surface' or 'buried'.

Ordnance Category	Ordnance Category Description	Danger Radii (m)	Potential Threat Item
0	No Explosive Ordnance (EO) suspected to be present	NA	X
1	Landmines, Anti-Personnel, HE; HE in Bulk <5Kg; Pyrotechnics	< 75	NA
2	Projectiles, HE <75mm calibre; Projectiles, Mortar, HE 50mm to < 75mm calibre; Grenades, Hand, HE; Grenades, Rifle, HE.	< 100	NA
3	Projectiles, HE < 125mm calibre; Rockets, HE, Anti-Tank (HEAT); Bombs PIAT, HE; Arial Bombs, HE, 50-250Kg (Surface & Buried); Aerial Bombs, Blast, HE & Sea Mines 20-250Kg; Aerial Bomb, HE, 250-500Kg (Buried)	< 250	NA
4	Bombs, Mortar, HE <105mm calibre; Bombs, Mortar, Spigot, HE; Landmines, Anti-Tank, HE; Aerial Bombs, HE, 250-500Kg (Surface)	< 300	NA
5	Projectile, HE > 125mm calibre; Aerial Bombs, HE, 1500-2500Kg (Surface); Aerial Bomb, Blast, HE & Sea Mines 500-1500Kg (Surface)	< 500	NA
6	Aerial Bombs, HE, 2000-10000Kg (Buried); Aerial Bombs, Blast, HE & Sea Mines 1500-4000Kg (Surface)	< 800	NA

ORDNANCE THREAT

This table assigns the 'Ordnance Threat', which is a function of the Ordnance Category and the anticipated encounter depth. i.e. the smaller and deeper the ordnance the less threat is present to people and property at the surface.

	ORDNANCE CATEGORY						Depth of Encounter (m)
0	1	2	3	4	5	6	
	ORDNANCE THREAT						
X							>10
							5<10
							2.5<5
							0.5<2.5
							0<0.5
							Surface

ORDNANCE THREAT LEVEL

The 'Ordnance Threat Level' is arrived at by comparing the 'Ordnance Risk' with the 'Likelihood of Encounter' of ordnance as a function of the level of expected ordnance contamination of a given type at a site of concern.

Ordnance Threat	ASSETS AFFECTED				LIKELIHOOD OF ENCOUNTER				
	People	Plant	Property	Environment	Very Unlikely	Unlikely	Likely	Very Likely	Extremely Likely
X	No effect								
	First aid injury	Slight damage	Slight damage	Slight Effect					
	Medical injury	Item repair	Minor damage	Minor Effect					
	Lost time <7 days	Item write off	Major damage	Local Effect					
	Lost time injury >7 days	Unit level damage	Major wider damage	Major Effect					
	Fatality	Multiple damage	Catastrophe	Massive Effect					

ORDNANCE THREAT LEVEL

No special measures required	**NEGLIGIBLE**	X
Monitor & manage potential risks	**LOW**	
Review & emplace strict control measures if necessary	**MEDIUM**	
Control measures required to mitigate risks to acceptable levels	**HIGH**	
Intolerable Risk Level. Immediate control measures prior to any further works	**EXTREME**	

THREAT MITIGATION		
ACTIVITY	**THREAT MITIGATION MEASURES**	**FINAL THREAT LEVEL**
ALL ACTIVITIES	A threat management strategy **IS NOT REQUIRED** to be in place prior to intrusive engineering works within the UXB Threat Zone for the site of concern.	**AS LOW AS REASONABLY PRACTICABLE (ALARP)**

ANNEXES

A. Site Location & Layout.
B. Bomb Census Summary.
C. Historical Street Maps.

Annex A: Site Location
Client: CC Geotechnical Ltd
Project Ref: Liverpool Waters
Doc Ref: 0123 EOTA Liverpool Waters 13/01/17

Key:

Site Location

PLANIT RESTORING BALANCE

Annex A: Site Location
Client: CC Geotechnical Ltd
Project Ref: Liverpool Waters
Doc Ref: 0123 EOTA Liverpool Waters 13/01/17

Key:

Site Location

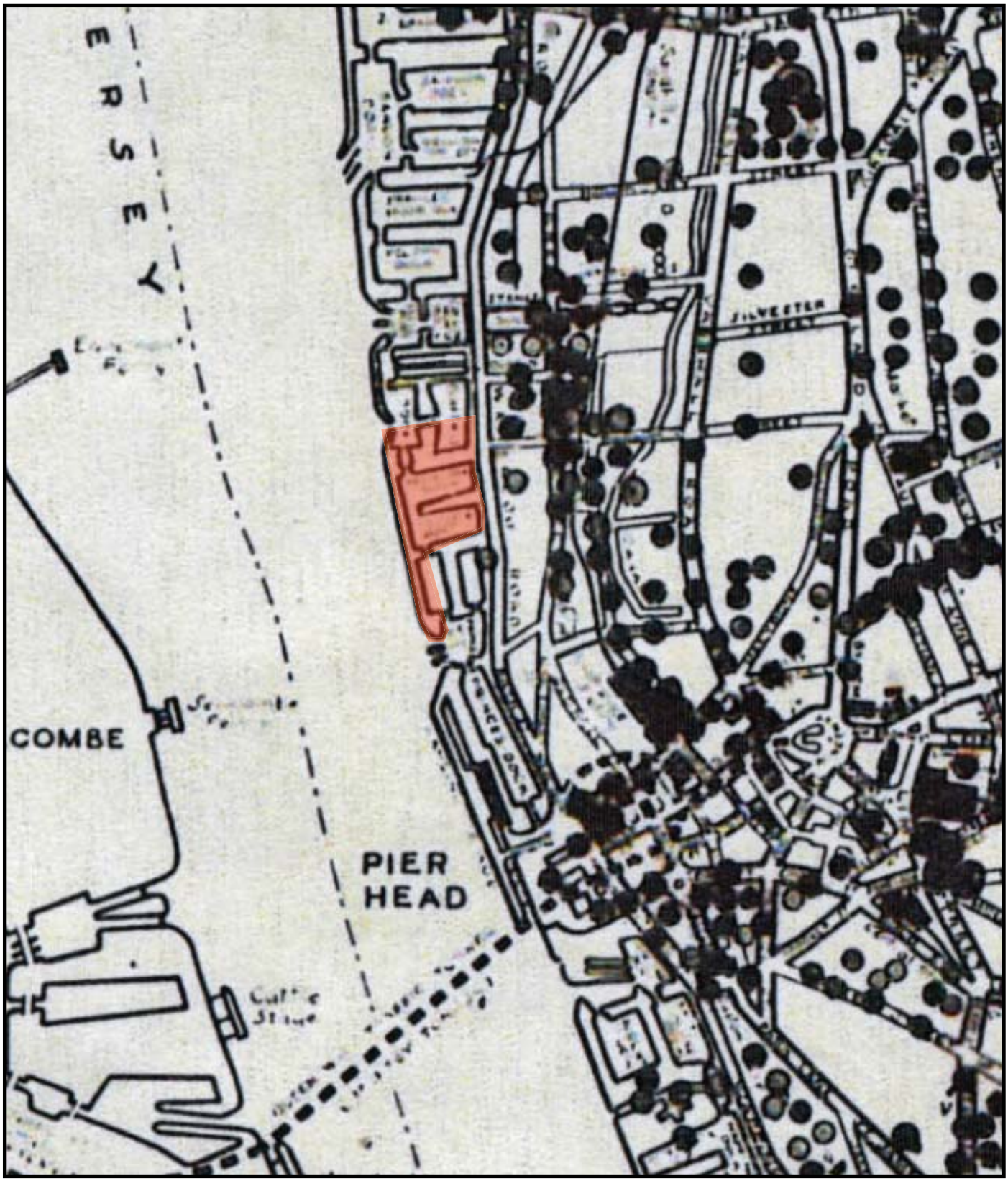
PLANIT RESTORING BALANCE

Annex A: Site Location
Client: CC Geotechnical Ltd
Project Ref: Liverpool Waters
Doc Ref: 0123 EOTA Liverpool Waters 13/01/17

Key:

Site Location

PLANIT RESTORING BALANCE



Key:

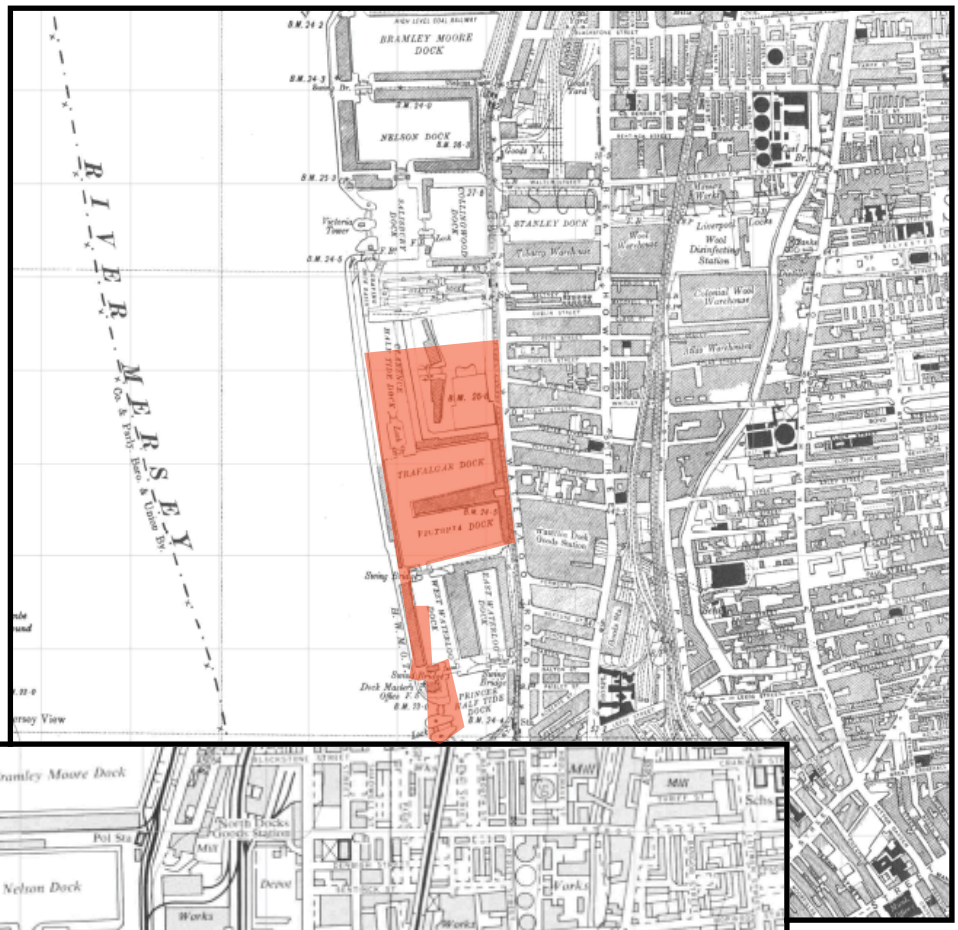
Site Location

HE Bomb Strikes

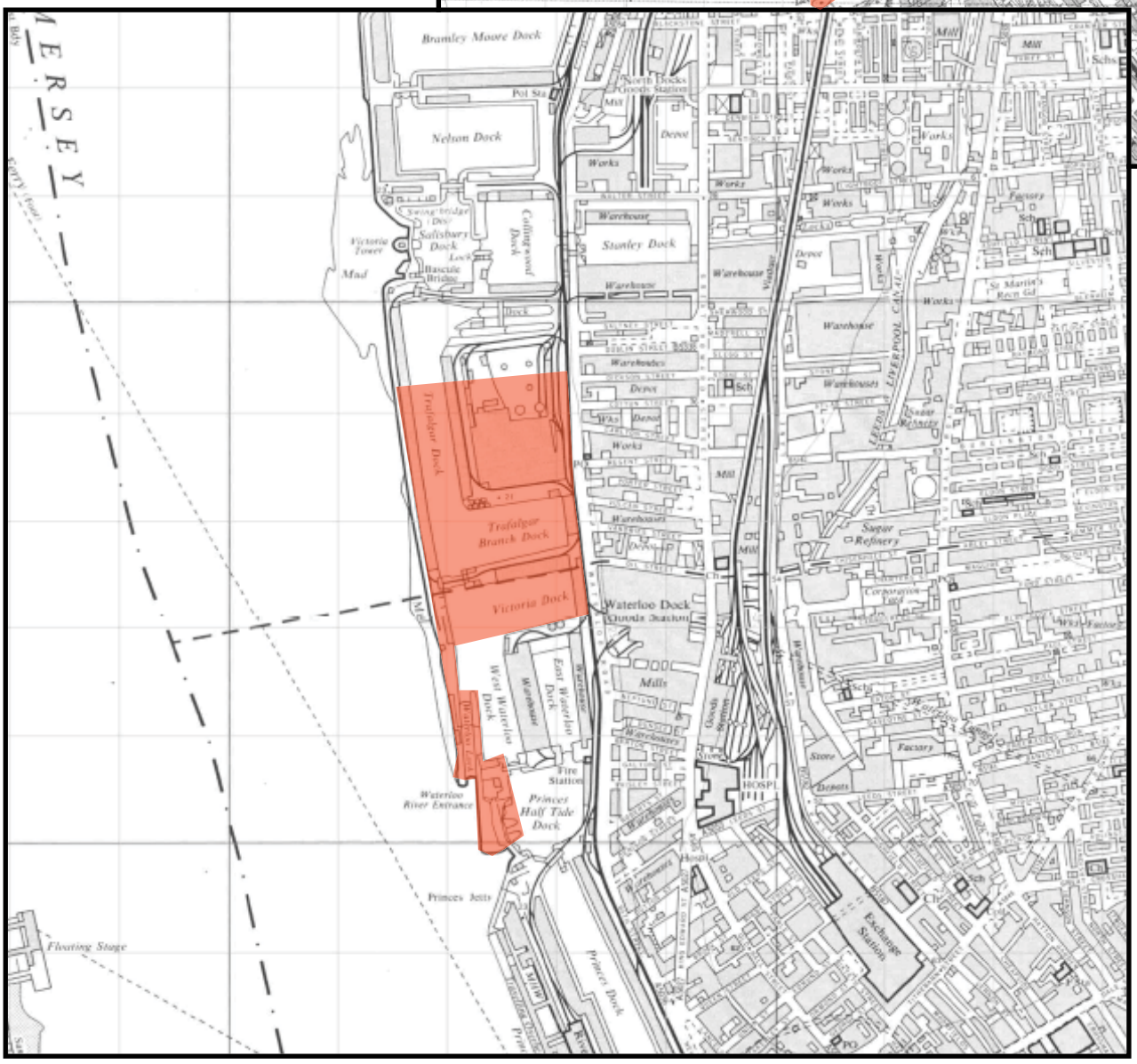
Annex B: Bomb Census Information
Client: CC Geotechnical Ltd
Project Ref: Liverpool Waters
Doc Ref: 0123 EOTA Liverpool Waters 13/01/17

PLANIT RESTORING BALANCE

1938



1967



Key:

Site Location

Annex C: Historical Street Maps
Client: CC Geotechnical Ltd
Project Ref: Liverpool Waters
Doc Ref: 0123 EOTA Liverpool Waters 13/01/17

PLANIT RESTORING BALANCE

APPENDIX O

ARCHAEOLOGIST REPORT

Appendix 4.1: Baseline 'Heritage' Environment

Liverpool Waters

Environmental Statement – Volume 2: Appendices – November 2011

4.0 Appendix 4 Archaeology and Cultural Heritage

4.1 Baseline Environment

4.1.1 The development of Liverpool waterfront and the central docks

Background

This section of the document summarises the historic development of the Liverpool Waters site and includes references to sites that are listed in the gazetteer (*Section 4.2*). Some information about the early development of the Liverpool docks outside the current study area has been included in order to provide a general historic context for the overall expansion of the dock landscape, and the significant advances in maritime engineering that accompanied each phase of development along the waterfront.

The development of Liverpool from small fishing port to a city of massive international significance was largely prompted by the construction of the docks. Initially, Liverpool failed to develop significantly between the 12th and seventeenth centuries as there was no established safe way of negotiating the river and putting into port. Liverpool Castle (former site now occupied by the Liverpool Crown Courts) stood on a promontory overlooking the river and guarding the entrance to a sea-lake known as the pool. However, few ships ever put into port as the tidal range and currents were treacherous and the river itself was strewn with hidden obstacles such as Pluckington Bank. Nevertheless in 1700 the construction of a wet dock within the confines of 'the pool' was proposed. Thomas Steers, an engineer with previous experience of dock construction at Rotherhithe on the Thames was contracted to design and oversee the construction. The city was effectively mortgaged to provide the £6000 required to fund the project. This was a high risk investment but the returns if the dock proved successful would potentially be vast. The Dock was built directly on the bedrock of the pool (where the bedrock was too deep, it is likely that a series of timber piles were erected to support the wall). The walls were constructed of hand made red brick and capped with yellow sandstone coping stones. Following the successful construction and opening of Thomas Steers Old Dock in 1715, there quickly followed a programme of land reclamation, sea wall and dock construction. This was to set a precedent for the continuous expansion and development of Liverpool's waterfront through a series of ingenious engineering feats which would radically alter the face of Liverpool and its place on the world stage in the nineteenth century.

Following the construction of the Old Dock, further modifications were made including the addition of a one and a half acre octagonal tidal entrance basin, a graving dock off the north side and a landing stage projecting from the south side of the entrance to the basin (Ritchie-Noakes, 1984, 19); the basin provided short term-berthing and access to the dock (Jarvis 1996). In 1714, a graving dock had been built by Alderman Norris and partners, which was superseded by the construction of the Dry Dock (later Canning Dock) in 1740 (Ritchie-Noakes, 1984, 19), which was designed by Thomas Steers but completed by his successor Henry Berry. This large basin also featured two graving docks which provided space for building and repairing ships. At this time the first sea wall was constructed to define the new shoreline, the line of the sea wall was later adopted as part of Georges Dock Passage. At the same time an ambitious programme of land reclamation was conducted as the citizens of Liverpool gradually began to shape the waterfront and create the area known today as Pier Head. Land was reclaimed using waste material obtained from local industry including, but not limited to, pottery production, quarry waste and organic waste generated by butchers, tanners etc who operated along the waterfront in areas such as Bird Street and Strand Street. By 1750 the land reclamation had successfully created a new strip of land known as Nova Scotia. This was quickly built upon and contained a variety of buildings including single room dwellings for the workforce, and pubs and hostelries, along with two slip ways; one constructed around

1750 to provide access to Bird Street and a later slip way in 1765 to provide access from the water to Nova Scotia. Accounts suggest that there may have been 38 dwelling houses of various sizes, accommodating 212 people in about 1770 (Wakefield 1927, 44). In 1790 records (Gore 1790) show that in Nova Scotia there were 17 houses and 15 cellars, occupied by 183 people and in Mann Island there were four houses and three cellars occupied by 30 people. Further land reclamation in a westwards direction between 1771 and 1785 necessitated the construction of two further sea walls and the Old Quay which was later superseded by the Manchester Basin (latterly the Manchester Dock).

The Pier Head, in it's present formation, did not exist until 1771. Excavation and cartographic evidence supports the fact that the development of the Pier Head followed on from the development of Mann Island and Nova Scotia with a succession of sea walls preceding the reclamation of land into useful waterside properties. The majority of land in this area was constructed from quarry waste, including crushed pink and yellow sandstone material interspersed with discrete dumps of pottery and other cultural material representing industry occurring elsewhere in the city centre (OA North 2009). Temporary retaining walls were found during the excavation for sections LCL5 and LCL6 of the new Liverpool Canal Link in 2007 (*ibid*). These structures comprised massive hewn blocks of sandstone (frequently recycled from other sources as evidenced by architectural components present in the walls) with dry stone wall-style construction. None of the temporary works walls were ever found to contain evidence of a mortar bond, and both stood to a height in excess of 6m. It is likely that the recycled masonry in the wall identified within section LCL5 (adjacent to Georges Sluice) originally came from the second Town Hall, which was built in 1673 but demolished and replaced by the current Town Hall between 1749 and 1754 (Belchem 2006, 147-8). The full extent of these walls was not established due to the formation of the canal excavation, however they are a clear indicator of the fact that some of Liverpool's earliest waterfront features still remain buried and relatively undamaged beneath the modern ground surface, despite the radical changes that have taken place on the waterfront in the last 250 years.

From 1771 the central area of Pier Head was occupied by Georges Dock, one of the largest in the area with an internal space of 3 acres (Hyde 1971). Georges Dock was linked to the Canning Dock via Georges Dock Passage to the south. Also built at the same time, Georges Dock Basin and Georges Ferry basin radically altered the shape and function of the Pier Head effectively creating a small series of islands linked by swing bridges. The Pier Head area around Georges Dock remained relatively free of structures as most of the warehouses and transit sheds were located on the eastern side of the docks around Strand Street and the Goree Piazza. The name Goree is a direct reminder of Liverpool's involvement in the slave trade; Goree is a prison island located off the coast of Senegal where slaves were held until the ships were ready to set sail for the Americas. This island is now a WHS (UNESCO 2010). By 1829 a long linear transit shed had been constructed on the west side of Georges Dock and this was matched by the construction of a corresponding transit shed on the east side of the dock in 1836 (Austin 1836).

The construction of the Manchester Dock swiftly followed in 1785. Although it had previously existed as a sandstone basin as early as 1772 the new closed dock was markedly different in size. Constructed of slightly more durable pink sandstone rather than the typically friable yellow sandstone, this dock was modified again with the establishment of entrance gates, between 1804- 1807 by John Foster (Jarvis 1996, Hyde 1971) and then finally double gates were added in 1816 (Jarvis 1996). In 1795 the Chester Basin was constructed in the same style as the Manchester Dock, although without the addition of dock gates. Both docks were used by flats and lighteners participating in the coastal rather than international trade.

The Pier Head was also the location of the mooring place of Private Floating Bath which was launched in 1816. This was replaced in 1828 by the establishment of Georges Baths which appear on Dwires map of 1823 (presumably representing the foundations), and is labelled on maps dating to 1829 and 1836 (*Section*

4.3.5). The foundations of Georges Baths, including sunken tiled areas thought to be part of the pool, and deep rectangular shafts still containing water, with cast iron pipes and possible pump mechanism were identified and recorded during the reduction of the land to the west side of the canal link as part of the public realm work in 2007 and 2008 (OA North 2009).

By the 1900s Georges Dock was drained and the construction of the Three Graces was underway, starting with the construction of the Port of Liverpool Building which was designed to house the Mersey Docks and Harbour Board Offices (Jarvis 1996). This was swiftly followed by the construction of the iconic Liver Building and finally the Cunard Building. The closure of Georges Dock rendered the associated docks in the network redundant. Georges Dock Basin, the ferry terminal and Georges Dock Passage were all closed at the same time (Hyde 1971). The extant remains of Georges Dock Passage are still visible today at Mann Island; however the basin and ferry terminal were filled in order to maximise the space at the Pier Head. Manchester Dock and Chester Basin were both affected by the change in transport from canals to railways and then roads, which made them redundant. Both were closed in the late 1920s and infilled c1936. The backfilling of the docks coincided with the excavation of the Mersey Road Tunnels, and both were filled using the pink crushed sterile sandstone tunnel risings (Jarvis 1996). This was confirmed by archaeological excavation in 2007 where both docks were re-exposed as part of the work for section LCL4 of the new Liverpool Canal Link. Both docks were found to be in excellent condition, surviving less than 0.3m beneath the 1930s cobble surface in some places. The Chester Basin even had extant dock furniture (OA North, 2009).

By the late 1920s and early 1930s the Pier Head area had become a wide open plaza area with three circular brick structures in place which were used as tram turning circles. Later during World War II the structures were used as temporary air raid shelters. Pier Head has more recently served as a point of embarkation and arrival for passenger vessels. The most frequent of those vessels have been ferries crossing the Mersey, but it has also been a terminal for ferries to the Isle of Mann and Ireland and the point of emigration for millions of Europeans on their way to the New World. It thus has a special place in the hearts of those emigrants, as possibly the last time they and their ancestors stood on European soil. Of the 5.5 million emigrants who crossed the Atlantic between 1860 and 1900, 4.75 million sailed from Liverpool (Jarvis 1996, OA North 2009).

Princes Dock

Following the development of Liverpool's closed dock system in the late eighteenth century; the construction of Princes Dock was the first substantial increase in the size of the docks (Pollard 2004, 95). It was also the first nineteenth century dock built in the town, with initial designs drawn up in 1800 by William Jessop and in 1810 by John Rennie, and was remarkable for the use of steam power and an iron railway to help remove spoil. Jessop commented on the silting of those older dock entrances with tidal basins, and proposed the installation of proper locks as a solution, together with improvements to the construction of the retaining walls (Jarvis 1996,14). By this time it has also been recognised that there were structural flaws to the use of sandstone walls set into the made ground, as it had been observed that the sheer weight of the walls made them prone to subsidence which left cracks and gaps in the dry bond (OA North 2009). Problems with raising funds, and securing land for the development, as part of the site encroached on the redundant fort and battery which had to be acquired as part of the site (Horwood 1803), meant that work did not commence until 1810, a full ten years after the original act to construct the dock had been passed in parliament. The problems of funding and labour were compounded by the Napoleonic Wars which limited the supply of men and horses for moving materials. By 1810, the full complement of land was still not available so work began on the construction of a dock which was now much reduced in size from the

original proposal. At the same time, the sea wall that now forms the boundary of the current marine parade was also being built. Stone for the works was shipped across the river from quarries at Runcorn. By July 1811, the name of Princes Dock had been officially bestowed by the Dock Committee (Tibbles 1999,26).

The Dock was officially completed in 1821 by the Dock Engineer John Foster (LCC 2005, 127). Until 1832, it was the largest dock in Liverpool, and was intended to be a flagship for Liverpool's trade with North America, for imported cotton and emigrating people (LCC 2005, 127). The dock covered an area of 4.6 hectares, with a lock at the southern end connecting it to Georges Dock. At the north end was a second lock leading through to Princes Dock Basin, which provided access to the Mersey. It was intended originally to build another dock on the north side of Princes Basin (Kaye 1816; Swire 1823-4; Walker and Walker 1823), but this area was not developed until the 1830s when the land was reclaimed. A swing bridge provided access to the island that formed the western side of the dock and a series of transit sheds, as well as the Dock Master's and Pier Master's offices (Ordnance Survey (OS) 1851). Further transit sheds and offices, such as a police station were on the east side of the dock.

Although as expensive to construct as an enclosed dock, the uses for Princes Dock Basin were limited. It could only be used by the smallest vessels, for landing fish and small coastal cargoes. It was primarily used to provide access to Princes Dock, and later for movements of materials for improvements to Princes Dock, and the construction of Waterloo and Clarence Dock.

Access to Princes Dock from the town was controlled by a dock boundary wall, the first to be built in Liverpool, begun in 1816 and completed in 1821 when the dock opened. Also built by John Foster, the wall was of red brick, four courses thick, with sandstone copings and a gateway built with sandstone piers in the Greek Revival style (LCC 2005, 65-6). Originally the wall extended around the dock but only the east side survives in situ. The buildings around Princes Dock were also characteristic of this phase of building as the newly constructed transit sheds were built to be easily constructed and dismantled. Archaeological excavation in the area of Princes Dock showed that despite the transitory nature of these structures, they were furnished with substantial foundations and associated crane bases (OA North 2009).

Dock Extensions in the 1830s

The next phase of docks to open within the central docks area was built by Foster's successor, Jesse Hartley. Hartley is considered Liverpool's most eminent dock engineer, and between 1824 and 1860 he more than doubled the dock accommodation (Stammers 1999, 37). His prolific building campaign and distinctive cyclopean granite architecture style meant that his docks are probably the most easily recognisable. The need for a rapidly expanding dock system was the result of Liverpool's expansion in trade arising from the growth in the textile industry and the opening up of markets in India and China, following the end of the East India Company's monopolies, and in South America. The tonnage of shipping doubled between 1815 and 1830, and again by 1845 (Milne 2006, 259).

One of Hartley's main achievements was the improvement made to the design of the dock retaining walls. His early docks were built from sandstone, but from the construction of Clarence Dock in 1830, he replaced this with granite (though shortages ensured some sandstone continued to be used into the 1880s). Hartley ensured that the quality of masonry work was very high, allowing him to build using relatively thin walls with only a slight batter (Pollard 2004, 96). Straighter walls were essential to accommodate deep, square-hulled steamships. Hartley's construction method involved taking piers down to the level of the general foundations, leaving in masses of bedrock, and then building flat relieving arches. The walls were supported by counterforts, 6 feet square and 12 feet apart, which were cruciform buttresses set into the rear of the walls. The walls themselves were 12 feet thick at the base, 6 feet thick at the capping and 36 feet high,

with a batter of only 1 inch to the vertical (Hynes 1996, 41-2). They were built using his distinctive 'cyclopean' construction technique, using massive bonding headers, with small irregular pieces of rubble in between, fitted together precisely with very thin mortar joints (Pollard 2004, 96).

Some distance to the north of Princes Dock and tidal basin, he built Clarence Dock and Clarence Graving Dock, which opened in 1830 (Pollard 2004, 97). Clarence was a dock specialising in steamships, and it was sited well away from the existing docks to reduce the fire risk to other shipping. It comprised two enclosed dock basins, parallel to each other and the river. Access to the sea from the inner basin was through an outer, half tide dock. The half tide dock allowed water to be impounded at high tide. Once the gates were shut, ships could then pass through to the fully impounded dock system beyond.

On the north side of the half tide dock was a passage with lock giving access to Clarence Gridiron Basin, which led onto Clarence Graving Docks. Dug partly from rock, the fine masonry work of the graving dock has stepped side and granite barrel runs, and the southern dock has two chambers (LB no 213395). The graving docks were only just large enough to accommodate one or two vessels at a time. After the vessels were floated in, water was removed either by pumps or drains, in order to allow repairs. In the case of Clarence Graving Docks, water was removed by pumps (Hynes 1996, 40).

The mid-1830s saw a rapid expansion in Liverpool Docks, and the area between Princes Half Tide Dock and Clarence Dock was soon infilled with new dock facilities. Although John Foster had already begun work on a new dock to the immediate north of Princes Dock before its completion, it was his replacement, Jesse Hartley who built and completed Waterloo Dock between 1831 and 1834 (LCC 2005, 128). It was a rectangular basin, orientated east/west, with its short side to the river providing five acres of enclosed water space. Waterloo Dock was chosen as the site of a number of significant buildings for the period, indicating that it was already assumed that this area of the docks would play a key role in international trade. A Northern Custom House, much smaller than the one at Canning Place, was established on the south side of the dock, along with the new fish market. In addition, the second observatory to be constructed in Liverpool was built there in 1844. This structure superseded the smaller observatory on St James Mount and played a central role in helping to fix the longitude of Liverpool in relation to that of Greenwich in London (Jarvis 1991a, 146). The observatory was relocated to Bidston Hill in the 1860s, as the requirement for grain storage prompted a redesign of the Waterloo Dock. The dock was used for general cargo.

By 1836, Hartley had built Victoria (NMR no SJ 39 SW1063) and Trafalgar Docks (NMR no SJ 39 SW1062) in the remaining space between Clarence and Waterloo Docks. Victoria Dock, Trafalgar Dock and Waterloo Dock formed a uniform multi-functional triumvirate of dock and quay space. Each dock covered 5 acres of enclosed water. Access from the river could be gained initially through the Victoria Dock lock gate entrance, however the Victoria Dock river access was closed after only ten years meaning that access could only be gained through the dock network, either to the north or south. This alteration made the Victoria, Trafalgar and Waterloo system 'the first real examples of spine and branch dock' (McCarron and Jarvis 1992,94). These docks were aligned east/west, parallel with Waterloo Dock and with their short ends to the river. Transit sheds surrounded each of the docks on each side (OS 1851). Hartley reduced both construction and operating costs by using interconnecting docks, limiting the number of river entrances.

Trafalgar Dock joined Clarence Dock to the north and Victoria Dock to the south. Victoria was connected to Waterloo, which had access to the river via a lock leading to Princes Dock tidal basin. This enclosed system of interconnecting docks also had the advantage of allowing ships to move around the dock system without having to wait for appropriate tides (LCC 2005, 131-2). All were built out into the river, with reclaimed land forming the islands for the outer dock walls. Recent archaeological excavations demonstrated that the

majority of reclaimed land around the Trafalgar and Victoria Dock comprised quarry waste and beach sand mixed with cultural material; presumably waste brought from the city for the purpose of helping to increase the bulk of the reclamation material (OA North, 2009). Parts of the Victoria Dock and the early original Trafalgar Dock walls were recently partially demolished in order to accommodate a section of the new Liverpool Canal Link. A 15m section of each wall was demolished. However, the rest of the original dock walls survive buried beneath a series of nineteenth and twentieth century backfills.

With the construction of new docks, the dock boundary wall was extended to control access. Hartley's boundary wall of the 1830s continued in the style of Foster's dock wall of 1821, being in red brick with sandstone copings. Hartley's gateways were all in the classical style, with square section piers in buff sandstone, with pitted rusticated bases, ashlar shafts and gabled caps with acroteria. Although the slots for the original gates survive in all the gateways, the gates themselves have been replaced by modern fencing. By Clarence Dock is a cast-iron drinking fountain, one of 33 inserted into the dock wall in 1859, in an effort to provide drinking water and keep dock workers out of the pubs. Originally the only source of drinking water on Waterloo Road was two horse troughs filled with fresh water that were located around the Princes Dock. Charles Pierre Melly was the driving force behind the installation of the drinking fountains, who undertook a study of the value of such fountains after bringing the idea back from Europe where public fountains were common place and much used. His work was published as a Treatise on Public Drinking Fountain in 1858 (LCC 2005).

Dock Extensions in 1848

Following the Dock Act of 1844, work began on a total of eight new docks for Liverpool, illustrating the demand for port facilities in the town and the confidence in its continuing growth (LCC 2005, 131). South of the central docks, Albert Dock was built, and to the north Wellington and Sandon Dock were built and opened by 1848. Between, in the central docks area, five docks were planned and built by Jesse Hartley as part of a single construction programme. These were Salisbury, Collingwood, Stanley, Nelson and Bramley Moore Docks, and they were completed and opened in 1848, on land already reclaimed by the early 1840s, and where a fort known as the North Battery had been built (Bennison 1841).

As with the 1830s docks, they formed an enclosed, interconnecting system, with Salisbury Dock the link to the river with a double half tide entrance separated by an island (Jarvis 1991b, 73). Bramley Moore Dock linked to Nelson Dock, which was linked to Salisbury Dock from the north. From the east, Stanley Dock led to Collingwood Dock, which linked to Salisbury Dock. The passages linking the docks were crossed by means of double leaf, iron swing bridges (Jarvis 1991b, 73). Separate barge passages were provided for canal boats using the Leeds and Liverpool Canal to pass between the Stanley Dock, Collingwood Dock, Salisbury Dock and the river. Only Stanley Dock was excavated from existing dry land, with the others built out into the river as the other central docks had been. The river wall which enclosed the docks was considered at the time to be a major feat. It was built in the same manner as the dock walls, using the 'cyclopean' granite technique.

Salisbury Dock, named after the 2nd Marquis of Salisbury, a major landowner in Liverpool, was small, covering only 3 acres, as its prime function was to provide access to the other docks in the system. It did, however, take small coastal vessels, and sheds were built on the south side of the dock in 1849 (LCC 2005, 132). Salisbury Dock does demonstrate that this period of dock construction is considered to be the culmination of Hartley's dock design. At the entrance to Salisbury Dock, Victoria Tower was built on the central island between the two dock gates. This is a clock- and bell-tower, which was not only a landmark building at the entrance to the docks, but provided the time to ships and neighbouring docks, and rang out

the high tide and other warnings (LB no 35936). The building contained a Pier Master's flat, whilst nearby stands the Dock Master's office (LB no 359435), a two-storey granite building with battlements.

Like Salisbury Dock, Collingwood Dock was also small, and served coasters and other small vessels. It was also the home to Liverpool Corporation's refuse boats. It had open goods sheds built on its north and south sides in 1849. The dock was named after Baron Cuthbert Collingwood, Nelson's right-hand man (LCC 2005, 132). At the east end of Collingwood Dock is the passage through to Stanley Dock, crossed initially by a swing bridge and, later, a lifting bridge that carried Regent Road. The Bascule Bridge, which is currently closed on health and safety grounds, dates from 1932 and was constructed by Dorman Long. It is one of five that were built in that year within the dock estate. The bridge is formed from two main steel trusses which support cross girders and a road deck. The rolling bascule consists of an arc section with a large steel ballast box which acts as the balance for lifting the bridge. A separate engine room is supported on a steel deck spanning the carriageway and was originally operated by hydraulic power.

Stanley Dock was named after the Lord Stanley, the 13th Earl of Derby, who was major landowners in the area, and who had sold the land on which the dock was built to the Liverpool Dock Trust (LCC 2005, 133). The dock provided a link to the Leeds and Liverpool Canal though a canal spur with a series of four locks, enabling goods to be transferred directly from the canal to ships. These goods were mainly low-cost or bulky items, such as coal for export and cotton and wool imports for the Lancashire and Yorkshire mills (LCC 2005, 132). The dock also connected with both the Lancashire and Yorkshire Railway and the Docks Railway, allowing more expensive goods to be transhipped directly to the towns of northern England, or to other docks for links to railways to the rest of the country (LCC 2005, 132).

On the north and south sides of the Stanley Dock, two warehouses of similar design to those at the Albert Dock were built in 1852-56 for bonded storage of high value goods. They were the first dock warehouses designed for rail and hydraulic power (Pollard 2004, 125); the hydraulic power centre on the north side of the dock providing the power for hoists, capstans and tobacco presses. By the end of the nineteenth century, the warehouses were no longer in great demand, and half the dock was infilled to construct the vast Tobacco Warehouse in 1900-01. This purpose designed structure, 14 storeys high, with a floor area of 1.3 million square feet could accommodate 70,000 hogsheads of tobacco and is said to be the largest warehouse in the world, and the largest brick-built structure in Europe (LCC 2005).

It was consistently the most profitable of the Board's warehouses. From this period, Hartley's south warehouse was used in conjunction with the Tobacco Warehouse for storage of tobacco, and the north warehouse was used for rum. In the south-east corner of the dock is the King's Pipe, the chimney to the furnace, built c.1900, used to burn tobacco scraps. Part of the north warehouse was destroyed in the blitz and was replaced with a single storey structure. The Tobacco Warehouse remained in use until 1980, but since then the whole complex has been vacant, apart from the use of the ground floor as a Sunday market. Despite lying derelict, the warehouses surrounding the Stanley Dock still retain a large number of original fixings and machinery including the lift mechanisms. The bascule bridge which provides access over the entrance to the Stanley Dock is currently undergoing major restoration and repair.

Nelson Dock, which lay to the north of Salisbury and Collingwood Docks, was named after Admiral Nelson. It served a variety of ships, including the largest steamships of the time, and its principal trade was with the livestock markets of Scotland and Ireland. It had transit sheds on all sides by 1850, including a secure brick-built shed on the west (LCC 2005, 133). The last regular trade was in bulk rum, which was piped to the North Stanley Dock Warehouse.

Bramley Moore Dock is the largest of the five docks, at a little under 10 acres (Jarvis 1991b, 73), and was named after the chairman of the Dock Committee and mayor of Liverpool. Like Nelson Dock, it too was built to take the largest steamships, and its gates were thus built wider than those of Clarence Docks. The rapidly increasing size of ships, however, meant that it was soon found to be inadequate, and the dock specialised in coal export. It did not have any sheds until 1856, when a high level coal railway was built by the Lancashire and Yorkshire Railway, which allowed wagons of coal to be taken by wagons directly to ships and dumped into the holds (LCC 2005, 133).

The dock boundary wall, which Hartley built to enclose this set of new docks differed from the earlier walls. Instead of using brick, Hartley employed the same 'cyclopean' granite style of building used in the dock walls, with finely jointed stones brought to a fair face, with rounded coping stones. This is now recognised as his signature style and was later copied by successive Dock Engineers, including Lyster. Set into the walls at intervals are granite plaques bearing the name of each dock and the date of construction, 1848 (LCC 2005, 67). Within the wall at Nelson Dock is one of the surviving cast-iron drinking fountains. The gateways through the wall were also different in character from those in the earlier dock wall. The 1848 gateways are all similar in design, with double entrances with round tapering towers as gate piers. The central round towers are larger with slit windows as they also functioned as offices for the dock policemen. At the entrance to Salisbury and Collingwood Docks, the central turret also has a granite letter box. Gates slid out on rollers, operated by counterweights, from slits in the side gate piers, closing into slitted recesses in the central towers. Although no longer functional, the gates to all the 1848 entrances are still extant (*ibid*).

Later nineteenth Century Dock Alterations

Princes Half Tide Dock: Princes Basin was modernised and rebuilt around 1868 by GF Lyster, the successor to Jesse Hartley. The original basin was inefficient and could only handle the smallest vessels. Lyster created a half tide dock, sub-rectangular in shape with dock retaining walls built in the 'cyclopean' granite style of Hartley, that is of granite rubble brought to a fair face laid in blocks of differing sizes with fine mortar joints (LB no 436020). Additional emphasis was placed on the Hartley style by incorporating it into the surface of the quayside in place of the traditional rectangular granite setts. The reworking of the dock also retained the traditional style Hartley Dock furniture.

The dock also included steps laid diagonally. The half tide dock operated through a triple entrance to the river, with two passages for half tide use, and a barge lock which could be used at almost any state of the tide. The new dock was attractive to small vessels, particularly coastal traffic. The goods brought in were transferred to a specially built railway shed on the east quay, built in 1875 (Jarvis 1991a, 36). The success of Princes Half Tide Dock is reflected in the development of transit sheds around it. The 1875 shed was extended by 129 feet in 1877, at the same time as a new wooden shed was built on the south-east quay (Jarvis 1991a, 36-8).

In 1873 Lyster infilled the Georges Dock Basin that previously gave access to the southern end of the Princes Dock. This allowed construction of a long floating roadway that led down to the Liverpool Landing Stage, a wood and iron pontoon that served the ferries and cross river traffic. Eventually, the landing stage was extended to 2,500 feet, running from the Pier Head northwards the full length of the Princes Dock, becoming the principal point of embarkation for transatlantic passenger liners. To cater for travellers, the landing stage was equipped with waiting rooms, customs points and baggage handling facilities (Sharples 2004).

In 1895 Riverside Station was opened on the west side of Princes Dock, bringing main line passengers right down to the river's edge, with covered bridges leading directly to the floating landing stage at two levels. The rail link to Riverside Station came in from the Waterloo Dock Goods Yard, only a short distance away.

At the north end of the Liverpool Landing Stage, Princes Jetty was built in 1899-1900. Designed by AG Lyster, in association with Gustave Mouchel, it was the first reinforced concrete structure in the docks and is one of the earliest examples of the use of the Hennebique system in Britain (Pollard 2004, 122). Princes Jetty incorporates two substantial components, which appear to be constructed of timber with a concrete deck, and following the removal of the original iron and timber structure in 1975, it is the only surviving element of the Liverpool Landing Stage. It incorporates the former fire-damaged remains of a timber shelter and a moveable bridge.

Waterloo Dock: the development of Princes Half Tide Dock was partly tied in to the redevelopment of the neighbouring Waterloo Dock, also carried out by GF Lyster in 1868. The impetus for the rebuilding of Waterloo Dock was the repeal of the Corn Laws, when the Mersey Docks and Harbour Board saw the opportunity for importing grain from North America, using Waterloo Dock as a specialist bulk grain dock (Pollard 2004, 122-3), the first in the world. The new dock comprised two basins orientated east/west, with sandstone block walls constructed across the site of the former single north/south aligned basin.

East Waterloo Dock was the specialist grain dock, with massive brick warehouses with open colonnades on the ground floor. Originally there were three warehouses, matching long warehouses on the west and east quays and a shorter warehouse on the north quay. The long warehouses stood on a granite base with a limestone floor. There were five working floors plus a basement and a mezzanine level on the top floor. The surviving warehouse is 43 bays long and 5 bays wide (LB no 359705). The basement and mezzanine levels held machinery and conveyor belts, which were operated in all the warehouses by one hydraulically driven system, in a separate engine house. The hydraulic system also operated three moveable bridges, ten ship capstans and 24 gate engines (LCC 2005, 128-9).

West Waterloo Dock provided berths for medium-sized, ocean-going vessels, and provided a passage between Victoria Dock and Princes Half Tide Dock (LCC 2005, 128). It had two long sheds on the east and west quays, plus a smaller south shed on the south quay to the west of the passage to Princes Half Tide Dock. On the west quay, between Waterloo and Princes Half Tide Dock, was the Dock Master's Office with clock tower (OS 1890).

The Docks in the twentieth Century

Trafalgar Docks Development: the central docks soon became inadequate, as the size of ships increased requiring greater harbour depths, and the need for rapid turnarounds and accurate timetables made the half tide dock system inefficient. Trafalgar Dock, for example, had been designed for deep-sea sailing ships, but by 1900 could only take coastal and canal traffic (Stammers 1999, 55). New docks were built further downstream, where the channel was deeper and the foreshore wider (Pollard 2004, 98). In 1929, a programme of modernisation was carried out in the central docks, leading to the filling in of Clarence Dock, Clarence Half Tide Dock and Victoria Dock and the reconstruction of Trafalgar Dock (NMR nos SJ 39 SW1054; SJ 39 SW1062; SJ 39 SW1063). The filled in areas of these docks remain largely undeveloped and are now used for business and light industry, although a power station, now demolished, was built on Clarence Dock (NMR no SJ 39 SW1054). The new Trafalgar Dock was a long, narrow basin aligned north/south and parallel to the river wall. At the north end, it incorporated Clarence Gridiron Dock Basin which provided access to Clarence Graving Docks. The south end of the dock had a passage through

to West Waterloo Dock. Most of the new Trafalgar Dock has now been filled in, although the walls are still visible and are clearly demarcated by a series of modern extant mooring bollards.

Princes Docks and Waterloo Dock Developments: the grain warehouses on East Waterloo Dock continued to operate into the twentieth century, even though they became inefficient as they failed to keep pace with changing technology (LCC 2005, 129). In 1904 part of the warehouses were converted to a mill, and in 1925 they were re-equipped for handling oil seeds. The north warehouse was demolished following bomb damage in 1941, and the west block was demolished in 1969 (NMR no SJ 39 SW1064). Today, only the east warehouse still stands, now converted to apartments. Despite the conversion of the warehouses to residences, the dockside has retained much of its character including the original facing, coping stones and quayside surface. Much of the dock furniture is also still extant including mooring rings and bollards.

West Waterloo Dock and Princes Half Tide Dock were altered in 1949. The length of West Waterloo Dock may have been increased at this time, as the surviving north wall of the dock is constructed from finely mortared sandstone blocks, suggesting that it was the original wall to Victoria Dock, part of which may have been incorporated into West Waterloo Dock. The entrance to Princes Half Tide Dock was closed, though retaining the original lock gates in front of the blocking, and a new entrance lock was built into West Waterloo Dock (LCC 2005, 129). This provided direct access through the lock system to Trafalgar Dock. In 1969, there were further alterations with the development of a container port at West Waterloo Dock, resulting in the demolition of the west warehouse of East Waterloo Dock. The container terminal was for Irish and coastal container traffic (LCC 2005, 129). West Waterloo Dock was lengthened, and the new dock wall was constructed using the recently introduced 'diaphragm' wall. The consisted of a row of huge, vertical, semi-cylindrical sections, with a fin extending from the rear of each section (Pollard 2004, 96). The modern extension to West Waterloo Dock has been mostly filled in at the northern end, as has the 1949 river lock entrance. Despite being infilled the river lock entrance is still partially visible and is one of the most impressive structures in this section of the dock complex. A long linear passage with four extant metal lock gates of huge proportions. The size of this structure and the complexity of the subterranean mechanisms that remain *in situ* demonstrate the ingenuity of the Liverpool Dock Engineers.

The Princes Dock remained largely unchanged until 1905, by which time its shallow depth combined with the cambered profile of the dock walls made it unsuitable for the deeper, more square-sided steamers, that were liable to suffer damage when mooring alongside the wall. A new quayside structure was therefore built within the dock, complete with sheds and a concrete deck, occupying the whole of the west side of the original water area. This proved a success, and when funds later became available from the proceeds of the sale of the Clarence Dock to Liverpool City Council for the construction of a power station, a similar structure was inserted along the east side of the dock. This established, belatedly, a specialised facility for coastal trade, with an emphasis on Irish traffic. A "roll on/roll off" terminal was installed in 1967 at the southern end of the dock, for the Irish Packet, but continuing declines in passenger numbers and the construction of the new terminal at Victoria Dock made it redundant in 1981 (McCarron and Jarvis 1992,72). Despite an illustrious and varied history the dock fell into decline until the 1990s when a new phase of regeneration saw the dock placed at the heart of the newly founded waterfront business district (OA North 2009).

Regeneration

After its closure in 1981, and being close to the central business district, Princes Dock was regarded as a potential area for new office development, and in 1988 its ownership passed to the Merseyside Development Corporation. In 1992, in accordance with a masterplan prepared by Tibbalds Monro, development commenced. The transit sheds and other buildings were cleared, the east quay was widened

to create larger development sites, and the dock walls were rebuilt. The first phases included the Crown Plaza Hotel, and a section of Princes Parade. A revised masterplan was prepared in 1998 by Taylor Young for the Princes Dock Development Company. This provided the framework for the remainder of the site, including access to Waterloo Road/Bath Street, the partial infilling of Princes Dock and the identification of additional parcels of land for development.

With changes in the property market, and differing aspirations since the 1998 masterplan, further revisions were approved in April 2002. The new plan introduced a greater mix of uses, higher densities, and indicative heights for each development plot. Some new plots were allocated for development. Whilst the emphasis of this masterplan was to deliver commercial development, in recognition of changing market demands, and the failure to attract the desired volume of commercial activity, it was agreed with the Princes Dock Development Company that the original aspiration could be relaxed to allow for a greater proportion of new residential development around the dock. This has mostly been in the form of individual tall buildings.

At the south end of the dock, the blocked passage to the former Georges Basin and the original coursed sandstone quay wall survive. Along the riverside, where a set of derelict steps remain, it is possible to see sections of the original river wall.

In 2007 work commenced on the Liverpool Canal Link which directly impacted upon the Princes Dock. In 2008, as part of the bulk excavation, elements of the transit shed foundations and the north wall of the Georges Dock Basin were uncovered. The original sea wall and temporary works wall were also identified during the course of the works. The 1967 roll on-roll off ramp was re-exposed and removed in order to allow the construction of a culvert across Plot 7 (OA North 2009).

4.1.2 Associated Development

Warehouses and other development to the west of the docks

To the east of the docks, between Regent Road and Waterloo Road, and Great Howard Street are a series of workshops and warehouses that developed in the nineteenth century alongside the docks. The most prominent examples are the warehouses around Stanley Dock, which were contained within its boundary wall (see above). One of the earliest known examples in this area was the warehouse of J Bibby and Sons on Galton Street, built in 1826 (LB no 214127) which, although listed, has since been demolished and the site redeveloped with two large retail units.

Just south of Stanley Dock the bonded tea warehouse at 177 Great Howard Street, known as Clarence Warehouses, is an early example of a fireproof warehouse (Giles 1999, 11), and is considered to be the largest group of private warehouses still surviving in the city. It was built by S and J Holme before 1850, and comprises 11 separate stacks of six storeys within a single shell (Pollard 2004, 126). There is a second early example of a fireproof warehouse at 27 Vulcan Street (listed Grade II in May 2008). Both warehouses had recessed loading bays, and unusual feature for pre-1850s warehouses, suggesting that they may date towards 1850. Number 177 Great Howard Street represents a considerable investment, as its size was considerable and it was built with cast-iron columns, brick arches, tile floors and cast- and wrought-iron roof trusses. It is likely that such financial investment was worthwhile as the warehouse was intended to store valuable bonded goods, even though the first recorded use was for grain (Giles 1999, 11). Mid to late-nineteenth century and early twentieth century examples are more common in this area to the east of the docks, with surviving examples opposite the north end of Bramley Moore Dock, between Regent Road and Fulton Street, and on Vulcan Street and Porter Street.

As well as the warehouses, there was a tobacco works at 2-4 Roberts Street from the middle of the nineteenth century, comprising a series of warehouses with an office block (NMR no SJ 39 SW574). This became an engineering works in the 1960s. The area developed for mixed commercial and residential use, and one of the earliest houses was nearby the tobacco works on Roberts Street. It was a brick-built house with stone dressings of around 1800, and which was later used as part of St Paul's Eye Hospital (NMR no SJ 39 SW453), although the site has now been redeveloped. The area continued to see some residential development throughout the nineteenth century, such as the three storey brick terrace on Regents Road (NMR no SJ 39 SW1037), built amongst warehouses on Regent Road and Fulton Street. In general, by the late nineteenth century it remains a very mixed area. The OS map of 1890 (*Section 4.3.5*) shows numerous small works relating to the docks, including cooperages, iron works, repair depots, etc, amongst warehouses, pubs, hotels and domestic houses. A few of these buildings, including some historic pubs survive and provide context to the dock boundary wall.

Railways

With dock development came the development of a railway system to transport goods to and from and between docks. In 1849, the Waterloo Dock Branch Railway opened, with a massive goods station to the east of Victoria and Waterloo Docks. Further north, Stanley Dock had links to the Lancashire and Yorkshire Railway, and in 1855 the Sandhill and North Docks Branch Railway goods line opened, with a goods station just to the north of Stanley Dock. The Waterloo Goods Station, in particular, increased in size, doubling in area by the end of the nineteenth century (OS 1894).

Within the docks, most goods were carried around by horse and cart, and it was not until the end of the nineteenth century that an internal railway system was built, the tracks for which can still be seen in many areas of the docks (Pollard 2004, 101). The railway lines and associated granite setts surrounding them survive remarkably well within the central dock complex and the complexity of the lines indicate the busy and substantial nature of this internal railway. At the north end of the docks, a high level railway line was constructed at Bramley Moore Dock to bring in coal for loading directly onto ships (LCC 2005, 133). This served the east and north quays of the dock, and linked to the Sandhills and North Docks Branch Line (OS 1890).

The most famous railway line associated with the docks was the Liverpool Overhead Railway, the first train ran in 1892, and it was officially opened in 1893. It was mainly a commuter line, and was affectionately known as the Dockers' Umbrella (Jarvis 1996). To reduce the risk of fire to the surrounding sheds, warehouses, goods yards and ships, it was run as an electric railway at the outset. It was the world's first elevated electric railway. The railway was incredibly popular, and became a tourist attraction and provided good views over the docks (LCC 2005, 142). The line ran along the inside of the dock walls, supported by cast iron stanchions which still survive, along with one of the signal posts at Princes Dock. Within the central docks area there were stations at Princes Dock, Clarence Dock and Nelson Dock. All the stations were reached by a stairway from street level with ticket facilities on the platforms (NMR nos SJ 39 SW702; SJ 39 SW703; SJ 39 SW742). The line was closed in 1956, because of severe corrosion, and it was demolished in 1957 (LCC 2005, 142). There are only a limited number of extant features which indicate the location of the Overhead Railway, most of which are evident along the top of the dock boundary wall. These include cast iron girders, vertical supports built into the wall and adjacent to the Wellington Dock, and a substantial stone buttress built in cyclopean granite style. The most substantial remains are associated with the bascule bridge at Stanley Dock complex.

Leeds and Liverpool Canal

The Leeds and Liverpool Canal, which opened from Liverpool to Wigan in 1774, provided Liverpool with access to manufacturing districts of Lancashire, Yorkshire and Staffordshire (LCC 2005, 131). The original terminus was at Old Hall Street, and by 1803, when Horwood's map (*Section 4.3.5*) was published, an additional linked basin had been installed running parallel to the western side of Ladies Walk. This basin provided access to the canal system in association with activity related to the adjacent coal yards. In 1846 Jesse Hartley created a branch with four locks down to the Stanley Dock and thence into the dock system and the River Mersey via the Salisbury Dock passage. This removed the need for transhipment of goods between the canal and the docks by horse drawn vehicles. The canal was used to transport a wide range of goods to and from the port, including coal cotton, wool, stone, grain, pottery and general goods. The fine set of locks is constructed in granite (*op cit*).

Recent construction work carried out under the auspices of British Waterways between 2007 - 2009 has provided a new final section of the Leeds and Liverpool Canal, ensuring that over 230 years since it was first constructed, it is now possible to bring a boat down the lock flight and through the central docks all the way to the Albert Dock. The work for the new canal required the re-opening of several previously closed dock passages including the passage between Princes Dock and Princes Dock Half Tide Basin. The culvert for the new section of canal lies within the modern infill of the Princes Half Tide Basin passage and so did not alter the original buried fabric of the dock entrance.

4.1.3 Previous Archaeological Work

Unpublished information relating to previous archaeological work within and adjacent to the study area was obtained from the Merseyside Archaeology Service. Eight reports related to work carried out within the study area:

- heritage impact assessment of the Liverpool canal link (Hodgkinson and Emmet 2003);
- evaluation of the canal link (OA North 2006);
- desk-based assessment for a proposed development at Princes Dock (Adams 2005);
- watching brief on land at Princes Half Tide Dock (Pevely and Adams 2007);
- Liverpool Pier Head Canal Link (OA North 2009);
- Mann Island Canal Link (OA North 2008b);
- Mann Island Excavation Report (OA North 2008c);
- Liverpool Central Docks (OA North 2008a).

The evaluation of the canal link did not include any trenches within the study area, although several trenches were located within the study area buffer zone. Further bulk excavation and trenching, in advance of the construction of the Liverpool Canal Link across the Central Docks area, identified a number of surviving buried archaeological features. Features identified during the course of these projects are recorded in the site gazetteer.

Several features of archaeological and cultural heritage interest were identified by the heritage impact assessment. The desk-based assessment covered only the Princes Dock area, and the watching brief found only made ground. Warehouses on and near Waterloo Road were recorded in an English Heritage assessment of Liverpool's historic warehouses (Giles 1999). The report remains in draft form, but is supplemented by documentary research undertaken by Liverpool Museums (1998). A summary of the results of the survey have been published in a popular book (Giles and Hawkins 2004). Additional inspections of the exterior of these warehouses were undertaken during the OA North walkover survey in 2010.

4.1.4 Walkover Survey

The walkover survey, undertaken during March 2010, observed the study area to be subject to significant variability, in terms of the condition of fabric related to the historic environment, the nature of current land uses, and the nature and extent of late-twentieth- and twenty first-century development. The southern part of the study area, including the Princes Docks (Site **83**) and East Waterloo Dock (Site **67**), have been subject to redevelopment and much of these areas are now occupied by business and residential premises and appear to be regularly maintained (Plates 1 and 2). Some of the structures in these areas are of modern design and construction and some of the modifications have impacted upon the appearance and fabric of the enclosed docks, as well as likely impacts upon remains associated with the quays. Some parts of this southern area have not been redeveloped and comprise derelict areas, such as the Princes Jetty (Site **90**; Plate 3). Other areas comprise open spaces featuring substantial remains of historic surfacing and railway lines, which are either utilised as *ad hoc* car parking areas (Plate 4), or cordoned-off and are not used (Plate 5). Dock walls, the boundary wall, sea walls, and associated gateways and furniture are also present within this area.

The central part of the study area comprises the dockland lying between Princes Half Tide Dock (Site **77**), to the south, and Trafalgar Dock (Site **49**) and Clarence Graving Docks (Site **43**), to the north. This area is largely derelict (Plate 6), with business usage occupying part of the land to the north of East Waterloo Dock (Site **67**). Large portions of Trafalgar Dock (Site **49**) have been infilled, as has part of West Waterloo Dock (Site **66**; Plate 7). There are numerous visible portions of surfacing fabric and dock walls, sea walls, and boundary walling, as well as dock furniture and machinery associated with the operation of dock and lock gates. Much of the historic fabric in this area has become concealed as a result of the accumulation of grass and scrub, as well as tarmac, concrete, and gravel associated with later uses of the site. This area is open and devoid of ruined or derelict buildings that survive above ground. The canal link runs from north to south through the western part of this area and, although this feature generally utilises the eastern side of the infilled docks, it is particularly incongruous where it transitions between West Waterloo Dock and Trafalgar Dock. In this area, the earlier passage joining the two docks has been bypassed by a sinuous route that does not respect the layout of any of the historic docks, and which has been constructed using conspicuous white concrete (Plate 8).

The northern part of the study area, from Clarence Graving Docks (Site **43**) to Bramley Moore Dock (Site **09**), contains the largest number of standing buildings of archaeological and cultural heritage significance within the red-line boundary of the proposed development. This is also the point at which the line of the red-brick boundary wall (Site **51**) continues in the cyclopean granite style of Jesse Hartley (Site **13**). In addition to listed buildings (Plate 9), such as the Victoria Tower (Site **36**) and the Dock Master's Office (Site **40**), there are numerous bridging points and dock water spaces in this area (Plate 10). In addition to numerous examples of surfacing and rail tracks in this area a set of obsolete timber lock gates was encountered on the quayside to the west of Salisbury Dock (Site **33**), which appeared to have become displaced when the gateway was bricked-up. Differential discolouration of the inner face of the boundary

wall to the east of Bramley Moor Dock (Site **07**), Nelson Dock (Site **09**), and Collingwood Dock (Site **29**) provided evidence of former structures built against the inner face of the wall (Site **13**). These areas consisted of conspicuously clean masonry, defined by straight vertical and horizontal lines where the blackened masonry characteristic of these walls was present (Plate 11). This suggests that these portions of the wall were protected from residues associated with the former railway and the occurrence of plaques on the inner face of the wall, within these clean areas, providing the names and dates of Bramley Moore Dock (Site **07**), Nelson Dock (Site **09**; Plate 12), and Collingwood Dock (Site **29**), suggests that the structures might have been associated with loading and unloading from the railway, and that the plaques had been incorporated into the structures in order to allow rail users to orientate themselves within the dock complex.

At the time of the walkover survey, the northern and eastern sides of Bramley Moore Dock (Site **07**) were being used for the storage of sand and grit (Plate 13) and the southern side was occupied by a long shed. Vessels were moored within Bramley Moore Dock (Site **07**). The eastern side of Nelson Dock (Site **09**) was being used for the storage of timber. With the exception of the storage of timber, most of the southern part of Nelson Dock (Site **09**), in addition to the entire western side of the docks in this northern area, was derelict, with some buildings being subject to neglect, decay, and superficial vandalism.

4.1.5 Map Regression

The development of the study area may be traced from the sequence of available historic mapping and illustrations.

Gregson (nd) reconstruction of Liverpool *c* 1565 (with chronologically later details): this map represents one of the earliest phases of the development of Liverpool to have been presented as a map-based reconstruction during the nineteenth century. This map suggested that the edge of the Mersey Foreshore only just fell within the site footprint at this time. A small undeveloped area of the shore falls within the 250m buffer zone and includes the Stanley Tower, a small fortified tower house on the shore and the site of the Chapel of St Mary Del Key. Agricultural land plots along the River's edge were clearly demarcated and named according to held the lease on the land or a prominent feature on the land. Plots within the study area include Launclots Hey, Walnut Croft, Barn Hey, and Dogs Fields. The majority of the land was owned by the Moore Family. The streets named on this map include Chappell Street which was part of the original medieval H-shaped street layout.

Anon (nd) reconstruction of Liverpool *c* 1572: this also showed the edge of the Mersey Foreshore falling just within the site footprint. The study area was still largely undeveloped and only contained three streets; Chappell Street, Barricke Street, and Mulne Lane, of which only Chapel Street still exists under the present name. The tithe plots been clearly marked with the names of leasees including Robert More, William More, and A More. The prominent addition of the Custom House on the shore adjacent to The Tower suggests increased shipping at this time. The Chapel of St Mary del Key was clearly marked.

Okill's map of 1650 (Fig 4.4): this map represented a reconstruction of Liverpool in *c* 1650, which was derived from historical records of land ownership. This map suggests that none of the original foreshore extended into the proposed footprint of the development. Within the study area the tithe plots are clearly marked, although they are now mostly under new ownership. Chapel Street is now framed on the north and south side by a series of small buildings. Chapel Street now forms part of the H-shaped street plan along with Old Hall Street (previously Mulne Lane) and Water Street, all of which still exist within the city today. Old Hall is constructed on Old Hall Street.

Eye's map of 1765 (Fig 4.5): this map indicates that at this time much of the proposed development footprint lay to the west of the shoreline, however Eye's map features the conjectured sea wall and edge of the as yet unconstructed dock basin that would accompany Georges Dock (Site **94**). The study area shows that the town had developed considerably following the construction of the Old Dock in 1715 by Thomas Steers. Chapel Street, Old Hall Street and Water Street were flanked by a grid of new streets including James Street, Moor Street and Redcross Street, all of which are extant. Goree Causeway flanks the west side of the Strand. A substantial inroads had been made into the initial land reclamation process by this time. A battery was depicted to the south-east of Princes Dock (Site **83**).

Eye's map of 1785: this updated map included a substantial series of newly constructed sea walls and reclaimed land within the development footprint as well as the completed Georges Dock Dry Basin (Site **105**). This is the first map that outlined the formative development of the now significant Pier Head. The 250m buffer zone shows substantial construction work on all the streets which originally comprised the H shaped street plan, as well as new surrounding streets including the land around St Paul's Square. The newly reclaimed land to the north had enabled the construction of a substantial fort. The north-eastern side of the town was occupied by the newly constructed Leeds and Liverpool Canal which terminated in a small basin.

Anonymous map of 1795 (Fig 4.6): indicated increased land reclamation as well to the north as the land included within the development footprint was gradually reclaimed from the River Mersey. The area is defined by an increasingly lengthy section of sea wall (Site **87**) as well as the area of a proposed dock which later became the Princes Dock (Site **83**), marking the appearance of the southernmost dock within the proposed development footprint. The outlines of the streets on this map are much less detailed however they indicate small built structures appearing along the edge of the newly reclaimed water front. The northern extent of the map shows the newly constructed gaol and also a series of as yet unadopted streets.

Horwood's map of 1803: this map showed little change from the 1795 map within the study area, aside from a small cluster of structures built against the newly constructed sea wall in the area now occupied by the Princes Dock (Site **83**). Even at this stage there were still a limited number of structures within the development footprint. The 250m buffer zone was depicted as being completely filled by additional structures and streets, principally warehouses, and small businesses which developed in tandem with the growth of the docks. This map was the first to depict the addition of a canal basin (Site **108**) and, an associated coal yard, to the southern end of the Leeds and Liverpool Canal. This basin was positioned at the western side of Ladies Walk.

Gage's map of 1807: this map showed the fort and barrack as four distinct buildings located on a promontory that was later developed as part of the Princes Dock complex. Bath Street exists just outside the development footprint and is flanked on both sides by small buildings including a public bath house. Further unadopted streets (probably planned but not yet constructed at the time of this map) are shown to the north along the foreshore near the New Gaol. Within the 250m buffer zone, all plots of land are now dominated by dense groups of buildings, although these are only identified as city blocks and not outlined as individual buildings.

Kaye's map of 1816: this accompanied the publication of The Strangers Guide to Liverpool and included the outline of the Princes Dock (Site **83**) and illustrated the reduction in size of the fort to one linear structure as the rest of the area was absorbed into the new development. Another notable addition at this time is the Georges Ferry Basin (Site **95**), which was constructed to provide a sheltered port for local ferry traffic and a proposed basin south of Princes Dock. The map also shows that westward phase of land

reclamation is now complete and at this point, the shoreline has developed and will remain in the same formation until the present day. The proposed basin which will accompany the Princes Dock is marked on the map but has not yet been constructed. By 1816 the Princes Dock and the Gaol still mark the northern boundary of the city.

Swire's map of 1823 (Fig 4.7): this was the first map that extended to the limit of the study area, including both the footprint of the development and the 250m buffer zone. The land reclamation continues to the north with the addition of a tidal basin to the north end of the dock complex. Land parcels have been divided up directly to the east of the basin (west of Bath Street), however at this stage only one plot is shown as being occupied. An additional basin is shown at the northern extent of the reclaimed land. Three small buildings are shown around the perimeter of the Princes Dock Boundary wall. These are probably gatehouses and an early tidewaters office within the walled complex. Waterloo Road and Regent Road appear on this map in their formative stages, although at this stage Regent Road leads out into the countryside and is flanked by approximately six small buildings. Within the 250m study area, the streets flanking Waterloo Road have been named and include Neptune Street and Hill Street and new streets are indicated around Great Howard Street, around the Gaol.

Walker and Walker's map of 1823 (Fig 4.8): this map showed the planned North Dock and associated basin within the development footprint, however the plan was a simplified version of the dock that was eventually constructed in this area. At this point Marine Parade is now established on the west side of Princes Dock and New Quay, Bath Street, Waterloo Road and Regent Road now form one continuous route along the east side of the developing North Docks. The linear street plans appear to be set out along the old land boundaries. A fish market was depicted on the east side of the proposed North Docks complex**.**

Anonymous map of 1829 taken from A Strangers Guide to Liverpool (Fig 4.9): this showed the development of several new linear transit sheds (Site **92**) constructed parallel to Princes Dock within the walled complex. The proposed Trafalgar (Site **50**), Victoria (Site **61**) and Waterloo Docks (Site **65**) are outlined on the map, but are not yet constructed. The dock boundary wall (Site **71**) still only encircles the Princes Dock at this stage. The northern terminus of the docks at this point is formed by Clarence Dock (Site **46**) and Basin. Within the 250m buffer zone, the streets along east side of Waterloo and Regent Road are gradually developing and becoming occupied by warehouses and small units associated with the docks. At this point Oil Street, Porter Street, Regent Street and Carlton Street are defined in their modern form. These streets still exist today.

Henry Austin's map of 1836 (Fig 4.10): this map showed the presence of the Trafalgar, Victoria and Waterloo Docks, which connected to the Princes Dock to the south and the Clarence Dock Basin to the north forming one of the first examples of a branch dock network. A circular feature is marked at the north side of the Waterloo Dock. This represents the Liverpool Observatory which was constructed in order to measure the tides and help establish longitude at Liverpool. A series of transit sheds appear around the grid iron shaped Clarence Dock at this time and Clarence Dock can now be accessed from Barrack Street which separates the Clarence Graving Dock complex from the newly constructed North Battery (Site **114**). The North Battery marks the limit of the developing city on the waterfront.

Gage's map of 1836: this map depicted the irregular nature of the reclaimed land north of the North Battery (Site **114**) but also showed this structure in greater detail. This map also shows in greater detail the boundary walls which encompassed the evolving dock complex, now including the Trafalgar, Victoria and Waterloo Docks with the North Battery having its own boundary wall, presumably because it was not owned by the Docks and Harbour Board. Within the 250m buffer zone, the expansion of warehouses and small business premises along Regent Road to the edge of Clarence Dock provides evidence of how the

expansion of warehousing was keeping pace with the developing docks. At the southern end of the development footprint, the original single transit shed on the west side of the Princes Dock has been split into three separate sheds.

Bennison's map of 1841: this map provided little evidence for change in the dock network within the development footprint, with the exception of the presence of long, linear transit sheds on the south sides of the Trafalgar, Victoria and Waterloo Docks.

Bennison's map of 1848: similarly to the map of 1841, this mainly showed the addition of further transit sheds around the north sides of the Trafalgar, Victoria, and Waterloo Docks, which probably indicated increased traffic through these docks. At the southern end of the 250m buffer zone, the footprint of Georges Baths is clearly visible.

Ordnance Survey map of 1851 (Fig 4.11): this showed the expansion of Clarence Graving Dock and the addition of Salisbury Dock (Site **33**), Collingwood Dock (Site **29**), Stanley Dock (Site **18**) Complex and Lock Flight, Nelson Dock (Site **9**), and Bramley Moore Dock (Site **7**), all of which were completed and opened in August in 1848 by Jesse Hartley. This included the first cartographic depiction of the Victoria Tower (Site **36**). Just outside the development footprint is Wellington Dock to the North and to the east is the Stanley Dock Lock Flight known as the New Cut which linked the Leeds and Liverpool Canal to the newly constructed Stanley Dock Complex which included two large warehouses. Transit sheds and ancillary structures around these new docks are sparse with the exception of Collingwood and Salisbury Dock which are constructed with purpose built transit sheds. The basin (**59**) at the southern end of the Leeds and Liverpool Canal (**15**) was first labelled as 'Clarke's Basin' on this map.

Dower's map of 1863 (Fig 4.12): this included the addition of the Wellington Dock Half Tide Basin and the Sandon Basin and Sandon Dock. Within the development footprint, large new transit sheds are constructed on the north and south side of the Wellington Dock and all sides of the Bramley Moore and Nelson Dock. The increased capacity of the docks and their associated structures is demonstrated by one huge linear transit shed which extends from the north side of Wellington Dock to the south side of Bramley Moore Dock. Within the 250m buffer zone, the newest and most significant features are the addition of the railway which links the transit sheds at Wellington Dock with the main line at Sandhills Station and the construction of the Liverpool Landing Stage out into the Mersey adjacent to Princes Dock. This was the first map to depict the North Docks, Waterloo, and Howard Street goods rail stations.

Philip's map of 1881 (Fig 4.13): this map depicted the addition of the high level coal railway and a key alteration to the dock complex is the revision undertaken to Waterloo Dock (Site **65**), which was shown to have developed from a single east/west-aligned dock to two north/south orientated docks (Sites **65** and **67**), both of which were connected to Princes Half Tide Dock. The eastern side of Waterloo Dock was now shown to be surrounded by a complex of purpose built grain warehouses. At the southern end of the development footprint, the Liverpool Landing stage appeared to have undergone some structural revisions and was considerably longer than the earlier structure shown in 1863.

Anonymous map of 1885: this map showed that the pace of dock development had slowed considerably and there were few changes to the area, aside from the quaysides becoming increasingly covered over with transit sheds. A density in the built environment on the east side of Regent Road and Waterloo Road is increasingly apparent.

Ordnance Survey map of 1890 (Fig 4.14): this map further demonstrated a lack of changes around the established dock complexes. A key addition was the expansion of the dockside railway, which was vital in removing goods from the quayside in order to facilitate the flow of trade. New lines had been added along

the eastern side of Nelson, Collingwood, and Clarence Dock. Within the 250m buffer zone on the east side of Regent and Waterloo Road there was a conspicuous increase in the density of ancillary buildings and warehouses, and the land was divided into increasingly small plots.

Bartholomew's map of 1891: this map was very similar to the OS map of 1890. The main difference between the maps is that that produced by Bartholomew is not as detailed as the OS map. Therefore, the very slight differences in the size and shape of some of the buildings, which are evident between the two maps, might be a result of differences in survey and illustration accuracy, rather than representing genuine changes in the landscape.

Bacon's map of 1901: Bacon's map very was similar in depiction and level of detail to that produced by Bartholomew in 1891. One major difference was that Stanley Dock was shown as being narrower than in the former depictions, with the Tobacco Warehouse (Site **23**) having been built within the southern part of the dock. This was the first of the available maps to show the merging of the former Sandon Basin and Wellington Half Tide Dock, to form a the new sub-rectangular Half Tide Dock. Although the overhead railway had been established by this time, the level of detail, and lack of relevant annotation, does not allow this addition to be observed on the map.

Ward *et al*'s map of 1904: this map was very similar to that produced by Bacon, but featured a lesser degree of detail. The installation of the Riverside Railway, across the northern and western sides of Princes dock, and the associated Riverside Station at the south-western side of the dock were depicted on this map. A major change to the dockside landscape was represented by modifications to the Pier Head, where the area previously occupied by Georges Dock had been infilled and laid out as three vacant plots.

Ordnance Survey map of 1908 (Fig 4.15): there were several noticeable changes between this very detailed map and those produced between 1890 and 1904, one of the most conspicuous of which is the addition of the Overhead Railway, which had opened in 1893 and ran along the western side of the dock boundary wall. The gates between Trafalgar and Victoria Docks were not shown on this map and the entrance between these two docks appeared wider than previously shown. The re-modelled south-western side of Princes Dock was depicted on this map, showing the narrowing of the southern end of the dock. The tramway in the vicinity of the Pier Head was shown as an extended complex, and the Dock Office (Port of Liverpool Building, Site **95**) was depicted. Slight changes had occurred across the extent of the study area, with the removal and addition of dock sheds and buildings.

Haywood's map of 1924: this map presented a similar landscape to that depicted on the OS map of 1908, but with considerably less detail.

Ordnance Survey map of 1927 (Fig 4.16): few major changes were visible between the OS map of 1927 and that produced in 1908, across the majority of the study area, with the exception of additional railway lines at the eastern side of the docks. The most conspicuous change evident on this map was the addition of the Liver Building (Site **98**) and Cunard Building (Site **94**) at the Pier Head.

Appendix 4.2: Gazetteer of Sites: (1) Heritage Assets & (2) Potential Sites/Features

Liverpool Waters

Environmental Statement – Volume 2: Appendices – November 2011

4.2 Gazetteer of Sites: (1) Heritage Assets & (2) Potential Sites/Features

Note: (i) "Off-Site" = Non-Liverpool Waters Site
(ii) "Potential Site/Feature" = Site Not Defined as a Heritage Asset

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Table 4.6: Summary of British archaeological periods and date ranges

Period	Date Range
Palaeolithic	30,000 – 10,000 BC
Mesolithic	10,000 – 4000 BC
Neolithic	4000 – 2200 BC
Bronze Age	2,200 – 700 BC
Iron Age	700 BC – AD 43
Romano-British	AD 43 – AD 410
Early Medieval	AD 410 – AD 1066
Late Medieval	AD 1066 – AD 1540
Post-medieval	AD 1540 – c1750
Industrial Period	cAD1750 – 1914
Modern	Post-1914

(1) Heritage Asset Sites: Liverpool Waters plus Wider Study Area

Site Number **1**
Site Name Hydraulic Engine House, Bramley Moore Dock
NGR SJ 33615 92567
Site Type Hydraulic Engine House
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 3593-05. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Hydraulic engine house, designed Bramley Moore Dock. Engine house, accumulator tower and truncated octagonal chimney 1884. Brick with slate roof. Round-headed windows and entrances; pyramidal roof to accumulator tower; chimney cap missing. Attached transit shed demolished with two gable ends surviving showing 22 iron I shaped roof girders.

Site Number **2 (Off-Site)**
Site Name Warehouse, 57-66 Regent Road
NGR SJ 33710 92528
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey
Description
Three storey brick terrace with twentieth century commercial or shop fronts.

Site Number **3 (Off-Site)**
Site Name Warehouse, 15-17 Fulton Street
NGR SJ 33720 92530
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey
Description
Four storey warehouse, brick with a slate roof. The warehouse was built in the third quarter of the nineteenth century.

Site Number **4 (Off-Site)**
Site Name Warehouse, 19 Fulton Street
NGR SJ 33724 92574
Site Type Warehousing

Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey
Description
Brick warehouse, built in the late nineteenth century.

Site Number 5 (Off-Site)
Site Name Warehouse, 68 Regent Road
NGR SJ 33715 92579
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey
Description
Late nineteenth century brick-built warehouse in Regent Road. Derelict in 2002.

Site Number 6 (Off-Site)
Site Name Warehouse, 9 Blackstone Street
NGR SJ 33745 92539
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey
Description
Mid-late nineteenth century brick warehouse with later additions.

Site Number 7
Site Name Bramley Moore Dock
NGR SJ 33460 92490
Site Type Wet dock; characterised by granite rubble cyclopean architecture
Period Industrial
SMR No 3392-003
Statutory Designation Grade II listed, LB no 359303. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; Baines 1852; OS 1851; Dower 1863
Description
Bramley Moore Dock and retaining dock walls built by J Hartley. Listed retaining walls of granite rubble brought to a fair face, of large and small blocks, and includes entrances to Sandon Half Tide and Nelson Docks. At around 10 acres it is the largest of the five northern docks built by Hartley in 1848. The gated entrance measures 60 feet in width with a quay frontage of 935 yards (Baines 1852, 832) The dock originally handled the larger steamers but these moved to Sandon and Huskisson Docks. Instead it became the centre of Liverpool docks' coal export. The arches beneath the coal railway housed an early refrigerated store of 1884 and a power station for the overhead railway by 1893. It was named after and opened by

John Bramley Moore, Chairman of the dock committee, on 4th August 1848. The most southerly of the docks still in used this dock currently contains and dredging boat used to move sand and also a floating caisson barge.

Site Number **8**
Site Name Site of Swing Bridge, Bramley Moore and Nelson Dock
NGR SJ 33323 92386
Site Type Swing Bridge
Period Industrial
SMR No 3392-003
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OS 1851; OS 1st edition 1851
Description
Site of swing bridge between Bramley Moore and Nelson Docks. Only the recesses and remnants of the mechanism survive.

Site Number **9**
Site Name Nelson Dock
NGR SJ 33303 92319
Site Type Wet dock
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359304. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; Baines 1852; OS 1851
Description
Nelson Dock and retaining dock walls built by J Hartley and characterised by cyclopean granite architecture. Listed retaining walls of granite rubble brought to a fair face, of large and small blocks, and includes entrances to Bramley Moore and Salisbury Dock. The dock represents 7 acres of enclose water with 60 foot wide gates and a quay frontage of 803 feet (Baines 1852, 832) It is connected to the south to Salisbury Dock by a 9m passage. Originally used by screw steamers, in the 1900s the dock was mainly being used by the coastal trade and was later used by the City of Dublin Steam Packet and Coastal Liners' container services. The dock was named after Admiral Horatio Nelson.

Site Number **10**
Site Name Series of drinking fountains
NGR SJ 33630 92305
Site Type Boundary wall furniture
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; Melly 1858
Description
Cast-iron drinking fountain set into the dock perimeter wall at Nelson Dock. A series of 33 fountains were installed in 1859 in an attempt to keep the dock workers out of the pubs, where they were forced to go to find refreshment. Prior to the construction of the drinking fountains the only source of water was two horse troughs. The cast-iron fountain is still intact, although the pipework behind and the adjacent tap have been

removed. The driving force behind the provision of drinking fountains for the dock workers was Charles Pierre Melly who produced a treatise on the requirement for amenities such as drinking fountains in 1858.

Site Number **11**
Site Name Site of Nelson Dock Station, Waterloo Road
NGR SJ 33614 92364
Site Type Railway
Period Industrial
SMR No -
Statutory Designation N/A
Source Egerton Lea Consultancy 2008; walkover survey
Description
Passenger railway station on the Liverpool Overhead Railway. Opened by May 1896, as a replacement for Sandon Dock station. It was on the elevated line 16 feet above street level on the iron structure which supported the line. Originally served by trains between Dingle and Seaforth Sands stations. Each platform had its own stairway leading to street level, ticket facilities were provided on the platforms. The station was closed on the 30th December 1956 and demolished in late 1957.

Site Number **12 (Off-Site)**
Site Name Site of Sandhills and North Docks Branch Railway
NGR SJ 33758 92241
Site Type Railway
Period Industrial Revolution II
SMR No -
Statutory Designation LINEAR 1246
Source Egerton Lea Consultancy 2008; walkover survey
Description
An important goods station and branch railway, that opened in 1855 and closed in 1966. The railway has been removed, and a site walkover within the area noted no physical evidence of this site remaining.

Site Number **13**
Site Name Dock Boundary Wall and entrances from opposite Sandhills Lane to Collingwood Dock
NGR SJ 33691 92588
Site Type Boundary wall and gates
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359301. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OS 1851
Description
Dock wall and four entrances between Sandhills Lane and Collingwood Dock. Stone wall about 18 ft high, built by Jesse Hartley of large irregular shaped blocks of granite, and with large carved plaques eg "Collingwood Dock". Entrance at northern end of Bramley Moore Dock (near Regent Road) has two round tapering turrets with centre turret oval in plan, with large base and heavy abacus tops, and deep slits at sides for gates. Entrance to North Collingwood, North Salisbury and Nelson Docks (near Walter Street) has 3 round towers, the centre one taller and larger. Entrance to Nelson, South Wellington and Bramley Moore Docks (opposite Fulton Street) also has three round towers, the centre one taller and larger. A similar

former entrance (now blocked) (F) lies near Bramley Moore pumping station. The wooden gates survive, although they are now out of use. The wall also contained cast iron ornate drinking fountains, which were placed in 1859 to try to keep dock workers out of the pubs. This site also includes features immediately adjacent to the wall, such as four former structures that lay to the east of Bramley Moore Dock and Nelson Dock. The former presence of these structures was identified as a result of sharply defined clean areas on the inside of the wall, where the blackening that typifies the appearance of the wall had been prevented from occurring.

Site Number **14**
Site Name Liverpool Overhead Railway
NGR SJ 33876 90514
Site Type Railway
Period Industrial
SMR No 33689 92588
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Liverpool overhead railway, locally known as the Dockers' Umbrella, designed by James Greathead and Sir Douglas Fox for the Mersey Docks and Harbour Board in 1888. Work started in October 1889 and completed in January 1893 by resident engineers Francis Fox and S.B Cottrell. It was officially opened by the Marquis of Salisbury on the 4th February 1893. The line extended along the Dock Road and originally comprised 13 stations. Sandon Station was the first station to be closed, but this was replaced by the opening of Nelson and Huskisson Stations. Now only a few remnants left *in situ*, notably the stanchions built into various parts of the Dock wall.

Site Number **15 (Off-Site)**
Site Name Leeds and Liverpool Canal
NGR SJ 33902 92124
Site Type Canal waterway
Period Post-Medieval
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Leeds and Liverpool Canal, the longest single canal in Britain built by a single company. Work began in 1770, and by 1777 the section Wigan to Liverpool was opened. The whole of the main line from Leeds to Liverpool was completed by 1816.

Site Number **16 (Off-Site)**
Site Name Bridge on the Leeds and Liverpool Canal at head of Stanley Dock
NGR SJ 33869 92122
Site Type Bridge
Period Post Medieval
SMR No -
Statutory Designation Grade II listed, LB no 3595-69. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey

Description
Bridge on the Leeds and Liverpool Canal at head of Stanley Dock. Built by J Hartley of granite rubble with curved abutments, and segmental arch with bullnosed voussoirs and parapet.

Site Number **17 (Off-Site)**
Site Name Entrance to Leeds and Liverpool Canal at head of Stanley Dock
NGR SJ 34953 91119
Site Type Lock gate and passage
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359567. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Entrance to Leeds and Liverpool Canal at head of Stanley Dock. Retaining walls to canal entrance and bridge by J Hartley. Built of granite rubble brought to a fair face and laid in large and small blocks. The bridge has similar concave-sided parapets. This item connects the dock with the lock on the Leeds and Liverpool Canal.

Site Number **18 (Off-Site)**
Site Name Stanley Dock
NGR SJ 33730 92110
Site Type Wet Dock
Period Industrial
SMR No 3392 07
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; Baines 1859; LCC 2005, Liverpool
Description
Stanley Dock built by J Hartley, and the only dock east of Regent Road, providing a link between the dock system and the Leeds and Liverpool Canal. It was the only dock constructed by being excavated into dry land rather than built out into the river by means of land reclamation. In it's original formation it encompassed just over 7 acres of enclosed water with a quay frontage of 753 yards (Baines, 1859 89). It had been envisaged from the outset as another fully enclosed dock like Albert, with warehouses within a boundary wall, to provide secure storage for high value, or more particularly for bonded, goods. More important than the link to the Leeds and Liverpool Canal which mainly carried heavy low-value goods such as coal, flagstones, slates and pig-iron, was the connection with the Lancashire and Yorkshire Railway. This enabled direct dispatch of bonded or high-value goods from the warehouses to most of the key towns of the Lancashire hinterland and beyond. There was also connection to the Dock Railway connecting Stanley to other docks, and the lines of the London and North Western Railway. Stanley was partially filled in 1900, when Tobacco Warehouses were erected between Hartley's warehouses. The dock was closed in 1988. It was named after the Stanley Family who were the Lords of the Isle of Man and Earls of Derby.

Site Number **19 (Off-Site)**
Site Name North-east entrance to Stanley Dock
NGR SJ 33857 92174
Site Type Boundary wall and gates
Period Industrial
SMR No 3392 07

Statutory Designation Grade II listed, LB no 214200. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
North-east entrance to Stanley Dock. Gate piers and gate watchman's hut by. J Hartley. Built of granite rubble, the central watchman's hut is oval, with chamfered base, battered sides and Doric capital. Side gate piers are similar, but smaller, with gate slots. Both gateways are blocked.

Site Number 20 (Off-Site)
Site Name North-west entrance to Stanley Dock
NGR SJ 33633 92174
Site Type Boundary wall and gates
Period Post-Medieval (c.1848)
SMR No -
Statutory Designation Grade II listed, LB no 359306, located within WHS and Conservation Area
Source Egerton Lea Consultancy 2008; walkover survey
Description
North-west entrance to Stanley Dock. Gate piers and gate watchman's hut by J Hartley. Built of granite rubble, the central watchman's hut is oval, with chamfered base, battered sides and Doric capital. Side gate piers are similar, but smaller, with gate slots. One gateway is bricked up, that to right is open, with remaining gate.

Site Number 21 (Off-Site)
Site Name Hydraulic Tower, Stanley Dock
NGR SJ 33636 92144
Site Type Hydraulic Tower
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359566 , located within WHS and Conservation Area
Source Egerton Lea Consultancy 2008; walkover survey; LHER
Description
Hydraulic tower to west of north warehouse, Stanley Dock. Built of rubble granite, it is a tall octagonal tower with castellated top and a round chimney; with arrow slit openings. Attached 5-bay block has Tudor-arched entrance and windows; parapet altered.

Site Number 22 (Off-Site)
Site Name Warehouse on north side of Stanley Dock
NGR SJ 33740 92150
Site Type Warehousing
Period Industrial
SMR No 3392 08
Statutory Designation Grade II listed, LB no 359565. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Warehouse on north side of Stanley Dock, part of Jesse Hartley construction. Eastern half is now demolished. Built of brick on a cast iron frame, it has 5 storeys, 20 x 6 bays. Ground floor on south side

recessed behind colonnade of cast iron Doric columns with concave sides interrupted by 3 elliptical arches. Windows have segmental heads and small-paned iron casements. Top parapet with dentils. North side has 6 loading bays. On a par with the warehouses of Albert Dock.

Site Number **23 (Off-Site)**
Site Name Stanley Dock Tobacco Warehouse
NGR SJ 37970 92038
Site Type Warehousing
Period Empire
SMR No 3392-09
Statutory Designation Grade II listed, LB no 359563. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Tobacco warehouse on south side of Stanley Dock, built of red and blue brick on a high, rusticated stone base, with 12 storeys, 42 x 7 bays. Panelled with pilasters, and crowned by small pediments and parapets. Extends whole length of dock on south side, in front of the earlier Stanley Warehouse. Built on part of infilled Stanley Dock

Site Number **24 (Off-Site)**
Site Name Stanley Warehouse
NGR SJ 33750 91980
Site Type Warehousing
Period Industrial
SMR No 3391 10
Statutory Designation Grade II listed, LB no 359564. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; LHER
Description
Stanley warehouse to south of tobacco warehouse by J.Hartley. Built together with the warehouse on the north side of the dock, but now cut off from the dock by the later Tobacco Warehouse. Built of brick with rubble granite base, rock-faced stone ground floor, it has 5 storeys, 31 bays. Segmental headed windows with small paned iron casements, cast iron Doric columns to ground floor of north side, but arches now blocked by brick infilling. Parapet altered.

Site Number **25 (Off-Site)**
Site Name South-east entrance to Stanley Dock complex
NGR SJ 33851 91972
Site Type Boundary wall and gates
Period Post-Medieval (c.1848)
SMR No -
Statutory Designation Grade II listed, LB no 214201. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
South-east entrance to Stanley Dock at Stanley Street corner. Gate piers and gate watchman's hut by. J Hartley. Built of granite rubble, the central watchman's hut is oval, with chamfered plinth, battered sides and Doric capital. Blocked window and entrance, gate slots. Smaller gate piers to sides are similar, with gate slots. Gateway to left is blocked, remaining gate to right.

Site Number **26 (Off-Site)**
Site Name South-west entrance to Stanley Dock complex
NGR SJ 33639 91967
Site Type Boundary wall and gates
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359307. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
South-west entrance to Stanley Dock at Stanley Street corner. Gate piers and gate watchman's hut by. J Hartley. Built of granite rubble, the central watchman's hut is oval, with chamfered plinth and Doric capital. Blocked window and entrance, gate slots. Smaller gate piers to sides are similar, with gate slots. Gateway to left is bricked up.

Site Number **27**
Site Name Stanley Dock Bascule Bridge
NGR SJ 33627 92109
Site Type Bascule Bridge
Period Post-Medieval
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; Cunningham 1910; LCC 2005
Description
Stanley Dock bascule bridge, an hydraulically-operated rolling bascule bridge at Stanley Dock installed in the 1930s as part of a large bridge modernisation programme which had begun in 1928. Originally a combination of swing bridge and draw bridge which carried the electrified overhead railway the 50 foot distance over the entrance to the Stanley Dock. The lower level was arranged with bascule leaves so that barges and small craft could pass beneath it without the necessity of swinging the whole structure and interrupting the frequent railway service (Cunningham 1910, 456). Following the modernisation process of 1928 this part of the bridge survives only as foundations.

Site Number **28**
Site Name Police Hut between Collingwood and Stanley Docks
NGR SJ 33612 92136
Site Type Ancillary buildings
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OS 1890; OS 1908
Description
Small, red-brick buildings built against the west face of the dock wall next to the passage between Collingwood and Stanley Docks. Built between 1890 and 1908.

Site Number **29**
Site Name Collingwood Dock

NGR SJ 33530 92100
Site Type Wet Dock;
Period Industrial
SMR No 3392 06
Statutory Designation Grade II listed, LB no 359302. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; LCC 2005; Baines 1859
Description
Collingwood Dock and retaining dock walls built by J Hartley and characterised by cyclopean granite architecture with extant dock furniture including moor bollards, mooring rings etc. Listed retaining walls of granite rubble brought to a fair face, of large and small blocks, and includes entrances to Stanley to the east and Salisbury Docks and subsequently the Mersey to the west. The dock encompasses over 5 acres of enclosed water with 553 yards of quayside (Baines 1859,88). The gates and barge locks are now derelict. The dock was used by coasters and was the home of the Liverpool Corporation refuse boats. It also derived a small part of its trade from the west coast of South America (Baines 1859, 89). It is named after Admiral Cuthbert Collingwood, Nelson's right hand man.

Site Number **30**
Site Name Collingwood Dock Office Building
NGR SJ 33602 92028
Site Type Building
Period Industrial (pre 1927)
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OS 1927
Description
Early twentieth century brick building on the south-east corner of Collingwood Dock. It was probably built as an extension to the south shed of Collingwood Dock.

Site Number **31**
Site Name Collingwood Dock passage
NGR SJ 33609 92112
Site Type Dock passage; characterised by
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; Cunningham 1910
Description
At the passage from Collingwood Dock to Stanley Dock are the foundations of former movable bridges, including a double-deck swing bridge which carried the Overhead Railway. Originally a combination of swing bridge and draw bridge which carried the electrified overhead railway the 50 foot distance over the entrance to the Stanley Dock. The lower level was arranged with bascule leaves so that barges and small craft could pass beneath it without the necessity of swinging the whole structure and interrupting the frequent railway service (Cunningham 1910, 456). Following the modernisation process of 1928 this part of the bridge survives only as foundations

Site Number **32**
Site Name Site of Nelson Dock Swing Bridge
NGR SJ 33412 92209
Site Type Swing Bridge
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OS 1851
Description
Swing bridge over passage between Nelson Dock and Salisbury Dock. Probably built at the same time as the docks, which were constructed by J Hartley in 1848.

Site Number **33**
Site Name Salisbury Dock
NGR SJ 33390 92090
Site Type Wet Dock
Period Industrial
SMR No 3392-04
Statutory Designation Grade II listed, LB no 359438. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; LHER
Description
Salisbury Dock and retaining dock walls built by J Hartley that is characterised by Cyclopean granite architecture and was opened as part of a series of 5 docks (Collingwood, Nelson, Bramley Moore and Stanley Dock in 1848). Listed retaining walls of granite rubble brought to a fair face, of large and small blocks, and includes entrances to Trafalgar, Collingwood and Nelson Docks. It was built essentially as an entrance dock to the other docks. The entrance to the Mersey this has now been blocked. By the 1950s the dock was the centre for coastal and barge traffic. It was named after James Brownlow William Gascoyne Cecil who became the second Marquis of Salisbury in 1823.

Site Number **34**
Site Name Site of Dock Master's House, Salisbury Dock
NGR SJ 33288 92186
Site Type Dock Master's House
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359435 Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Dock Master's house, Salisbury Docks by J Hartley. Brick with stone dressings, hipped slate roof; west facade is rendered. 3 storeys, 2 bays to west with canted corner bays, 2-bay returns. Windows have gauged brick flat arches and some remaining sashes. South side has small square brick porch with stone cornice and a round-arched window. Wooden cornice on stone corbels. Iron area railings of square section, battered and fluted. Now demolished.

Site Number **35**
Site Name Sea Wall to North of Salisbury Dock entrance
NGR SJ 33282 92166
Site Type Sea Wall
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359439. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Sea wall to north island at entrance of Salisbury Dock by J Hartley. Length approximately 244. 5m, of granite rubble brought to a fair face, of large and small blocks, with raised lip to coping.

Site Number **36**
Site Name Victoria Clock Tower
NGR SJ 33390 92100
Site Type Clock and bell tower
Period Industrial
SMR No 3392 05
Statutory Designation Grade II listed, LB no 359436. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; LCC 2005
Description
Tower built of granite rubble by Jesse Hartley and characterised by an octagonal tower with an eight-faced clock in Gothic style. It was designed as a clock and bell tower to give time to neighbouring docks and arriving and departing ships in addition to ringing out high tide and warning notes; there was also a Pier Master's flat within the building. The tower is of granite rubble with a battered round base with round-arched window and entrances and roll moulding. The upper part is octagonal, with a bracketed balcony, 8-faced clock and paired slits with transoms above. Above these, blind roundels and date on south side. A projecting castellated parapet surrounds the top.

Site Number **37**
Site Name Sea Wall at Salisbury Dock
NGR SJ 33300 92095
Site Type Sea Wall
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359440. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Sea wall to island at Salisbury Dock entrance, by J Hartley of granite rubble brought to a fair face, of large and small blocks, with raised lip to coping.

Site Number **38**
Site Name Building foundations
NGR SJ 33342 92061
Site Type Foundations of small structure
Period Industrial (pre-1890)

SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OS 1890
Description
Small building shown on late nineteenth-century OS map. Survives as foundations.

Site Number **39**
Site Name Sea Wall south of Salisbury Dock
NGR SJ 33282 92000
Site Type Sea Wall
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359441. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Sea wall to south of Salisbury Dock entrance by J Hartley. Length approximately 117m, of granite rubble brought to a fair face, of large and small blocks, with raised lip to coping.

Site Number **40**
Site Name Dock Master's Office, Salisbury Dock
NGR SJ 33292 92020
Site Type Dock Master's Office
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359437. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; LCC 2005; Gage 1836; OS 1851
Description
Dock Master's Office, Salisbury Dock, on sea wall south of Victoria Tower by Jesse Hartley. Granite rubble cyclopean architecture in a medieval style, 2 storeys and 3 x 1 bays. Battered walls and bracketed parapet with battlements. Windows have 4-centred arched heads, those to end bays on west side are paired. Windows to west and north sides have label moulds, those to 1st floor with foliated stops. Entrances on north, east and south sides have 4-centred arches and label moulds, that to south side is dated 1848. Window frames mostly missing. Interior has brick segmental vaults. There is also includes a stretch of red-brick walling that extends southwards from the office building, and a small stone pump house lies at the southern end of this wall. These features are not believed to be included within the listed designation. The standing red brick walling formerly tied into the larger perimeter wall that extended around the Clarence Graving Docks, which was first depicted on Gage's map of 1836. The wall became obsolete with the extension of the Princes Dock boundary wall along Regent Road following the construction of Nelson and Bramley Moore Dock in 1848. There is a likelihood of sub-surface remains associated with some of the demolished portions of this wall.

Site Number **41**
Site Name Clarence Dock Fire and Police Station
NGR SJ 33596 92002
Site Type Municipal Building
Period Industrial

SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OS 1890
Description
Former Fire and Police Station, Clarence Graving Dock. A fire station was extant on the site in Pre-1890; and had been extended to include a police station by 1908.OS 2nd edition 1908

Site Number **42**
Site Name Site of Clarence Dock Station
NGR SJ 33617 91966
Site Type Railway station
Period Post-Medieval (1890)
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Clarence Dock station, Waterloo Road. Passenger railway station on the Liverpool Overhead Railway, opened March 1893. It was on the elevated line 16 feet above street level on the iron structure which supported the line. Originally served by trains between Dingle and Seaforth Sands stations. Each platform had its own stairway leading to street level, ticket facilities were provided on the platforms. The station was closed on the 30th December 1956 and demolished in late 1957.

Site Number **43**
Site Name Clarence Graving Dock
NGR SJ 33528 91964
Site Type Dry Dock
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 213935. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Clarence Graving Docks, built by J Hartley are the oldest docks still in use on the Mersey. They were modernised in 1928-33, and have stepped sides and granite barrel runs. The southern graving dock has two chambers.

Site Number **44 (Off-Site)**
Site Name Bonded tea warehouse, 177 Great Howard Street
NGR SJ 33760 91880
Site Type Warehouse
Period Industrial
SMR No 3391- 007
Statutory Designation Grade II listed, LB no 214199. Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey
Description

Bonded tea warehouse, 177 Great Howard Street. Built of brick to the designs of S and J Holme, it is of six storeys and a basement and presents a regular front to Great Howard Street and extends from Dublin Street to Dickenson Street. The Great Howard Street elevation has a carved and painted shield of arms and motto whilst the Dickenson Street facade has ten deeply recessed loading bays with segmental arched tops and iron doors. The listed building entry gives a date of around 1880, but it is more likely to date to the 1840s, built following the introduction of fireproofing regulations in the Building Act of 1843.

Site Number **45**
Site Name Entrance gate to Clarence Dock complex
NGR SJ 33621 91940
Site Type Boundary wall and gates
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359712. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Gate to Clarence and Clarence Graving Docks, by J Hartley Gate piers, square battered stone with rusticated bases and gabled caps with acroteria; C20 gates.

Site Number **46**
Site Name Clarence Dock
NGR SJ 33502 91790
Site Type Wet Dock
Period Industrial
SMR No 3391 14/15
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; LHER
Description
Clarence Dock, Liverpool's first steamship dock, designed by Jesse Hartley. It was located away from the main area of the docks to avoid the risk of fire from the steam ships. However, the dock soon became outdated and in 1929 was sold to the Liverpool Corporation and the site used for a power station (Site **124**). The dock was named after William, Duke of Clarence - King William IV.

Site Number **47**
Site Name Gate to Clarence Dock
NGR SJ 33625 91812
Site Type Boundary wall and gates
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359711. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Gate to Clarence Dock, by J Hartley. Gate piers, square battered stone with rusticated bases and gabled caps with acroteria; C20 gates.

Site Number **48**

Site Name Cast iron drinking fountain in boundary wall at Clarence Dock
NGR SJ 33631 91708
Site Type Boundary wall furniture
Period Post-Medieval (1859)
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Cast-iron drinking fountain set into the dock perimeter wall at Clarence Dock. A series of 33 fountains were installed in 1859, in an attempt to keep the dock workers out of the pubs, where they were forced to go to find refreshment as prior to the construction of the drinking fountains the only source of water was two horse troughs. The cast-iron fountain is still intact, although the pipework behind and the adjacent tap have been removed. The driving force behind the provision of drinking fountains for the dock workers was Charles Pierre Melly who produced a treatise on the requirement for amenities such as drinking fountains in 1858. Although the tap next to the fountain has been removed, the structure is otherwise intact.

Site Number **49**
Site Name Current Trafalgar Dock
NGR SJ 33365 91838
Site Type Wet Dock
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone.
Source Egerton Lea Consultancy 2008; walkover survey
Description
Trafalgar Dock was built in 1929 as part of modernisation following the infilling of Clarence Dock and Clarence graving dock basin , Clarence half tide and the outer end of Trafalgar Dock were reworked into the present Trafalgar Dock.

Site Number **50**
Site Name 1836 Trafalgar Dock and Lock
NGR SJ 35577 91603
Site Type Wet Dock
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OA North 2008a
Description
Trafalgar Dock was built by Jesse Hartley in 1836 and comprised a rectangular basin with access via the Victoria entrance to the south or Clarence half tide dock to the north. Access to Clarence half-tide Dock was enabled by the interconnecting Trafalgar Lock. In 1929 most of the dock was filled in and the outer end was reworked into the present Trafalgar Dock. The dock is named after the battle of Trafalgar. During the construction of the knuckle section of the new Liverpool Canal Link a substantial proportion of the extant remains of the southern wall of the Trafalgar Dock were exposed. Orientated East- West the wall was in excellent condition and survived less than 0.3m beneath the modern ground level. The north facing elevation was constructed of pink ashlar sandstone masonry with a grey mortar bond; irregular courses

with a variety of medium and large rectangular stones. The wall was excavated to the formation level of the canal (c.5.2m) and as such the full extent of the wall was not reached. The wall was capped by trademark Hartley cyclopean granite coping stones. The southern side of the wall was dominated by a substantial sandstone buttress. The land between the Victoria and Trafalgar Docks was disturbed by a series of red brick culverts and a large cast iron water main which was installed in the 1890s. A 15m section of the wall was removed as part of the cutting for the new Liverpool Canal Link however the rest of the wall remains extant beneath the current brown field site.

Site Number **51**
Site Name Dock boundary wall from Collingwood Dock to Waterloo Dock
NGR SJ 33621 92067 – 33677 91072
Site Type Boundary wall
Period Industrial
SMR No -
Statutory Designation Located within WHS and buffer zone
Source Egerton Lea Consultancy 2008; walkover survey; LCC 2005, 66; Gage 1836
Description
Dock perimeter wall, from Collingwood Dock south to Waterloo Dock. Extending along Waterloo Road and Regent Road with entrances to Princes Dock, Waterloo Docks, Trafalgar Dock, Victoria Dock, Clarence Dock and Clarence Graving Dock. The dock entrances are in a Greek Revival style. The wall was built in red brick with sandstone copings in the same style as John Foster's 1821 wall around Princes Dock, but dates to between 1836 and 1841 when the docks were extended. The wall also contained cast iron ornate drinking fountains, which were placed in 1859 to try to keep dock workers out of the pubs. This wall originally featured additional sections, which surrounded the land occupied by Trafalgar, Victoria, and Waterloo Docks. Although only the eastern side of the wall survives as a standing structure, there is a likelihood of the survival of sub-surface remains associated with some of the demolished portions.

Site Number **52 (Off-Site)**
Site Name Warehouse, 27 Vulcan Street
NGR SJ 33661 91646
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation Grade II listed?
Source Egerton Lea Consultancy 2008; walkover survey
Description
Warehouse, 27 Vulcan Street. Six storey warehouse, built of brick with a slate roof. Mid nineteenth century build.

Site Number **53 (Off-Site)**
Site Name Warehouse, 17 Porter Street
NGR SJ 33672 91654
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation Listed Building. Located within WHS buffer zone

Source Egerton Lea Consultancy 2008; walkover survey
Description
Warehouse, 17 Porter Street. Five storey warehouse, built of brick with a slate roof.

Site Number **54 (Off-Site)**
Site Name Warehouse, 13-15 Porter Street
NGR SJ 33677 91655
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey
Description
Warehouse, 13-15 Porter Street. Three storey brick warehouse. Early twentieth Century build.

Site Number **55 (Off-Site)**
Site Name Warehouse, 8 Vulcan Street
NGR SJ 33777 91631
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation -
Source Egerton Lea Consultancy 2008; walkover survey
Description
Brick warehouse, 8 Vulcan Street. Mid nineteenth century build.

Site Number **56 (Off-Site)**
Site Name Warehouse, 9 Vulcan Street
NGR SJ 33766 91634
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation -
Source Egerton Lea Consultancy 2008; walkover survey
Description
Brick warehouse, 9 Vulcan Street. Mid-late nineteenth century build.

Site Number **57 (Off-Site)**
Site Name Warehouse, 10 Vulcan Street
NGR SJ 33752 91637
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey

Description
Brick warehouse, 10 Vulcan Street. Mid-late nineteenth century build.

Site Number **58 (Off-Site)**
Site Name Warehouse, Porter Street
NGR SJ 33780 91674
Site Type Warehousing
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey
Description
Warehouse, Porter Street. Three storey warehouse, built of brick with a slate roof.

Site Number **59 (Off-Site)**
Site Name Site of Waterloo Dock Branch Railway and Waterloo Dock station
NGR 33763 91403
Site Type Railway line and associated structure
Period Industrial Revolution II
SMR No Linear 1241
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey, LHER
Description
Waterloo Dock Branch Railway and Waterloo Dock station. The line was opened in 1849 from Edge Hill to Waterloo Dock via the Victoria and Waterloo tunnels. The descent, being a gradient of 1:60, required a stationary engine to control the wagons, a situation which remained until the end of the century. The line closed in 1965. The station had doubled in size by the end of the nineteenth century. There are no extant structures relating to this site and the area has now been given over to a large retail unit.

Site Number **60**
Site Name Gate to Victoria and Trafalgar Dock complex
NGR SJ 33650 91535
Site Type Boundary wall and gate; characterised by
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359710. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Gate to Victoria and Trafalgar Docks, by J Hartley Gate piers, square battered stone piers with rusticated bases, Doric caps with gabled tops and acroteria. No gates, twentieth century railings.

Site Number **61**
Site Name Victoria Dock including quayside surface
NGR SJ 33500 91396
Site Type Wet Dock
Period Industrial

SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; OA North 2008a; walkover survey
Description
Victoria Dock, constructed as part of the rapid dock expansion programme in 1836, and designed by Jesse Hartley. The dock originally covered 5 acres with a gated entrance measuring 45 feet across. In 1929 the dock was infilled for the formation of the new Trafalgar Dock. Most recently this area was bisected by the construction of the new Liverpool Canal Link which saw the exposure and partial demolition of the northern dock wall (OA North 2008a). Both the north and south facing aspects of a section of the wall were recorded, although a south facing 8m section of the wall was already exposed prior to the commencement of work. The eastern side of the wall had been partially truncated by the installation of a series of concrete caissons in the 1960s. The wall itself was constructed of pink ashlar sandstone topped with massive granite coping stones. In total 15m of the wall was exposed and the excavation on the north side revealed a large 1.1m square pink sandstone buttress bonded with grey cement mortar. Backfill against the dock was homogeneous river sand with little evidence of tip lines or occupation debris. The 15m exposed section was demolished as part of the cutting for the new canal link. Three different phases of cobbled surface indicating changes in surfacing and repairs around the Victoria Dock are located at the juncture between West Waterloo and Victoria Dock. At least one phase is contemporary with the standard gauge railway line at the western side of the dock.

Site Number **62**
Site Name North Gate to Victoria, Princes and Waterloo Docks
NGR SJ 33665 91404
Site Type Boundary wall and gates
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359709. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
North gate to Victoria, Princes and Waterloo Docks, by J Hartley. Gate piers, square battered stone with rusticated bases and gabled caps with acroteria; twentieth century railings.

Site Number **63**
Site Name Gate to Waterloo Dock
NGR SJ 33664 91353
Site Type Boundary wall and gates; orientated north/south on the east side of the docks
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359708. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Gate to Waterloo Dock, by J Hartley. Gate rubble piers with splayed bases, rounded angles andDoric caps, that to left with window and rear entrance (gatekeeper's hut); twentieth century railings. The complex is characterised by cyclopean architecture, granite rubble masonry piers with associated iron fixings including gates, signage and a gatehut.

Site Number **64 (Off-Site)**
Site Name Waterloo Grain Warehouse
NGR SJ 33560 91250
Site Type Grain Warehouse converted to residential dwellings
Period Industrial
SMR No 3391/012
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OA North 2008a; LHER
Description
Constructed in 1866-8 after the Waterloo Dock was reconfigured as a specialist grain dock. Built by George Fosbery Lyster. These were the first warehouses in the world built to handle bulk grain directly from a central power source, which drove all the elevators and conveyors. The surviving warehouse is one of a series of three contemporary structures. The north stack was demolished after it was damaged in the May Blitz of 1941 and the west stack was demolished in 1969. Built mostly of brick the warehouse has 6 storeys and 43 bays divided into six compartments by five full height vertical loading bays and two hoist towers of an additional two storeys with pedimented gables. The ground floor comprises a colonnade of rusticated stone arches and square piers arches. (WHO nomination - referencing how? 2005, 66) Paired round-headed windows have iron frames, louvred with round window above. Bands at sill levels. Parapet and cornice Converted to residential apartments between 1989 –1998.

Site Number **65**
Site Name 1834 Waterloo Dock
NGR SJ 33530 91210
Site Type Wet Dock; characterised by red sandstone with granite coping stones
Period Industrial
SMR No 3391/11
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OA North 2008a
Description
Constructed in 1834 by Jesse Hartley as a general goods dock which was aligned E-W, with pink sandstone wallsand colossal grey granite coping stones. Originally 5 acres in size with gates measuring 45 feet to accommodate large sailing ships. This dock was initially a hub of activity and was surrounded by important structures including the Northern Custom House, the second observatory which was constructed in 1844 and a new fish market. Following the repeal of the Corn Laws in 1846 the dock was remodelled. In 1863-8 it was rebuilt and divided into Waterloo East Dock and Waterloo East Dock. The dock was named after the Battle of Waterloo.

Site Number **66**
Site Name West Waterloo Dock
NGR SJ 33499 91207
Site Type Wet Dock; characterised by red sandstone with granite coping stones
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; OA North 2008a, LCC 2005, 129; Pollard 2004, 122

Description
Waterloo Dock was remodelled in 1863-8 by GF Lyster. West Waterloo Dock represents the remains of one of two branch docks that were aligned north/south as part of a rebuilding of the original 1834 Waterloo Dock and provided berths for medium-sized ocean-going vessels and provided a route between Victoria Dock and Princes Half Tide Dock. A new river entrance (Site **98**) with locks was built in 1949 at the south end of the dock, removing the Dock Master's Office and the West Shed which had been built following the Dock's original reconstruction, and blocking the entrance to Princes Half Tide Dock.

Site Number **67 (Off-Site)**
Site Name East Waterloo Dock
NGR SJ 33615 91229
Site Type Wet Dock; characterised by red sandstone with granite coping stones
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey; LCC 2005, 128- 9; Pollard 2004, 122
Description
Following the repeal of the Corn Laws in 1846 Waterloo Dock was remodelled and Waterloo East Dock was one of two branch docks aligned north/south, part of a rebuilding of the original 1834 Waterloo Dock in 1863-8. Designed by GF Lyster, it was the world's first specialist bulk grain dock, with three blocks of warehouses equipped for the handling and storage of grain, on the west, north and east sides of the dock. In 1904 part of the warehouses were turned into a mill and by 1925 the warehouses were re-equipped to handle oil seeds. Two of the warehouse blocks have been demolished: the north block was demolished following the May Blitz of 1941 whilst the west block was demolished in 1969 to make way for a container terminal. In 1988 the docks were closed.

Site Number **68**
Site Name Site of South Shed, West Waterloo Dock
NGR SJ 33469 91148
Site Type Transit Shed
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey; OS 1890
Description
South shed, West Waterloo Dock. The brick foundations of a small building, probably the structure marked as South Shed in 1890.

Site Number **69**
Site Name Site of Swing Bridge between Princes Half Tide and West Waterloo Docks
NGR SJ 33522 91142
Site Type Swing Bridge
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey

Description
Swing bridge constructed 1863-8 between Princes Half Tide Dock and West Waterloo Dock. The bridge is no longer extant, but the recesses for the bridge mechanism still survive.

Site Number **70**
Site Name Site of Swing Bridge between Princes Half Tide and East Waterloo Docks
NGR SJ 33617 91163
Site Type Swing Bridge
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; LCC 2005
Description
Site of swing bridge constructed 1863-8 between Princes Half Tide Dock and East Waterloo Dock. The bridge is no longer extant, and the east side of the dock entrance has been rebuilt.

Site Number **71**
Site Name South gate to Victoria, Princes and Waterloo Docks
NGR SJ 33678 91172
Site Type Boundary wall and gates; orientated north/south on the east side of the docks.
Period Industrial
SMR No -
Statutory Designation Grade II Listed, LB no 359707. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
South gate to Victoria, Princes and Waterloo Docks, by J Hartley. Constructed in the 1830s,gate piers, square battered stone with rusticated bases and Doric caps with gabled tops and acroteria; gate slots are present but twentieth century railings subsequently installed. The complex is characterised by red brick architecture and granite rubble masonry piers with associated iron fixings including gates, signage and a gatehut.

Site Number **72 (Off-Site)**
Site Name Site of J Bibby and Sons warehouse, Galton Street
NGR 33746 91159
Site Type Warehouse
Period Industrial Revolution II
SMR No 3391 8/9
Statutory Designation Grade II LB no, 214127. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
J Bibby and Sons warehouse, Galton Street, of brick with stone dressings. Five storeys, 6 x 6 bays. Windows have wedge lintels, some with casements, others blocked. Stone cornice and brick parapet. Left return to Greenock Street has oval stair lights to ends; 3rd bay windows attached. Stone coped truncated gable has round openings flanking date plaque. Two loading bays with iron cat-heads. Corrugated asbestos awning over ground floor of Galton Street facade. Bibby and son specialised in the production of ready

blended foods for cattle. Later involved in oil and soap production. The building has been demolished and replaced by a large retail unit.

Site Number **73 (Off-Site)**
Site Name St Paul's Eye Hospital, 91-3 Old Hall Street
NGR SJ 33801 91198
Site Type Hospital Building
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
St Paul's Eye Hospital, 91-3 Old Hall Street. House built around 1800, later used as part of the eye hospital. Brick with stone dressings and a slate roof, it is of 2 storeys and 5 bays. Now incorporated in SAS Radisson Hotel.

Site Number **74 (Off-Site)**
Site Name Sprague Brothers Engineering Building, 2-4 Roberts Street
NGR SJ 33747 91083
Site Type Engineering Building and warehouse
Period Post-Medieval
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Sprague Brothers Engineering Building, 2-4 Roberts Street, believed to have been built between 1841 and 1851. The site was originally occupied by a tobacco works, the buildings were owned by British American Tobacco in the early-mid twentieth century, until the 1960s when it became an engineering works. The works is composed of a series of single and two storey factory / warehouse units connected by internal doorways, with a four storey office block at the top of the site. The entire complex is built of red brick laid in Flemish bond, although where walls have been rebuilt and openings have been changed the replaced brickwork is in an irregular English garden wall bond. Sandstone dressings exist in the form of copings, sills, keystones and lintels. The office block also has glazed brick decorations in the form banding details and quoined window surrounds. The office block has a tiled roof and the warehouse / factory units have slate roofs.

Site Number **75 (Off-Site)**
Site Name Boundary wall and gates, Roberts Street
NGR SJ 33675 91059
Site Type Boundary wall and gates; orientated north/south on the east side of the docks.
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 213712. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description

Dock gate opposite Roberts Street, by J Hartley. Granite rubble gate piers with splayed bases, rounded angles, and Doric caps, brick wall between. The complex is characterised by red brick architecture and granite rubble masonry piers with associated iron fixings including gates, signage and a gatehut.

Site Number **76**
Site Name Entrance to Princes Half Tide Dock
NGR SJ 33508 91020
Site Type Wet Dock;
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 359254. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Entrance to Princes Half Tide Dock, by J Hartley. Granite rubble wall brought to a fair face, laid in blocks of greatly differing sizes to landward and seaward of original timber gates. Two capstans remain to landward side.

Site Number **77**
Site Name Princes Half Tide Dock
NGR SJ 33647 91056
Site Type Wet Dock; cyclopean sandstone walls, granite coping stone, dock furniture including mooring rings and bollards, subterranean buttresses quayside, bridge and pontoon structures.
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no, 436020. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; LCC 2005, 128-9; LHER; Pollard 2004, 12
Description
North/south orientated dock structure located between Princes Dock and East and West Waterloo Docks. Designed by Jesse Hartley, this dock represents an excellent example of nineteenth century dock engineering. Originally built as a tidal basin and then rebuilt in 1868 by G.F Lyster in Hartley fashion. The walls and locks are constructed of intricate cyclopean granite masonry. The Princes Half Tide Dock entrance was formerly a swing bridge however the channel has been in-filled and a causeway created to carry a fixed roadway over the former dock entrance. The northern side (i.e. all that lies within the Princes Half Tide Dock) is Grade II listed (Wardell Armstrong 2003, 23). The access to the dock was previously via a lock system on the west side of the dock in the sea wall. This passage has been closed off. Construction of the Liverpool Canal Link in 2007-2008 saw the temporary re-opening of the original passage from Princes Dock to Princes Half Tide Dock with a new channel being cut through the original infill (Wardell Armstrong, 2003; Oxford Archaeology North, 2008). As part of the same phase of work the dock was partially in-filled using a ballast of sterile 6F2 to reduce its overall depth.

Site Number **78**
Site Name Site of Riverside Branch Railway
NGR SJ 33522 90918
Site Type Railway line
Period Industrial
SMR No 1248

Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey
Description
Riverside railway built in 1895 to connect to the main line from Euston with ocean going liners berthed at Princes landing stage. It closed in 1971.

Site Number 79 (Off-Site)
Site Name Site of Princes Dock station, Waterloo Road.
NGR SJ 33671 91018
Site Type Passenger railway station on the Liverpool Overhead Railway
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Egerton Lea Consultancy 2008; walkover survey
Description
Princes Dock station on Waterloo Road opened in February 1893. It was on the elevated line 16 feet above street level on the iron structure which supported the line. Originally served by trains between Herculaneum Dock and Alexandra Dock stations. Each platform had its own stairway leading to street level, ticket facilities were provided on the platforms. Extensively bomb damaged in 1941, it never reopened and was demolished in late 1957.

Site Number 80
Site Name Princes Dock Gates (north), including railway furniture
NGR SJ 33684 90951
Site Type Boundary wall and gates
Period Industrial
SMR No -
Statutory Designation Grade II listed; LB no 213714. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Granite rubble piers with splayed bases, rounded angles and Doric caps. One pier larger with window and rear entrance, for gatekeeper, the other with groove and original gate. Now blocked. The listing records this as by John Foster, but it appears to date to the rebuilding of Princes Half Tide Dock by Lyster in 1868, as its form imitates Hartley's gates of the 1840s.

Site Number 81
Site Name Dock gates (south)
NGR SJ 33722 90854
Site Type Boundary wall and gates
Period Post-medieval (1821)
SMR No -
Statutory Designation Grade II listed, LB no 213713. Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description

Dock gates by John Foster, Dock Engineer between 1799 and 1824. The gates are formed by a pair of square buff sandstone piers in the Greek Revival style. The shaft of each is formed by three pieces of stone. Stone piers have pitted rustication, raised panels and caps, twentieth century railings close the entrance.

Site Number **82**
Site Name Cast Iron Drinking Fountain Series
NGR SJ 33728 90841
Site Type Cast-iron drinking fountain set into the dock perimeter wall at Princes Dock.
Period Post-Medieval (1859)
SMR No -
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Cast-iron drinking fountain set into the dock perimeter wall at Princes Dock. A series of 33 fountains were installed in 1859, in an attempt to keep the dock workers out of the pubs, where they were forced to go to find refreshment as prior to the construction of the drinking fountains the only Source of water was two horse troughs. The cast-iron fountain is still intact, although the pipework behind and the adjacent tap have been removed. The driving force behind the provision of drinking fountains for the dock workers was Charles Pierre Melly who produced a treatise on the requirement for amenities such as drinking fountains in 1858. Although the tap next to the fountain has been removed, the structure is otherwise intact.

Site Number **83**
Site Name Princes Dock
NGR SJ 33770 90570
Site Type Wet Dock; cyclopean sandstone walls, granite coping stone, dock furniture including mooring rings and bollards, subterranean buttresses quayside, bridge and pontoon structures, extant iron and wood derelict wharfage off shore to the west of the dock.
Period Post-medieval
SMR No Industrial
Statutory Designation Located within WHS
Source Egerton Lea Consultancy 2008; walkover survey; McCarron and Jarvis 1992; OA North 2008a; OA North 2009; Sharples 2004
Description
North/south orientated dock structure originally designed in 1800 but not commenced until 1810 and completed in 1821. Encompasses approximately 15 acres of enclosed water plus substantial additional wharfage in the form of a timber and iron pier extending out into the Mersey. At the south end there is a blocked passage to the former site of Georges Basin which was subsequently a graving and then branch dock with the original coursed Runcorn stone quay wall (Sharples 2004, 122). A "roll on roll off" terminal was installed in 1967 at the southern end of the dock, for the Irish Packet which was made redundant in 1981 (McCarron and Jarvis 1992, 72). This modification meant that the south-western corner of the dock was heavily modified and significantly reduced in height to accommodate a reinforced concrete ramp. The Eastern quay was modified and widened in 1988 as part of redevelopment master plan under Taylor Young (Sharples, 2004). At this time a substantial part of the basin was edged with concrete facing obscuring the original stone work. Concrete caissons were also constructed down the west side of the dock. Further modification in 2007 saw the removal of the concrete ramp installed in 1988 as well as the remaining section of the south-western wall down to formation level. This modification was undertaken as part of the

Plot 7 development for the construction of the new Liverpool Canal Link (OA North 2008a; OA North 2009). A lock situated within the dock now provides access into the subterranean concrete box culvert which forms part of the new canal.

Site Number **84**
Site Name Princes Dock Boundary wall and piers, Bath Street
NGR SJ 33671 90980– 33878 90514
Site Type Boundary wall orientated north/south on the east side of the dock
Period Industrial
SMR No -
Statutory Designation Grade II listed, LB no 477706. Located within the WHS
Source Egerton Lea Consultancy 2008; walkover survey
Description
Access to Princes Dock from the town was controlled by this dock boundary wall, the first to be built in Liverpool. Construction begun in 1816 and was completed in 1821 when the dock opened. The wall was built by John Foster of red brick, and was four courses thick with ridgeback sandstone copings and a gateway built with sandstone piers in the Greek Revival style. The wall complex includes iron fixings including gates, signage and gatekeepers building. This site also includes features that are immediately adjacent to the wall, such as historic surfacing and a signal point for the dockside railway that is located on the western side of the wall at Princes Half Tide Dock. Originally the wall surrounded the dock but only the eastern side survives as a standing structure with a likelihood of the survival of sub-surface remains associated with some of the demolished portions.

Site Number **85**
Site Name Varied Phases of the Sea Wall
NGR SJ 33258 92526
Site Type Sea Wall
Period Industrial
SMR No -
Statutory Designation -
Source Walkover survey; Strangers Guide to Liverpool 1816; Walker and Walker 1823; Egerton Lea Consultancy 2008, OS 1851
Description In addition to Sites **35**, **37**, and **39**, numerous portions of the sea wall were established during the nineteenth and early-twentieth centuries and represent an intrinsic part of the historic dockscape. The oldest portions of sea wall within the Liverpool Waters site are those in the vicinity of Seacombe Basin (Site **108**), which appears to have been constructed by 1816, and that at Princes Dock, which was constructed between 1810 and 1821. The stretches of sea wall lying to the north of Princes Dock were constructed prior to 1851, although the West Waterloo Dock river entrance (Site **98**) was built during the twentieth century. Some stretches of the sea wall, such as that to the west of Trafalgar Dock, were subject to modification during the twentieth century with the addition of concrete reinforcing, although many of the earlier phases of the wall appear to remain beneath this veneer.

Site Number **86**
Site Name Sea Wall (c 1760)
NGR SJ 33769 90489
Site Type Historic Sea Wall
Period Post-Medieval

SMR No -
Statutory Designation Located within WHS
Source OA North 2008a; OA North 2009; Eyes 1765; Eyes 1785.
Description
North - South orientated section of early sea wall extending approximately 50m. Constructed using yellow sandstone ashlar masonry without a mortar bond. Identified during the bulk excavation at Plot 7 in advance of the Liverpool Canal Link. Already significantly reduced in height this wall was only encountered c. 400mm above the formation level of the canal culvert. Probably dismantled during the construction of the northern passage linking Georges Dock and Princes Dock. The foundations of this wall were recorded and left in situ. They survive beneath the backfill of the construction cut for the subterranean canal culvert which now links the Pier Head section of the canal to Princes Dock Lock.

Site Number **87**
Site Name Temporary retaining or buttress wall
NGR SJ 33769 90504
Site Type Historic Sea Wall
Period Post-Medieval
SMR No -
Statutory Designation Located within WHS
Source OA North 2008a; OA North 2009; Eyes 1765; Perry 1769; Eyes 1785
Description
East/west orientated section of temporary retaining or buttress wall. A 3m section of this wall was identified during the bulk excavation at Plot 7 in advance of the construction of the Liverpool Canal Link. This wall was constructed of yellow sandstone ashlar masonry with some pink sandstone quarry waste packing. Part of the wall was constructed using recycled architectural stone including part of a large stone lintel or pediment. A similar wall was found within LCL5 of the Pier Head section of the Canal Link in front of the Cunard Building. The full extent of this wall was not established as it continued beyond the eastern formation of the canal construction cut. Likely to extend eastwards beneath the Crown Plaza Hotel car park.

Site Number **88**
Site Name Trafalgar Dock Windmill
NGR SJ 33466 91497
Site Type Foundations of Windmill
Period Post-Medieval
SMR No -
Statutory Designation Located within WHS buffer zone
Source OA North 2008a
Description
Circular yellow sandstone ashlar masonry foundations located between Trafalgar and Victoria Dock. Uncovered during the bulk excavation in advance of the construction of the Liverpool Canal Link in 2008. Removal of the a section of the Trafalgar Dock and the Victoria Dock wall, followed by excavation to formation level at 5.2m uncovered the circular structure which is likely to represent the remains of one of the windmills that were built along the north shore from the 1760s onwards.

Site Number **89**
Site Name Dockside Railway at Princes Dock
NGR SJ 33746 90760
Site Type Standard gauge railway tracks
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Walkover survey; OS 1890
Description
Standard gauge rails set into contemporary cobbled surface orientated N-S on the East Side of Princes Dock. Rails run the full length of the site apart from truncation due to newly developed car park. Associated with transit sheds which were located on the east side of the dock. Comprises three sets of rails. Portions of railway tracks associated with the docks are visible in numerous locations across the extent of the study area. The rails pre-date the production of the OS mapping of 1890.

Site Number **90**
Site Name Princes Jetty
NGR SJ 33506 90861
Site Type Landing stage
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Walkover survey
Description
Wooden and concrete pier structure projecting into the river. Three piers form landing stage. Landing stage also characterised by extant iron railings, timbered office and dock furniture including temporary bridge structure. Departure point from the UK to Ellis Island for thousands who emigrated from Liverpool to the New World.

Site Number **91**
Site Name Site of Riverside Railway Station/Offices
NGR SJ 33662 90575
Site Type Railway building
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Walkover survey
Description
Foundations of station and possible railway office buildings opposite Princes Landing Stage. Associated with the Riverside Railway (Site **78**) and located on the west side of Princes Dock.

Site Number **92**
Site Name Site of Princes Dock Transit Shed
NGR SJ 33726 90798
Site Type Transit Shed
Period Industrial

SMR No -
Statutory Designation Located within WHS
Source Walkover survey; Gage 1836; Austin 1836; Bennison 1841, Bennison 1848; OS 1851; Dower 1863
Description
Remnants of transit shed footings orientated N-S on the east side of the Princes Dock. Sections of brick footings separated by in situ metal runners which would have originally houses the transit shed doors. Archaeological excavations at the south end of the Princes Dock have shown that the foundations can survive up to a depth of 0.8m and may include associated crane and machine bases. Foundations are surrounded by original contemporary cobble surface and contemporary dockside railway tracks.

Site Number 93
Site Name West Waterloo Dock River Entrance and Extension
NGR SJ 33436 91197
Site Type Entrance with Series of 4 lock gates
Period Industrial
SMR No -
Statutory Designation Located within WHS buffer zone
Source Walkover survey
Description
Mammoth cast iron gates allowing access to the river from the Waterloo Dock. Cast iron dock furniture survives extant along the river edge. Dock gates in excellent condition despite two of the four in the series having been buried by backfill. Voids in quayside clearly show survival of gate mechanisms surviving extant. The dock was extended in length in 1949 to connect directly with the southern end of Trafalgar dock, utilising part of the former northern entrance of Victoria Dock. This works associated with this expansion are likely to have destroyed the former dock gate between West Waterloo and Victoria Docks.

Site Number 94 (Off-Site)
Site Name Cunard Building
NGR SJ 33927 90280
Site Type Building
Period Industrial/Modern
SMR No -
Statutory Designation Grade II* listed, LB no 27/502
Source Belchem 2006; Cunard Building 2010
Description The Cunard Building was built as the headquarters and main passenger terminal of the Cunard Steamship Company (Cunard Building 2010) and forms one of the 'Three Graces' of the Liverpool Pier Head. Construction began in 1913 and finished in 1917 and the building followed the style of Italian Renaiissance palazzos (Belchem 2006, 20; Cunard Building 2010).

Site Number 95 (Off-Site)
Site Name Port of Liverpool Building
NGR SJ 33955
Site Type Building
Period Industrial
SMR No -

Statutory Designation Grade II* listed, LB no 27/501
Source Belchem 2006
Description The Port of Liverpool Building was built in 1907 for the Mersey Docks and Harbour Company. The building features distinctive baroque domes and forms one of the 'Three Graces' of the Liverpool Pier Head (Belchem 2006, 20, 279)**.**

Site Number 96 (Off-Site)
Site Name Mersey Road Tunnel Ventilation and Central Station
NGR SJ 34017 90220
Site Type Ventilation and central station
Period Modern
SMR No -
Statutory Designation Grade II listed, LB no 27/500
Source Belchem 2006
Description Ventilation and central station for the Queensway Mersey road tunnel, which opened in 1934 (Belchem 2006, 270).

Site Number 97 (Off-Site)
Site Name St Nicholas' Church
NGR SJ 33950 90500
Site Type Chapel/Church
Period Medieval - Modern
SMR No 3390 - 001
Statutory Designation located within WHS
Source LHER; walkover survey; Eyes 1765; Eyes 1785
Description
Chapel of St Nicholas and Our Lady. The Parish Church of Liverpool and located on the former site of the Chapel of St Mary Del Key. The church was partially rebuilt following fire damage caused by a wartime air raid in 1940. Still an active parish church surrounded by a small landscaped garden that was formerly a cemetery.

Site Number 98 (Off-Site)
Site Name Liver Building
NGR SJ 33892 90351
Site Type Building
Period Industrial
SMR No -
Statutory Designation Grade I listed. LB no 27/503
Source Belchem 2006
Description The Royal Liver Building was built in 1911 for Royal Liver Assurance. The building forms one of the 'Three Graces' of the Liverpool Pier Head (Belchem 2006, 20, 279). The opposing clock towers are each adorned with Liver Birds, which have become an iconic symbol for Liverpool.

Site Number **99**
Site Name Clarence Graving Dock Workshop
NGR SJ 33454 91962
Site Type Workshop
Period Modern
SMR No -
Statutory Designation Located within WHS and Conservation Area
Source Aerial photographs; site visit by P de Figueiredo
Description
This large red-brick building is rectangular in floor plan, lies between the western end of the Clarence Graving Docks, and is aligned east/west. It is of an unusual design, with the outer face of the southern side extending deeper than that at the northern side, as the building straddles a step down onto a lower shelf at the northern side of graving dock No. 2. From the exterior, therefore, the building gives the impression of being two stories high to the south and a single story in height to the north. The building has a wide doorway at the eastern side and is likely to have been used as a workshop, as it lacks the dockside sliding loading doors indicative of a shed, which, as a structure, would not have been appropriate at a graving dock. The building was not depicted on any of the maps and plans of the area up until, and including, that produced in 1927.

Site Number **100**
Site Name Trafalgar Dock Office Building
NGR SJ 33440 91999
Site Type Office building
Period early to mid twentieth century?
SMR No -
Statutory Designation Located within WHS and Conservation Area
Source Aerial photographs; site visit by P de Figueiredo
Description
This single story office building is brick-built and features a hipped slate roof and a projecting porch with a concrete slab roof. The window and door frames and lintels are wooden and the building has a brick chimney. The building was not depicted on any of the maps and plans of the area up until, and including, that produced in 1927.

Site Number **101**
Site Name Clarence Graving Dock Office Building
NGR SJ 33435 91925
Site Type Office building
Period early to mid twentieth century?
SMR No
Statutory Designation Located within WHS and Conservation Area
Source Aerial photographs; site visit by P de Figueiredo
Description
This single story office building is brick-built and features a pitched roof and a brick chimney. The building has wooden window and door frames and stone lintels. It was not depicted on any of the maps and plans of the area up until, and including, that produced in 1927.

Site Number **102**
Site Name Clarence Graving Dock Basin
NGR SJ 33333 92039
Site Type Tidal basin and basin
Period Constructed between 1823 and 1836
SMR No
Statutory Designation Located within WHS and Stanley Dock Conservation Area
Source Swire 1823; Austin 1836; Gage 1836; OS 1851
Description
The tidal basin was first depicted on Austin and Gage's maps of 1836, and had not been depicted on Dwire's map of 1823. The 1836 depictions show the basin to have been sub-rectangular and fed by a channel leading directly from the river. By the time of the production of the OS map of 1851, following the construction of the Salisbury and Collingwood Docks, the basin had been incorporated within a link between the Clarence Graving Docks, Clarence Basin, and Salisbury Dock, which later became Clarence Gridiron Basin (Site **116**). The channel and part of the eastern and northern sides of the basin appeared to have been infilled at this time and part of the southern wall was removed in order to link the basin to the graving dock basin. Part of the basin was infilled prior to the construction of the Trafalgar Dock in 1929, which is likely to have destroyed the southern and eastern sides of the basin. Parts of the original tidal basin walls are likely to survive as sub-surface remains to the north and west of the northern end of Trafalgar Dock.

Site Number **103**
Site Name Clarence Graving Dock WWII Air Raid Shelters
NGR SJ 33461 91924, 33499 91929, 33475 91999
Site Type Air Raid Shelters
Period Modern
SMR No
Statutory Designation Located within WHS and Stanley Dock Conservation Area
Source Aerial photographs; site visit by P de Figueiredo
Description
Three rectangular air raid shelters are present to the north and south of the Clarence Graving Docks. The shelters are of brick construction with concrete roofs.

Site Number **104**
Site Name Shelter
NGR SJ
Site Type Structure
Period Modern
SMR No -
Statutory Designation -
Source Aerial photographs; site visit by P de Figueiredo
Description A brick-built open-sided shelter with stone lintels and steel stanchions that suggest the reuse of materials from earlier structures. This appears to have been a dockside shelter associated with the storage of materials or machinery.

Site Number **105**
Site Name Georges Dock Basin

NGR SJ 33860 90410
Site Type Infilled Wet Dock
Period Post-Medieval (c.1785)
SMR No 3390-007
Statutory Designation Located within WHS
Source OA North 2008a; OA North 2009; Eyes 1785
Description
An east/west orientated section of large pink and yellow sandstone wall revealed during the bulk excavation in advance of the construction of the Liverpool Canal Link. The wall was characterised by the use of pink sandstone with granite coping and pink rubble sandstone buttresses. The wall still stood to its full height (c.6.2m) and the toe identified at formation level. The wall showed evidence of numerous phases of repair work, including reworking on one side for the addition of a brick shaft which was probably a sluice. A substantial buttress on the north side was constructed using irregular pink sandstone bonded with a grey cement mortar. The northern construction face of the wall was roughly constructed with a mixture of pink and yellow sandstone, some of which was likely recycled from the sea wall which would have previously stood in this location demarcating the northern boundary of the reclaimed land which now forms the modern Pier Head. A 12 metre section of the structure was removed to install the canal culvert however the rest of the structure remains extant beneath the public realm.

Site Number **106**
Site Name Site of shed to the north of Bramley Moore Dock
NGR SJ 33463 92563
Site Type Transit Shed
Period Industrial/Empire
SMR No -
Statutory Designation Located within WHS buffer zone
Source Walkover survey
Description
Remnants of warehouse/transit shed attached to back of Wellington Dock Hydraulic Tower. 22 cast iron roof stanchions visible at east end and western gable wall standing extant but isolated. Surfaces not visible due to current use of area. Metal door runners visible at quayside edge.

Site Number **107**
Site Name Floating Bridge
NGR SJ 33787 90385
Site Type Ancillary structure
Period Industrial
SMR No -
Statutory Designation Located within WHS
Source Walkover survey
Description This floating roadway formerly connected the quayside to the floating landing stage and was able to raise and lower in accordance with the changing tide and, therefore, enable constant access to and from moored vessels. The walls of the original structure survive but the floating roadway has been replaced by a fixed road.

(2) Potential Sites/Features: Liverpool Waters plus Wider Study Area

Site Number **108 (Potential Site/Feature)**
Site Name Clarke's Basin
NGR SJ 33788 90835
Site Type Canal Basin
Period Industrial
SMR No -
Statutory Designation -
Source Horwood 1803; OS 1851
Description A canal basin at the southern end of the Leeds Liverpool Canal, which was first depicted on Horwood's map of 1803 and named as 'Clarkes Basin' on the OS map of 1851. This basin represented the south-western terminus of the Leeds Liverpool Canal throughout the nineteenth century.

Site Number **109 (Potential Site/Feature)**
Site Name Tidal Basin north of Princes Dock Basin
NGR SJ 33440 91173
Site Type Basin
Period Industrial
SMR No -
Statutory Designation -
Source Walkover survey; Walker and Walker 1823; Swire 1823; Strangers Guide to Liverpool 1829
Description A small tidal basin was depicted to the north of Princes Dock Basin on mapping produced in 1823. This basin was not shown on mapping produced in 1829.

Site Number **110 (Potential Site/Feature)**
Site Name Seacombe Basin
NGR SJ 33724 90441
Site Type Basin
Period Industrial
SMR No -
Statutory Designation -
Source Strangers Guide to Liverpool 1816; Swire 1823; Walker and Walker 1823; Austin 1836
Description This small basin had been constructed by the time of the publication of the Stranger's Guide to Liverpool in 1816, and was shown on maps produced in 1823, but was not depicted on the map accompanying the 1829 edition of this book. The basin was named as Seacombe Basin on Henry-Austiin's map of 1836.

Site Number **111 (Potential Site/Feature)**
Site Name Boat Yard
NGR SJ 33724 90441

Site Type Boat yard
Period Industrial
SMR No -
Statutory Designation -
Source Horwood 1803; Walker and Walker 1823
Description A boat yard associated with Clarke's Basin (Site **59**) of the Leeds and Liverpool Canal (Site **15**) was first named on Walker and Walker's map of 1823. It is possible, however, that a boat yard might have existed in this area since the establishment of Clarke's Basin, which was first depicted on a map in 1803.

Site Number **112 (Potential Site/Feature)**
Site Name Warehouse
NGR SJ 33435 91925
Site Type Warehouse
Period Industrial
SMR No -
Statutory Designation -
Source Stranger's Guide to Liverpool 1829
Description A warehouse was first depicted on the southern corner of Bath Street and Dutton Street on the map accompanying the Stranger's Guide to Liverpool in 1829.

Site Number **113 (Potential Site/Feature)**
Site Name Fort, Bath Street
NGR SJ 33620 90902
Site Type Fort
Period Constructed between 1765 and 1785
SMR No
Statutory Designation Located within WHS buffer zone
Source Eyes 1785; Gage 1807; Kaye 1816; Walker and Walker 1823
Description
This fort was first depicted on Eyes map of 1785, and had not been depicted on his map of 1765. The fort occupied a promontory of newly reclaimed land that represented the earliest extension of land reclamation into the present study area. The fort was shown as a complex of four buildings on Gage's map of 1807, however, the construction of Princes Dock resulted in the partial demolition of the fort and its reduction to a single building by 1816. By the time of the publication of Walker and Walker's map of 1823 the fort was not being depicted on mapping. Recent development at the north-eastern corner Princes Dock will have impacted upon part of the fort site, although sub-surface remains might survive to the south of this building.

Site Number **114 (Potential Site/Feature)**
Site Name North Battery
NGR SJ 33563 92114
Site Type Battery
Period Constructed between 1823 and 1836
SMR No
Statutory

Designation Located within WHS and Stanley Dock Conservation Area
Source Swire 1823; Austin 1836; Gage 1836
Description
This battery was first depicted on Austin and Gage's maps of 1836, and had not been depicted on Dwire's map of 1823. The battery occupied land to the west of Regent Road, in the vicinity of the current Collingwood Dock. The fort site is one of the few areas of the current waterfront that appears to have utilised pre-existing dry land, rather than reclaimed land. The fort is likely to have been almost completely destroyed during the construction of Collingwood Dock, which was completed in 1848.

Site Number **115 (Potential Site/Feature)**
Site Name Princes Dock Basin
NGR SJ 33482 93768
Site Type Dock Basin
Period Industrial
SMR No -
Statutory Designation -
Source Egerton Lea Consultancy 2008; Walker and Walker 1823; Swire 1823
Description This dock basin was first depicted on maps of 1823. The basin was replaced by Princes Half Tide Dock in 1868 (Egerton Lea Consultancy 2008).

Site Number **116 (Potential Site/Feature)**
Site Name Clarence Gridiron Basin
NGR SJ 33318 92018
Site Type Gridiron Basin
Period Industrial
SMR No -
Statutory Designation -
Source Egerton Lea Consultancy 2008; Austin 1836; Gage 1836; OS first edition 1851
Description The gridiron basin was first depicted on the OS map of 1851 and appears to have been formed as part of the reconstruction of Clarence Graving Dock Basin (Site 122) to form a link between Clarence Graving Docks (Site 43) and Salisbury Dock (Site 33). The basin was first labelled as a gridiron basin on the OS map of 1890.

Appendix 4.3: Scoping Responses and Actions – Cultural Heritage and Archaeology

Liverpool Waters

Environmental Statement – Volume 2: Appendices – November 2011

4.3 Liverpool Waters Scoping Responses and Action – Cultural Heritage and Archaeology

ES Topic	Scoping Comment Received – Summary of key points	Where (in this ES or supporting Technical Report) this has been addressed	Proposed scope of how each item raised will be addressed	Agreement reached with consultee?
4.1 Baseline data collection	**4.1 Graeme Ives, Historic Areas Advisor, English Heritage (EH) – letter dated 8/4/2010**			
OAN	4.1.1 EH has received Archaeology and Cultural Heritage Baseline Report, but has not seen Liverpool Waters Baseline Summary Report and can not endorse statement that this document represents the agreed baseline environment (letter para 5.02).	N/A	We do not require EH to agree to endorse the baseline not previously sighted by EH. A comprehensive updated baseline will be provided in ES Chapter 4.0.	N/A
4.2 Consultation history	**4.2 Graeme Ives, Historic Areas Advisor, English Heritage (EH) – letter dated 8/4/2010**			
OAN	4.2.1 EH has received Archaeology and Cultural Heritage Baseline Report and presentations regarding proposals and consultations on view analysis. They have not been consulted on EIA methodology (letter para ref 6.04).	ES Section 3.0. ES Section 4.2.	The overall approach to the impact assessment follows standard best practice and is provided in the ES. The specific detail of the methodology of the archaeology and cultural heritage assessment is provided in the ES in Chapter 4.2.	N/A
4.3 Environmental issues scoped in	**4.3 Graeme Ives, Historic Areas Advisor, English Heritage (EH) – letter dated 8/4/2010**			
OAN	4.3.1 In the Scoping Report in Section 8.47, sentence should be rephrased to state 'The OUV of Liverpool WHS is based on the criteria for inscription and its authenticity and integrity which are the focus for protecting, conserving, and presenting the site' (letter para ref 8.47).	ES Section 4.2.2	The Scoping Report will not be re-issued. This phrase will be incorporated within the ES in Chapter 4.0	N/A
OAN	4.3.2 Scoping Report in Section 8.48 should include reference to potential impact of overall character of wider area, including undesignated heritage. Reference to setting of protected buildings should be amended to setting of listed buildings and structures (letter para ref 8.48).	ES Section 4.5	The Scoping Report will not be re-issued. This will be incorporated within considerations associated with Chapter 4.0.	N/A
OAN	4.3.3 Potential cumulative effect of development, e.g. impact of Liverpool Waters in context of existing development and outstanding planning approvals should also be considered (letter para ref 8.48).	ES Section 4.5.3	The Scoping Report will not be re-issued. Cumulative effects, including outstanding planning approvals, will be considered.	N/A
OAN	4.3.4 could also include the European Landscape Convention (letter para ref 8.53)	ES Section 4.2.1.	The Scoping Report will not be re-issued. This has been addressed in Chapter 5.	N/A
OAN	4.3.5 Section 8.54 should be updated to delete PPG 15 and 16 and replace with PPS5 and related guidance (letter para ref 8.54).	ES Section 4.2.1.	The Scoping Report will not be re-issued. This has been applied to Section 4.2.1.	N/A
OAN	4.3.6 Section 8.55 should also include the North West Regional Assembly Strategic Views along the River Mersey (Entec 2003) (letter para ref 8.55).	ES Section 4.2.1.	The Scoping Report will not be re-issued. The NWRA has been abolished	N/A
OAN	4.3.7 The extent of the 'wider surrounding area' should be defined, as should the process for agreeing which undesignated cultural heritage assets are to be assessed (letter para ref 8.56).	The buffer zone for the study area is described in section 4.2.4, and criteria for	Explicit information on which site-types were included and excluded is provided in ES Section 4.2.4.	N/A

ES Topic	Scoping Comment Received – Summary of key points	Where (in this ES or supporting Technical Report) this has been addressed	Proposed scope of how each item raised will be addressed	Agreement reached with consultee?
		assessing assets is outlined in ES Section 4.3.6.		
OAN	4.3.8 Reference to PPG15 should be updated in Scoping Report Section 8.57 9 letter para ref 8.57)	This has been applied to ES Section 4.2.1.	The Scoping Report will not be re-issued. This has been applied to ES Section 4.2.1.	N/A
OAN	4.3.9 LPA may wish to agree the list of consultees, eg national amenity societies should be consulted as well as EH (see Scoping Report Section 8.61) (letter para ref 8.61).	ES Section 3.0, Table 3.1.	This is an issue for the LPA. WYG advised the LPA to consult John Hinchcliffe (WHS officer).	N/A
OAN	4.3.10 The Scoping Report Section 8.63 must be reconsidered with respect to influence of topography. It is incorrect to say that the city is generally flat and that views are therefore restricted. Topography was important in Liverpool's development and fundamental in appreciating the character of city centre and dock estate (letter para ref 8.63).	ES Section 4.5	The Scoping Report will not be re-issued. This perspective is incorporated in the considerations of the impact of the development in ES Chapter 4.0, in terms of setting.	N/A
OAN	4.3.11 There are more than 14 Conservation Areas within the city. Has a short-list been selected? It would be useful to list them (Scoping Report Section 8.66) (letter para ref 8.66).	The 3 Conservation Areas relevant to the study area for Chapter 4.0 are illustrated and described in ES Section 4.3.6.	The Scoping Report will not be re-issued. There are 3 CAs relevant to Chapter 4.0, which have been described in ES Section 4.3.6.	N/A
OAN	4.3.12 Detailed view analysis methodology is subject to separate consultation and this document and the specific view points to be agreed should be referred to (see Scoping Report Section 8.67) (letter para ref 8.67).	ES Section 4.5	Where relevant to Chapter 4, viewpoints incorporated within Chapter 5 will be cross-referenced.	N/A
OAN	4.3.14 It will be important to assess the potential impact of any related transport proposals on the historic environment of the city and adjoining borough and the potential impact on transport infrastructure should be a factor alongside issues such as views analysis, considered to inform the boundary of the study area (letter para ref 8.121).	ES Section 4.5	The potential impact of related transport proposals, as described in Chapter 12, will be considered.	N/A
OAN	4.3.15 Cumulative effects on the historic environment should be assessed as part of the EIA (letter para ref 8.164).	ES Section 4.5.3	Cumulative impacts will be assessed	N/A
OAN	4.3.16 Receptor sensitivity. Confirmation should be included in the final agreed Scoping Report for the application of this approach to the historic environment (letter para ref: none).	ES Sections 4.2.4 and 4.3.6	The Scoping Report will not be re-issued. ES Section 4.2.4 and 4.3.6 detail the method used to determine the sensitivity of the receptor.	G Ives agreed that this methodology was acceptable in an e-mail dated 26/04/2010
4.4 Proposed Assessment Methodology	**4.4 Steven Broomhead, Northwest Regional Development Agency (NWDA) – letter dated 8/4/2010**			
OAN	4.4.1 Section 8.54 identifies PPGs 15 and 16 as relevant policy documents. These have been replaced by PPS15 (sic) (PPS5).	ES Section 4.2.1	This has been addressed within ES Section 4.2.1.	N/A
OAN	4.4.2 Liverpool North Docks was designated a strategic regional site in July 2009. The draft purposes include the aim to 'secure the restoration of the built heritage'. No further details are included.	ES Section 4.2.1	The designation of Liverpool North Docks as a strategic regional site has been added to ES Section 4.2.1.	A Gordon (principal planner with NWDA) said that the finalised purpose will not include additional detail to the generic terms provided in the draft purpose. E-mail dated 10/05/2010

Appendix 4.4: Heritage Impact Assessment

Liverpool Waters

Environmental Statement – Volume 2: Appendices – November 2011

Refer to 'Liverpool Waters Heritage Impact Assessment – Assessment of Potential Effects on the World Heritage Site' (November 2011)

Liverpool Waters

Appendix 4.5: Summary Assessment Tables

Refer to 'Liverpool Waters Heritage Impact Assessment – Assessment of Potential Effects on the World Heritage Site' (November 2011)

APPENDIX P

GROUNDSURE DATA

Enviro Insight

Address:	**A5036 Waterloo Road Vauxhall, Liverpool,**
Date:	**9 Oct 2018**
Reference:	**CMAPS-AAG-747728-4165-091018EDR**
Client:	**CENTREMAPS**

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	11-Jun-2015
Grid Reference:	333452,391297
Site Size:	3.31ha

Report Reference: CMAPS-AAG-747728-4165-091018EDR
Client Reference: 4165

Contents Page

Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	34	8	69	172
1.2 Additional Information – Historical Tank Database	1	1	45	48
1.3 Additional Information – Historical Energy Features Database	0	0	7	67
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	1	18
1.6 Historical military sites	0	0	0	0
1.7 Potentially Infilled Land	23	2	9	22

Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	2
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	1
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	4
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	2	12	8
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	2	7
2.3.2 National Incidents Recording System, List 1	0	0	1	1
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 3: Landfill and Other Waste Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency/Natural Resources Wales Registered Landfill Sites	0	0	0	0	0	Not searched
3.1.2 Environment Agency/Natural Resources Wales Historic Landfill Sites	1	1	1	0	0	2
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	0
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	2	1	0	6	Not searched	Not searched
3.2.2 Environment Agency/Natural Resources Wales Licensed Waste Sites	0	0	1	2	4	10

Section 4: Current Land Use

	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	1	4	18	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	2
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology

5.1 Records of Artificial Ground and Made Ground present beneath the study site	Identified
5.2 Records of Superficial Ground and Drift Geology present beneath the study site	Identified
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology

	0-500m
6.1 Records of Strata Classification in the Superficial Geology within 500m of the study site	Identified
6.2 Records of Strata Classification in the Bedrock Geology within 500m of the study site	Identified

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	9	8
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	1
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	1	0	#250GWV #	#500GWV #	Not searched	Not searched

Section 6: Hydrogeology and Hydrology

	0-500m					
	On-site	0-50m	51-250	251-500	501-1000	1000-1500
6.9 Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site	No	No	No	No	Yes	No
6.10 Ordnance Survey MasterMap Water Network entries within 500m of the site	4	2	8	4	Not searched	Not searched
6.11 Surface water features within 250m of the study site	Yes	Yes	Yes	Not searched	Not searched	Not searched

Section 7: Flooding

7.1 Enviroment Agency Zone 2 floodplains within 250m of the study site	Identified
7.2 Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	Identified
7.3 Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site	High
7.4 Flood Defences within 250m of the study site	None identified
7.5 Areas benefiting from Flood Defences within 250m of the study site	None identified
7.6 Areas used for Flood Storage within 250m of the study site	None identified
7.7 Maximum BGS Groundwater Flooding susceptibility within 50m of the study site	Not Prone
7.8 BGS confidence rating for the Groundwater Flooding susceptibility areas	Not Applicable

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	2	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	1	0
8.5 Records of Ramsar sites	0	0	0	0	1	0
8.6 Records of Ancient Woodlands	0	0	0	0	0	0
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
8.8 Records of World Heritage Sites	2	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	0	0	0	0	0	0
8.14 Records of Green Belt land	0	0	0	0	0	0

Section 9: Natural Hazards

9.1 Maximum risk of natural ground subsidence	Moderate
9.1.1 Maximum Shrink-Swell hazard rating identified on the study site	Very Low
9.1.2 Maximum Landslides hazard rating identified on the study site	Very Low
9.1.3 Maximum Soluble Rocks hazard rating identified on the study site	Negligible
9.1.4 Maximum Compressible Ground hazard rating identified on the study site	Moderate
9.1.5 Maximum Collapsible Rocks hazard rating identified on the study site	Negligible
9.1.6 Maximum Running Sand hazard rating identified on the study site	Very Low
9.2 Radon	
9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.

Section 10: Mining

10.1 Coal mining areas within 75m of the study site	None identified
10.2 Non-Coal Mining areas within 50m of the study site boundary	None identified
10.3 Brine affected areas within 75m of the study site	None identified

Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licences, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

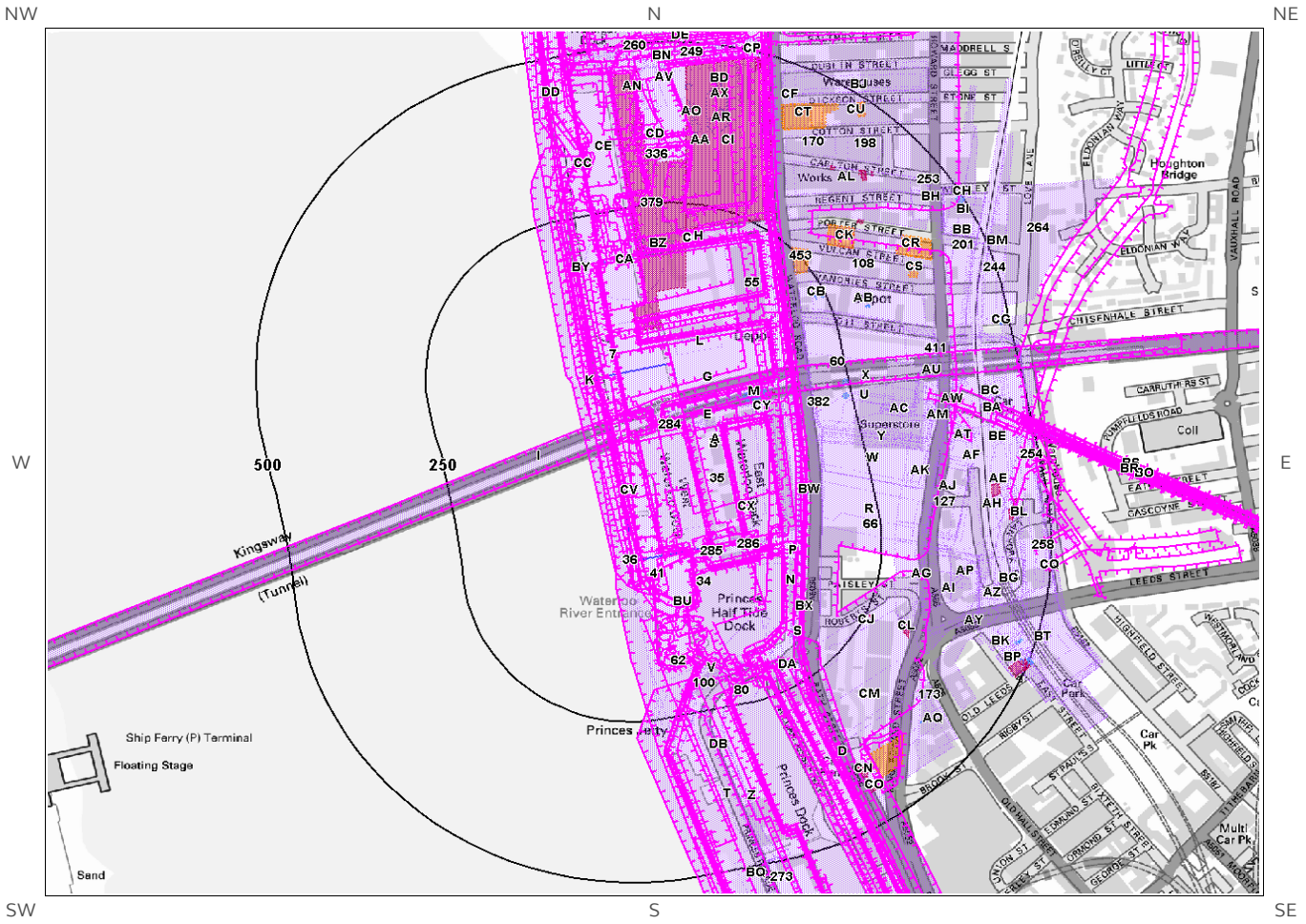
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Historical Land Use



Historical 1:10,000 and 1:10,560 scale mapping

Site Outline

Industrial Land Use

Potentially Infilled Land

250
500
Search Buffers (m)

Historical 1:2,500, 1:1,250 and 1:500 scale mapping

Energy Features

Petrol Stations

Historical military sites

Tanks

Garages

1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 283

ID	Distance [m]	Direction	Use	Date
1A	0	On Site	Railway Sidings	1982
2A	0	On Site	Railway Sidings	1973
3D	0	On Site	Docks	1982
4C	0	On Site	Docks	1982
5B	0	On Site	Docks	1938
6B	0	On Site	Docks	1909
7	0	On Site	Railway Sidings	1990
8C	0	On Site	Docks	1973
9D	0	On Site	Docks	1973
10A	0	On Site	Railway Sidings	1967
11CY	0	On Site	Docks	1967
12E	0	On Site	Docks	1890
13E	0	On Site	Docks	1906
14G	0	On Site	Docks	1990
15CW	0	On Site	Docks	1938
16F	0	On Site	Railway Sidings	1906
17F	0	On Site	Railway Sidings	1938
18Q	0	On Site	Railway Sidings	1927
19	0	On Site	Railway Sidings	1938
20F	0	On Site	Railway Sidings	1909
21H	0	On Site	Dock	1927
22J	0	On Site	Docks	1928
23K	0	On Site	Docks	1928
24G	0	On Site	Railway Sidings	1928
25H	0	On Site	Dock	1927
26I	0	On Site	Tunnel	1973
27I	0	On Site	Tunnel	1990
28I	0	On Site	Tunnel	1982
29J	0	On Site	Docks	1928
30K	0	On Site	Docks	1928
31CV	0	On Site	Dock	1851
32BV	0	On Site	Dock	1851
33CX	0	On Site	Dock	1851
34	0	On Site	Basin	1851

35	1	E	Unspecified Warehouse	1967
36	1	SW	Unspecified Tank	1928
37O	9	SE	Railway Sidings	1890
38BY	10	N	Dock	1851
39L	15	NE	Unspecified Depot	1990
40L	15	NE	Unspecified Depot	1982
41	26	S	Unspecified Tank	1906
42CZ	30	N	Dock	1851
43DA	53	E	Dock	1851
44DB	90	S	Dock	1851
45M	90	E	Unspecified Tank	1967
46M	95	E	Unspecified Tanks	1982
47M	95	E	Unspecified Tanks	1990
48N	106	E	Dock	1927
49N	106	E	Dock	1927
50	107	SE	Railway Sidings	1928
51O	107	E	Unspecified Warehouse	1990
52O	107	E	Unspecified Warehouse	1967
53O	107	E	Unspecified Warehouses	1973
54O	107	E	Unspecified Warehouse	1982
55	109	NE	Unspecified Warehouse	1982
56CA	110	N	Ferry Terminal	1982
57P	110	E	Fire Station	1973
58P	110	E	Fire Station	1967
59Q	127	SE	Railway Station	1928
60	146	E	Goods Station	1928
61AH	159	E	Railway Sidings	1967
62	161	S	Customs Depot	1928
63S	164	SE	Railway Station	1927
64R	165	E	Unspecified Commercial/Industrial	1982
65R	165	E	Unspecified Warehouses	1973
66	165	E	Unspecified Warehouses	1967
67DC	165	N	Dock	1851
68S	165	SE	Railway Station	1938
69S	168	SE	Railway Station	1938
70U	169	E	Goods Station	1851
71V	170	S	Customs Depot	1938
72BZ	172	N	Unspecified Tanks	1967
73AA	172	N	Unspecified Commercial/Industrial	1967
74T	172	SE	Dock	1928
75T	172	SE	Dock	1928
76S	174	SE	Railway Station	1909
77U	175	E	Unspecified Commercial/Industrial	1890
78W	177	E	Oil Cake Mills	1906

79V	178	S	Customs Depot	1927
80	180	S	Railway Sidings	1990
81S	181	SE	Railway Station	1906
82V	182	S	Customs Depot	1909
83V	182	S	Customs Depot	1938
84W	182	E	Oil and Cake Mills	1909
85W	182	E	Oil and Cake Mills	1938
86X	183	E	Goods Station	1906
87X	185	E	Goods Station	1938
88Y	185	E	Unspecified Commercial/Industrial	1982
89Y	185	E	Unspecified Mills	1973
90W	185	E	Unspecified Mills	1967
91X	187	E	Goods Station	1927
92X	188	E	Goods Station	1938
93X	188	E	Goods Station	1909
94X	191	E	Goods Station	1967
95V	197	S	Customs Depot	1906
96Z	199	S	Dock	1927
97Z	199	S	Dock	1927
98AA	204	N	Power Station	1973
99AB	206	NE	Unspecified Depot	1967
100	208	S	Customs Depot	1890
101AA	209	N	Disused Power Station	1990
102AA	209	N	Disused Power Station	1982
103AA	219	N	Abattoir	1938
104CJ	219	SE	Unspecified Warehouses	1967
105AB	223	E	Unspecified Depot	1973
106AB	223	E	Unspecified Depot	1990
107AB	223	E	Unspecified Depot	1982
108	233	NE	Unspecified Warehouses	1967
109CE	238	N	Basin	1851
110AC	240	E	Railway Sidings	1890
111AC	247	E	Railway Sidings	1928
112AD	263	NE	Unspecified Mills	1973
113AD	263	NE	Unspecified Commercial/Industrial	1990
114AD	263	NE	Unspecified Commercial/Industrial	1982
115AG	269	E	Hospital	1928
116AF	270	E	Railway Sidings	1928
117AK	275	E	Goods Station	1928
118AE	284	E	Railway Sidings	1938
119AE	284	E	Railway Sidings	1906
120AF	287	E	Railway Sidings	1927
121AF	289	E	Railway Sidings	1909
122AC	290	E	Railway Sidings	1938

123AF	299	E	Goods Station	1851
124CM	302	SE	Unspecified Warehouses	1967
125AG	304	E	Unspecified Commercial/Industrial	1890
126AH	306	E	Railway Sidings	1890
127	307	E	Railway Building	1890
128AI	309	E	Hospital	1938
129AI	309	E	Hospital	1906
130AL	311	NE	Unspecified Works	1990
131AI	311	E	Hospital	1851
132AI	312	E	Hospital	1927
133AJ	313	E	Goods Station	1906
134AJ	313	E	Goods Station	1938
135AI	313	E	Hospital	1938
136AI	313	E	Hospital	1909
137AH	313	E	Railway Sidings	1938
138AE	313	E	Unspecified Commercial/Industrial	1938
139AF	313	E	Unspecified Commercial/Industrial	1909
140AI	314	E	Hospital	1973
141AI	314	E	Hospital	1967
142AK	316	E	Goods Station	1927
143AJ	316	E	Goods Station	1938
144AJ	316	E	Goods Station	1909
145AJ	319	E	Railway Sidings	1851
146AJ	319	E	Goods Station	1967
147AL	320	NE	Unspecified Works	1967
148AN	335	N	Dock	1851
149DD	341	N	Dock	1851
150AK	345	E	Railway Building	1890
151AA	347	N	Unspecified Tank	1967
152AM	350	E	Railway Building	1928
153AM	355	E	Railway Building	1890
154AN	355	N	Railway Sidings	1909
155AV	355	N	Unspecified Commercial/Industrial	1909
156AA	358	N	Chimney	1990
157AP	358	E	Railway Building	1890
158AW	359	E	Tunnel	1851
159AO	361	N	Unspecified Tanks	1973
160AO	361	N	Unspecified Tanks	1982
161AS	361	SE	Coal Yards	1851
162AU	364	E	Railway Building	1928
163AP	364	E	Railway Building	1928
164AQ	364	SE	Hospital	1973
165AQ	364	SE	Hospital	1990

166AQ	364	SE	Hospital	1982
167AR	369	N	Unspecified Tank	1973
168AR	369	N	Unspecified Tank	1990
169AR	369	N	Unspecified Tank	1982
170	371	NE	Unspecified Works	1967
171AY	374	SE	Basin	1851
172AP	375	E	Unspecified Tank	1927
173	376	SE	Hospital	1967
174AQ	376	SE	Basin	1851
175AP	378	E	Railway Building	1928
176AM	379	E	Railway Buildings	1890
177AS	379	SE	Unspecified Heap	1909
178AT	380	E	Railway Building	1890
179AT	381	E	Unspecified Ground Workings	1990
180AT	385	E	Railway Building	1906
181AS	385	SE	Unspecified Heap	1906
182AU	387	E	Railway Building	1890
183AT	388	E	Railway Building	1927
184AT	390	E	Railway Building	1938
185AP	391	E	Railway Building	1890
186AU	394	E	Railway Building	1906
187AU	394	E	Railway Building	1938
188AR	395	N	Unspecified Tank	1967
189BA	395	E	Tunnel	1973
190AH	396	E	Railway Sidings	1990
191AV	397	N	Railway Sidings	1890
192	397	N	Railway Sidings	1906
193AW	400	E	Railway Building	1906
194CU	405	NE	Unspecified Depot	1967
195AX	405	N	Unspecified Tank	1973
196AX	405	N	Unspecified Tank	1982
197AZ	407	E	Railway Buildings	1927
198	409	NE	Unspecified Depot	1967
199AY	410	E	Unspecified Commercial/Industrial	1906
200AZ	411	E	Railway Buildings	1938
201	415	E	Unspecified Commercial/Industrial	1928
202BG	419	E	Unspecified Commercial/Industrial	1906
203BH	420	NE	Unspecified Commercial/Industrial	1928
204BB	424	E	Unspecified Mill	1967
205AH	424	E	Railway Building	1890
206AV	428	N	Unspecified Tank	1967
207AE	431	E	Railway Building	1906

208BA	432	E	Railway Building	1890
209BC	432	E	Railway Building	1890
210BB	436	NE	Railway Sidings	1890
211AE	437	E	Railway Building	1938
212BA	438	E	Railway Building	1906
213BC	438	E	Railway Building	1906
214BC	438	E	Railway Building	1938
215BD	439	N	Unspecified Tank	1967
216BE	439	E	Railway Building	1890
217BD	440	N	Unspecified Tank	1982
218BD	440	N	Unspecified Tank	1973
219BD	440	N	Unspecified Tank	1990
220BA	441	E	Unspecified Pit	1982
221BA	441	E	Unspecified Pit	1990
222BC	442	E	Railway Buildings	1927
223BE	444	E	Railway Building	1906
224BF	445	E	Railway Sidings	1851
225BF	445	E	Railway Sidings	1973
226BG	445	E	Railway Buildings	1938
227BH	446	NE	Unspecified Commercial/Industrial	1906
228BK	446	E	Railway Building	1928
229BJ	448	NE	Warehouses	1851
230BR	448	E	Tunnel	1851
231BI	448	NE	Unspecified Depot	1982
232BI	448	NE	Unspecified Depot	1973
233BI	448	NE	Unspecified Depot	1990
234BJ	449	N	Unspecified Warehouse	1906
235BJ	449	N	Unspecified Warehouses	1973
236BJ	449	N	Unspecified Warehouses	1982
237BJ	449	N	Unspecified Warehouses	1990
238BJ	449	N	Unspecified Warehouses	1967
239BL	450	E	Railway Building	1906
240BK	453	E	Railway Building	1909
241BP	453	E	Railway Building	1906
242BL	454	E	Railway Building	1938
243BF	455	E	Railway Building	1928
244	455	E	Unspecified Mill	1967
245BS	455	E	Tunnel	1928
246BI	455	NE	Unspecified Commercial/Industrial	1909
247BJ	458	N	Unspecified Warehouses	1909
248BJ	458	N	Unspecified Commercial/Industrial	1938
249	460	N	Railway Sidings	1927
250BN	460	N	Unspecified Commercial/Industrial	1938

251BM	461	E	Railway Buildings	1938
252BM	461	E	Railway Buildings	1909
253	466	NE	Unspecified Tank	1928
254	467	E	Unspecified Warehouses	1928
255BE	471	E	Railway Building	1890
256BQ	473	S	Railway Station	1928
257BK	475	E	Unspecified Tank	1851
258	476	E	Basin	1851
259BN	477	N	Graving Docks	1851
260	479	N	Railway Sidings	1928
261BO	482	E	Tunnel	1906
262CP	484	N	Railway Sidings	1906
263BO	485	E	Tunnel	1938
264	486	E	Unspecified Commercial/Industrial	1928
265BP	489	E	Railway Building	1927
266BP	490	E	Railway Building	1851
267BP	490	E	Railway Building	1938
268BQ	492	S	Railway Station	1909
269BP	492	E	Railway Building	1938
270CH	494	NE	Unspecified Tank	1927
271BQ	494	S	Railway Station	1927
272BR	494	E	Tunnel	1927
273	495	S	Railway Station	1938
274BS	496	E	Tunnel	1909
275BR	496	E	Tunnel	1938
276DE	496	N	Dock	1851
277BR	496	E	Tunnel	1973
278BR	496	E	Tunnel	1967
279BT	497	E	Railway Building	1890
280BT	498	E	Railway Building	1927
281BT	499	E	Railway Building	1906
282BT	499	E	Railway Building	1938
283BT	499	E	Railway Building	1909

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary: 95

ID	Distance (m)	Direction	Use	Date
284	0	On Site	Unspecified Tank	1927

285	11	S	Unspecified Tank	1927
286	51	E	Unspecified Tank	1927
287BU	80	S	Tanks	1975
288BU	81	S	Unspecified Tank	1996
289BU	81	S	Unspecified Tank	1993
290BU	81	S	Unspecified Tank	1982
291BU	81	S	Unspecified Tank	1983
292BU	82	S	Unspecified Tank	1975
293BV	91	E	Unspecified Tank	1983
294BV	91	E	Unspecified Tank	1982
295BV	92	E	Unspecified Tank	1975
296BV	92	E	Tanks	1969
297BV	92	E	Tanks	1953
298BV	93	E	Tanks	1962
299BV	93	E	Tanks	1953
300M	106	E	Tanks	1982
301M	106	E	Tanks	1983
302M	106	E	Unspecified Tank	1975
303M	119	E	Tanks	1983
304M	119	E	Tanks	1982
305M	120	E	Tanks	1975
306M	120	E	Tanks	1969
307BW	153	E	Unspecified Tank	1982
308BW	153	E	Unspecified Tank	1982
309BW	153	E	Unspecified Tank	1983
310BW	156	E	Unspecified Tank	1983
311BW	156	E	Unspecified Tank	1982
312BX	167	SE	Unspecified Tank	1982
313BX	167	SE	Unspecified Tank	1983
314BX	171	SE	Unspecified Tank	1983
315BX	171	SE	Unspecified Tank	1982
316BY	172	N	Unspecified Tank	1908
317BZ	172	N	Tanks	1962
318BZ	172	N	Tanks	1962
319CA	173	N	Unspecified Tank	1927
320BZ	173	N	Unspecified Tank	1908
321H	173	N	Tanks	1962
322H	174	N	Tanks	1962
323BY	174	N	Unspecified Tank	1927
324BZ	192	N	Tanks	1962
325BZ	192	N	Tanks	1962
326CB	233	NE	Tanks	1893
327U	235	E	Unspecified Tank	1996
328X	240	E	Unspecified Tank	1996
329CB	242	NE	Tanks	1908
330CB	242	NE	Tanks	1927

331AB	299	E	Unspecified Tank	1984
332AB	299	E	Unspecified Tank	1984
333AB	300	E	Unspecified Tank	1967
334AB	300	E	Unspecified Tank	1996
335AB	300	E	Unspecified Tank	1996
336	318	N	Unspecified Tank	1908
337CC	322	N	Unspecified Tank	1908
338CC	323	N	Unspecified Tank	1927
339CD	349	N	Unspecified Tank	1927
340CD	349	N	Unspecified Tank	1908
341CE	355	N	Unspecified Tank	1908
342CE	356	N	Unspecified Tank	1927
343AO	358	N	Tanks	1984
344AO	359	N	Tanks	1967
345AX	366	N	Tanks	1984
346AX	366	N	Tanks	1967
347AO	374	N	Tanks	1967
348AO	393	N	Tanks	1967
349AR	393	N	Unspecified Tank	1958
350AR	393	N	Unspecified Tank	1962
351AS	404	SE	Unspecified Tank	1968
352AQ	412	SE	Unspecified Tank	1984
353AV	426	N	Unspecified Tank	1958
354AV	426	N	Unspecified Tank	1962
355AX	436	N	Unspecified Tank	1958
356AX	437	N	Tanks	1967
357AX	437	N	Unspecified Tank	1962
358CF	446	NE	Unspecified Tank	1984
359CF	446	NE	Unspecified Tank	1984
360CF	447	NE	Unspecified Tank	1996
361CF	447	NE	Unspecified Tank	1996
362CF	447	NE	Unspecified Tank	1967
363BT	470	E	Unspecified Tank	1927
364BT	475	E	Unspecified Tank	1969
365BT	475	E	Unspecified Tank	1953
366BT	475	E	Unspecified Tank	1962
367BT	475	E	Unspecified Tank	1953
368BP	484	E	Unspecified Tank	1893
369CG	485	E	Unspecified Tank	1984
370CG	485	E	Unspecified Tank	1984
371CG	485	E	Unspecified Tank	1996
372CG	485	E	Unspecified Tank	1996
373CH	489	NE	Unspecified Tank	1927
374BP	491	E	Unspecified Tank	1908
375BP	492	E	Unspecified Tank	1927
376BP	495	E	Unspecified Tank	1963

377BP	495	E	Unspecified Tank	1953
378BP	495	E	Unspecified Tank	1953

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary: 74

ID	Distance (m)	Direction	Use	Date
379	58	N	Disused Power Station	1993
380M	135	E	Electricity Substation	1993
381M	135	E	Electricity Substation	1996
382	193	E	Electricity Substation	1969
383CI	209	N	Disused Power Station	1984
384CI	209	N	Disused Power Station	1984
385CI	209	N	Power Station	1967
386CJ	256	SE	Electricity Substation	1996
387CJ	256	SE	Electricity Substation	1993
388CJ	256	SE	Electricity Substation	1983
389CJ	256	SE	Electricity Substation	1982
390CK	302	NE	Electricity Substation	1996
391CK	302	NE	Electricity Substation	1996
392CK	306	NE	Electricity Substation	1984
393CK	306	NE	Electricity Substation	1984
394CL	306	SE	Electricity Substation	1993
395CL	306	SE	Electricity Substation	1996
396CL	306	SE	Electricity Substation	1969
397CL	306	SE	Electricity Substation	1953
398CL	306	SE	Electricity Substation	1975
399CL	307	SE	Electricity Substation	1953
400CK	307	NE	Electricity Substation	1967
401CL	309	SE	Electricity Substation	1982
402CL	309	SE	Electricity Substation	1982
403CL	309	SE	Electricity Substation	1983
404CM	318	SE	Electricity Substation	1984
405AD	348	NE	Electricity Substation	1984
406AD	348	NE	Electricity Substation	1984
407AD	350	NE	Electricity Substation	1996
408AD	350	NE	Electricity Substation	1996
409AL	381	NE	Electricity Substation	1953
410AL	381	NE	Electricity Substation	1953
411	382	E	Electricity Substation	1969

412AL	399	NE	Electricity Substation	1984
413AL	399	NE	Electricity Substation	1984
414AL	399	NE	Electricity Substation	1996
415AL	399	NE	Electricity Substation	1996
416AL	399	NE	Electricity Substation	1967
417AL	403	NE	Electricity Substation	1953
418CN	406	SE	Electricity Substation	1978
419CN	407	SE	Electricity Substation	1984
420AL	413	NE	Electricity Substation	1953
421AE	419	E	Electricity Substation	1982
422AE	419	E	Electricity Substation	1982
423AE	419	E	Electricity Substation	1983
424AE	420	E	Electricity Substation	1996
425AE	420	E	Electricity Substation	1993
426AH	439	E	Electricity Substation	1996
427AH	439	E	Electricity Substation	1993
428AH	439	E	Electricity Substation	1983
429AH	439	E	Electricity Substation	1982
430AH	440	E	Electricity Substation	1975
431AH	440	E	Electricity Substation	1969
432AH	440	E	Electricity Substation	1953
433AH	440	E	Electricity Substation	1953
434CO	442	SE	Electricity Substation	1954
435CO	442	SE	Electricity Substation	1968
436CO	442	SE	Electricity Substation	1954
437CP	473	N	Gas Governor	1996
438CP	473	N	Gas Governor	1996
439CP	473	N	Gas Governor	1984
440CP	473	N	Gas Governor	1984
441CP	475	N	Gas Governor	1967
442BP	476	SE	Electricity Substation	1984
443BP	488	E	Electricity Substation	1984
444BP	494	E	Electricity Substation	1995
445BP	494	E	Electricity Substation	1995
446CQ	496	E	Electricity Substation	1983
447CQ	496	E	Electricity Substation	1987
448BP	496	E	Electricity Substation	1989
449BP	496	E	Electricity Substation	1986
450CQ	496	E	Electricity Substation	1989
451CQ	497	E	Electricity Substation	1995
452CQ	497	E	Electricity Substation	1995

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 19

ID	Distance (m)	Direction	Use	Date
453	229	NE	Garage	1967
454CK	293	NE	Garage	1958
455CK	294	NE	Garage	1962
456CR	371	NE	Garage	1996
457CR	371	NE	Garage	1996
458CS	373	E	Garage	1996
459CS	373	E	Garage	1996
460CR	383	NE	Garage	1984
461CR	383	NE	Garage	1984
462CR	384	NE	Garage	1967
463CT	399	NE	Repairing Works	1908
464CT	399	NE	Repairing Works	1893
465AS	399	SE	Garage	1954
466AS	399	SE	Garage	1968
467AS	399	SE	Garage	1954
468CT	399	NE	Ship Repairing Works	1953
469CT	400	NE	Ship Repairing Works	1953
470CU	471	NE	Engineering Workshop	1953
471CU	472	NE	Engineering Workshop	1953

1.6 Historical military sites

Certain military installations were not noted on historic mapping for security reasons. Whilst not all military land is necessarily of concern, Groundsure has researched and digitised a number of Ordnance Factories and other military industrial features (e.g. Ordnance Depots, Munitions Testing Grounds) which may be of contaminative concern. This research was drawn from a number of different sources, and should not be regarded as a definitive or exhaustive database of potentially contaminative military installations. The boundaries of sites within this database have been estimated from the best evidence available to Groundsure at the time of compilation.

Records of historical military sites within 500m of the search boundary: 0

Database searched and no data found.

1.7 Potentially Infilled Land

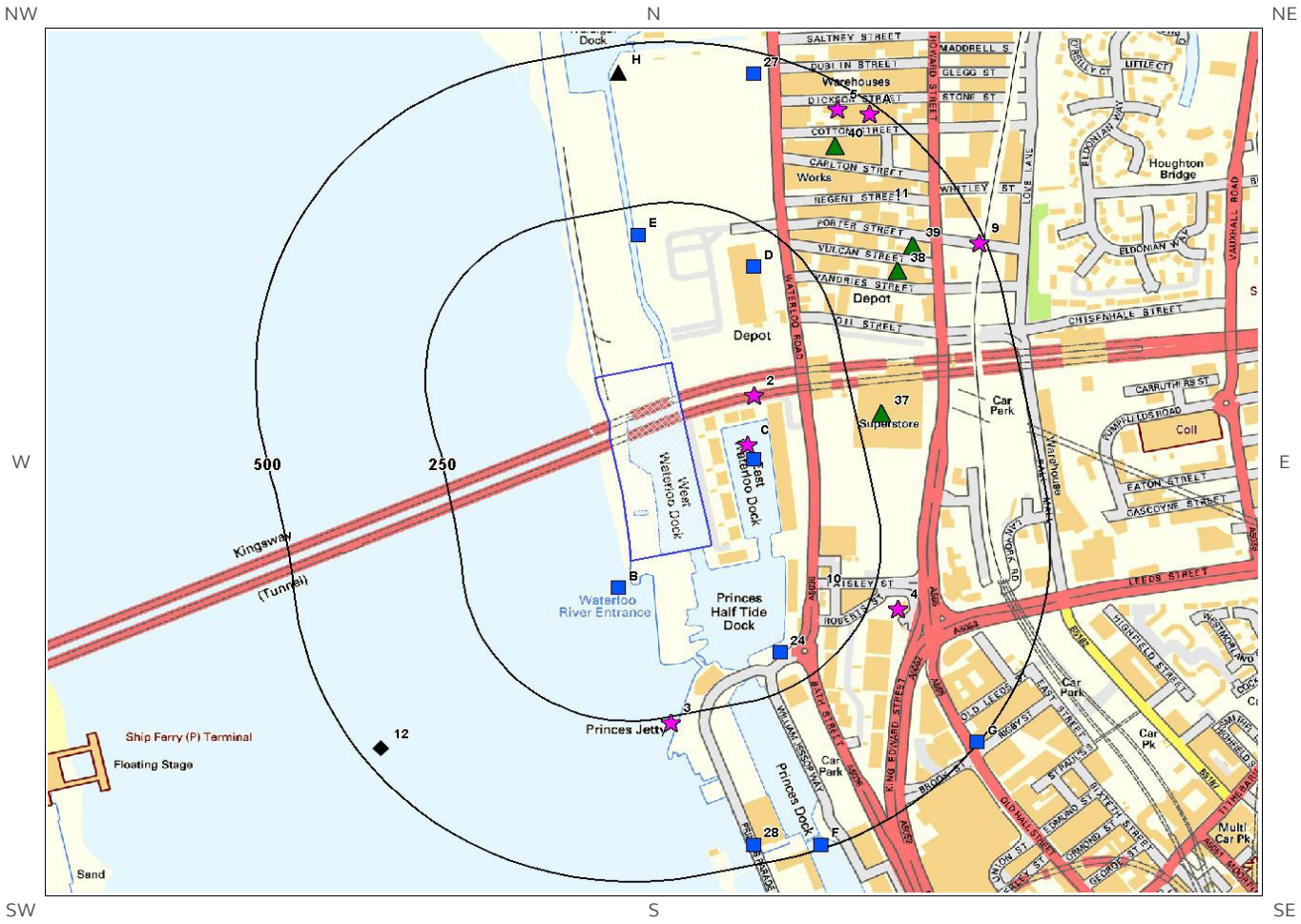
Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 56

The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
472I	0	On Site	Tunnel	1982
473I	0	On Site	Tunnel	1973
474I	0	On Site	Tunnel	1990
475D	0	On Site	Docks	1982
476D	0	On Site	Docks	1973
477CV	0	On Site	Dock	1851
478G	0	On Site	Docks	1990
479K	0	On Site	Docks	1928
480CW	0	On Site	Docks	1938
481E	0	On Site	Docks	1890
482E	0	On Site	Docks	1906
483J	0	On Site	Docks	1928
484C	0	On Site	Docks	1982
485C	0	On Site	Docks	1973
486H	0	On Site	Dock	1927
487H	0	On Site	Dock	1927
488BV	0	On Site	Dock	1851
489CX	0	On Site	Dock	1851
490B	0	On Site	Docks	1938
491B	0	On Site	Docks	1909
492CY	0	On Site	Docks	1967
493J	0	On Site	Docks	1928
494K	0	On Site	Docks	1928
495BY	10	N	Dock	1851
496CZ	30	N	Dock	1851
497DA	53	E	Dock	1851
498DB	90	S	Dock	1851
499N	106	E	Dock	1927
500N	106	E	Dock	1927
501DC	165	N	Dock	1851
502T	172	SE	Dock	1928
503T	172	SE	Dock	1928
504Z	199	S	Dock	1927
505Z	199	S	Dock	1927
506AN	335	N	Dock	1851

507DD	341	N	Dock	1851
508AW	359	E	Tunnel	1851
509AS	379	SE	Unspecified Heap	1909
510AT	381	E	Unspecified Ground Workings	1990
511CN	385	SE	Unspecified Heap	1906
512BA	395	E	Tunnel	1973
513BA	441	E	Unspecified Pit	1990
514BA	441	E	Unspecified Pit	1982
515	446	E	Canal	1851
516BR	448	E	Tunnel	1851
517BS	455	E	Tunnel	1928
518	475	E	Canal	1928
519BN	477	N	Graving Docks	1851
520BO	482	E	Tunnel	1906
521BO	485	E	Tunnel	1938
522BR	494	E	Tunnel	1927
523BR	496	E	Tunnel	1938
524BR	496	E	Tunnel	1909
525DE	496	N	Dock	1851
526BR	496	E	Tunnel	1973
527BR	496	E	Tunnel	1967

2. Environmental Permits, Incidents and Registers Map



Site Outline

250
500
Search Buffers (m)

Recorded Pollution Incident

Dangerous Substances (List 1)

Dangerous Substances (List 2)

Water Industry Referrals

Licenced Discharge Consents

Red List Discharge Consents

RAS 3 & 4 Authorisations

Part A(1) Authorised Processes and Historic IPC Authorisations

Part A(2) and Part B Authorised Processes

COMAH / NIHHS Sites

Sites Determined as Contaminated Land

Hazardous Substance Consents and Enforcements

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency/Natural Resources Wales and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

2

The following IPC Authorisations are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
41H	456	N	333400 391900	Operator: North Western Ship Repairers and Shipbuilders Ltd Address: Clarence Drydocks, Regent Road, Bootle, L20 4RD Process: Coating Processes And Printing	Permit Number: AU7761 Original Permit Number: IPCAPP Date Approved: 26-11-1996 Effective Date: 3-12-1996 Status: Superseded By Variation
42H	456	N	333400 391900	Operator: North Western Ship Repairers and Shipbuilders Ltd Address: Clarence Drydocks, Regent Road, Bootle, L20 4RD Process: Coating Processes And Printing	Permit Number: BD4678 Original Permit Number: IPCMINVAR Date Approved: 24-11-1998 Effective Date: 30-11-1998 Status: Revoked

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

0

Database searched and no data found.

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

1

The following List 1 Dangerous Substance Inventory Site records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
12	472	SW	333050 390850	Name: Scottsfield Screening Plant, Wallasey Status: Not Active Receiving Water: Any	Authorised Substances: Cadmium

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

4

The following Part A(2) and Part B Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
37	286	E	333789 391370	Address: Costco Petrol Filling Station, 37-39 Great Howard St, Liverpool, L3 7AN Process: Unloading of Petrol into Storage at Service Stations Status: Current Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified
38	361	NE	333813 391591	Address: A&M Metals, 3-9 Vulcan Street, Liverpool, L3 7BG Process: Non-ferrous Metal Foundry Processes Status: Current Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified
39	398	NE	333834 391631	Address: Esso, 121-127 Great Howard Street, Liverpool, L3 7AT Process: Unloading of Petrol into Storage at Service Stations	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified

ID	Distance (m)	Direction	NGR	Details	
				Status: Current Permit Permit Type: Part B	
40	413	NE	333721 391786	Address: GTB Demolition Co. Limited, 25 Cotton Street, L3 7DY Process: Other Mineral Processes Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

22

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
13B	47	SW	333400 391100	Address: MERSEY DOCKS & HARBOUR CO, DOCK MASTERS OFFICE, WATERLOO WEST, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY Permit Number: 016990737 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
14B	47	SW	333400 391100	Address: MERSEY DOCKS & HARBOUR CO, NDLB SCHOOL, PRINCES, NORTH, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 016990736 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
15C	87	E	333600 391300	Address: MERSEY DOCKS & HARBOUR CO, PRINCES, HALF TIDE, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY Permit Number: 016990726 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
16C	87	E	333600 391300	Address: MERSEY DOCKS & HARBOUR CO, SANDON, EAST, LIVERPOOL, MERSEYSIDE Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016990725 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
17C	87	E	333600 391300	Address: MERSEY DOCKS & HARBOUR CO, WATERLOO, EAST, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date:

ID	Distance (m)	Direction	NGR	Details	
				Permit Number: 016990728 Permit Version: 1	Revocation Date:
18C	87	E	333600 391300	Address: MERSEY DOCKS & HARBOUR CO, PRINCES, HALF TIDE, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY Permit Number: 016990724 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
19C	87	E	333600 391300	Address: MERSEY DOCKS & HARBOUR CO, WATERLOO, EAST, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY Permit Number: 016990727 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
20D	192	NE	333600 391600	Address: MERSEY DOCKS & HARBOUR CO, TRAFALGAR, EAST, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY Permit Number: 016990722 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
21D	192	NE	333600 391600	Address: MERSEY DOCKS & HARBOUR CO, TRAFALGAR, EAST, LIVERPOOL, MERSEYSIDE Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016990721 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
22D	192	NE	333600 391600	Address: MERSEY DOCKS & HARBOUR CO, WATERLOO, EAST, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY Permit Number: 016990720 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
23D	192	NE	333600 391600	Address: MERSEY DOCKS & HARBOUR CO, TRAFALGAR, EAST, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY Permit Number: 016990719 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
24	196	SE	333640 391000	Address: MERSEY DOCKS & HARBOUR CO, PRINCES, HALF TIDE, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY Permit Number: 016990707 Permit Version: 1	Receiving Water: RIVER MERSEY Status: LAPSED UNDER SCHEDULE 23 ENVIRONMENT ACT 1995 Issue date: Effective Date: Revocation Date: 01/10/1996
25E	205	N	333430 391650	Address: TRAFALGAR E - SHED, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 016990735 Permit Version: 1	Receiving Water: - Status: REVOKED - UNSPECIFIED Issue date: Effective Date: 01-Apr-1991 Revocation Date: 31/12/1994
26E	205	N	333430 391650	Address: TRAFALGAR E - SHED, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: 016990735	Receiving Water: - Status: LAPSED UNDER SCHEDULE 23 ENVIRONMENT ACT 1995 Issue date: Effective Date: 01-Jan-1995 Revocation Date: 01/10/1996

ID	Distance (m)	Direction	NGR	Details	
				Permit Version: 2	
27	465	N	333600 391900	Address: MERSEY DOCKS & HARBOUR CO, PRINCES, HALF TIDE, LIVERPOOL, MERSEYSIDE Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016990723 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
28	470	S	333600 390700	Address: MERSEY DOCKS & HARBOUR CO, PRINCES, WEST, LIVERPOOL, MERSEYSIDE Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016990710 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
29F	494	S	333700 390700	Address: MERSEY DOCKS & HARBOUR CO, PRINCES, EAST, LIVERPOOL, MERSEYSIDE Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016990731 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
30F	494	S	333700 390700	Address: MERSEY DOCKS & HARBOUR CO, PRINCES, EAST, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY Permit Number: 016990729 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
31F	494	S	333700 390700	Address: MERSEY DOCKS & HARBOUR CO, PRINCES, EAST, LIVERPOOL, MERSEYSIDE Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - NOT WATER COMPANY Permit Number: 016990730 Permit Version: 1	Receiving Water: RIVER MERSEY Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: Effective Date: Revocation Date:
32G	498	SE	333930 390860	Address: ST PAULS SQUARE PHASE 2 & 3, OLD HALL STREET, LIVERPOOL, ., MERSEYSIDE, L3 9SY Effluent Type: TRADE DISCHARGES - COOLING WATER Permit Number: 016993903 Permit Version: 3	Receiving Water: G.WATERS REINJECTION BOREHOLE Status: VARIED UNDER EPR 2010 Issue date: 01/03/2013 Effective Date: 01-Mar-2013 Revocation Date:
33G	498	SE	333930 390860	Address: ST PAULS SQUARE PHASE 2 & 3, OLD HALL STREET, LIVERPOOL, ., MERSEYSIDE, L3 9SY Effluent Type: GROUNDWATER - BOREHOLE Permit Number: 016993903 Permit Version: 1	Receiving Water: G.WATERS REINJECTION BOREHOLE Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 15/08/2006 Effective Date: 15-Aug-2006 Revocation Date: 17/03/2008
34G	498	SE	333930 390860	Address: ST PAULS SQUARE PHASE 2 & 3, OLD HALL STREET, LIVERPOOL, ., MERSEYSIDE, L3 9SY Effluent Type: TRADE DISCHARGES - COOLING WATER Permit Number: 016993903 Permit Version: 2	Receiving Water: G.WATERS REINJECTION BOREHOLE Status: VARIED BY APPLICATION - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Issue date: 18/03/2008 Effective Date: 18-Mar-2008 Revocation Date: 28/02/2013

2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 0

Database searched and no data found.

2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

9

The following NIRS List 2 records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
1C	83	E	333591 391324	Incident Date: 03-Jul-2001 Incident Identification: 13303 Pollutant: Other Pollutant Pollutant Description: Other	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
2	108	E	333600 391400	Incident Date: 10-Jul-2002 Incident Identification: 90449 Pollutant: Oils and Fuel Pollutant Description: Diesel	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
3	258	S	333478 390891	Incident Date: 03-Sep-2002 Incident Identification: 105137 Pollutant: Oils and Fuel Pollutant Description: Unidentified Oil	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
4	292	E	333813 391068	Incident Date: 03-Nov-2001 Incident Identification: 40958 Pollutant: Oils and Fuel Pollutant Description: Diesel	Water Impact: Category 3 (Minor) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
5	464	NE	333723 391846	Incident Date: 18-Jun-2002 Incident Identification: 85642	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact)

ID	Distance (m)	Direction	NGR	Details	
				Pollutant: Specific Waste Materials Pollutant Description: Commercial Waste	Air Impact: Category 4 (No Impact)
6A	485	NE	333771 391839	Incident Date: 11-Jun-2001 Incident Identification: 8540 Pollutant: Specific Waste Materials Pollutant Description: Organic Chemical Wastes	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
7A	485	NE	333771 391839	Incident Date: 11-Jun-2001 Incident Identification: 8540 Pollutant: Specific Waste Materials Pollutant Description: Other Specific Waste Material	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
8A	485	NE	333771 391839	Incident Date: 11-Jun-2001 Incident Identification: 8540 Pollutant: Specific Waste Materials:Specific Waste Materials Pollutant Description: Organic Chemical Wastes:Other Specific Waste Material	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
9	491	E	333933 391638	Incident Date: 30-May-2001 Incident Identification: 7038 Pollutant: Organic Chemicals/Products Pollutant Description: Other Organic Chemical or Product	Water Impact: Category 4 (No Impact) Land Impact: Category 2 (Significant) Air Impact: Category 3 (Minor)

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

2

The following NIRS List 1 records are represented as points on the Environmental Permits, Incidents and Registers Map:

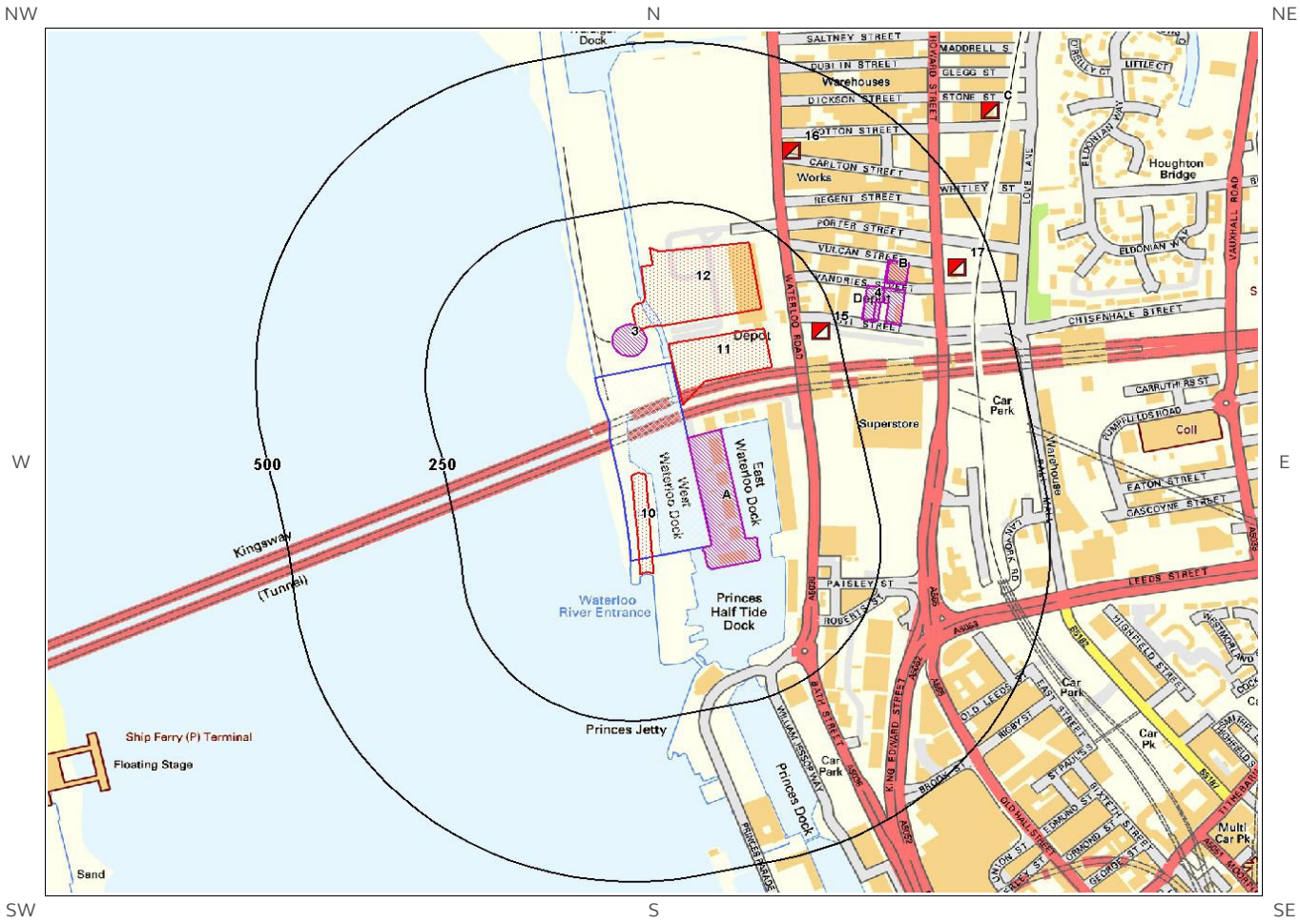
ID	Distance(m)	Direction	NGR	Details	
10	175	SE		Incident Date: 25-Jul-1999 Incident Identification: 30597.0 Catchments Name: RIVER MERSEY (ETHEROW) Water Description: ESTUARY Water Course: COASTLINE TRIB FOR 68/69 Incident Substantiated: Yes	Priority Description: Immediate (2 Hours) Waste Description: Industrial Water Impact: Minor Impact Land Impact: Major (Persistent, Extensive) Impact Air Impact: Major (Persistent, Extensive) Impact Action Taken: Other
11	406	NE		Incident Date: 25-Jul-1999 Incident Identification: 30587.0 Catchments Name: RIVER MERSEY (ETHEROW) Water Description: ESTUARY Water Course: COASTLINE TRIB FOR 68/69 Incident Substantiated: Yes	Priority Description: Immediate (2 Hours) Waste Description: Industrial Water Impact: Minor Impact Land Impact: Major (Persistent, Extensive) Impact Air Impact: Major (Persistent, Extensive) Impact Action Taken: Other

2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

Records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site	0

Database searched and no data found.

3. Landfill and Other Waste Sites Map



3. Landfill and Other Waste Sites

3.1 Landfill Sites

3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site:

0

Database searched and no data found.

3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site:

5

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
10	0	On Site		Site Address: Waterloo Dock River Entrance, Merseyside, Liverpool Waste Licence: - Site Reference: GDO M178 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: - First Recorded: 31-Dec-1985 Last Recorded: 31-Dec-1985
11	2	E		Site Address: Victoria Branch Dock, Merseyside Waste Licence: - Site Reference: GDO M177 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: - First Recorded: 01-Jan-1970 Last Recorded: 31-Dec-1971
12	57	N		Site Address: Trafalgar Branch Dock, Liverpool, Merseyside Waste Licence: - Site Reference: GDO M176 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: - First Recorded: 01-Jan-1970 Last Recorded: 31-Dec-1971
Not shown	1266	SW		Site Address: Alfred Dock River Entrance, Wirral, Merseyside Waste Licence: - Site Reference: GDO M179 Waste Type: Industrial Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: Morgan Plant Hire Licence Holder: Morgan Plant Hire First Recorded: 01-Jan-1985 Last Recorded: 01-Jan-1986
Not shown	1341	N		Site Address: Sandon Dock, Sefton, Merseyside Waste Licence: -	Licence Issue: Licence Surrendered: Licence Holder Address: -

ID	Distance (m)	Direction	NGR	Details	
				Site Reference: GDO M175 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Operator: - Licence Holder: - First Recorded: - Last Recorded: -

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

0

Database searched and no data found.

3.2 Other Waste Sites

3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

9

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details		
1A	0	On Site	333556 391238	Type of Site: Scrap Yard Site Address: N/A	Planning Application Reference: N/A Date: 1993	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
2A	0	On Site	333556 391238	Type of Site: Scrap Yard Site Address: N/A	Planning Application Reference: N/A Date: 1996	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
3	22	N	333417 391485	Type of Site: Waste Transfer Station Site Address: Regent Road, Regent Road, LIVERPOOL, Merseyside, L3	Planning Application Reference: 97P/2778 Date: -	Further Details: Waste recycling centre with temporary storage of special waste awaiting disposal. An application (ref: 97P/2778) for Detailed Planning permission was submitted to Liverpool C.C. on 17th December 1997. Data Source: Historic Planning Application Data Type: Point
4	289	E	333777 391542	Type of Site: Scrap Metal Yard Site Address: N/A	Planning Application Reference: N/A Date: 1953	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon

ID	Distance (m)	Direction	NGR	Details		
5	289	E	333775 391540	Type of Site: Scrap Metal Yard Site Address: N/A	Planning Application Reference: N/A Date: 1953	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
6B	338	E	333811 391591	Type of Site: Scrap Merchants Site Address: N/A	Planning Application Reference: N/A Date: 1984	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
7B	338	E	333811 391591	Type of Site: Scrap Merchants Site Address: N/A	Planning Application Reference: N/A Date: 1984	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
8B	341	E	333812 391591	Type of Site: Scrap Merchants Site Address: N/A	Planning Application Reference: N/A Date: 1996	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
9B	341	E	333812 391591	Type of Site: Scrap Merchants Site Address: N/A	Planning Application Reference: N/A Date: 1996	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon

3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site:

17

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

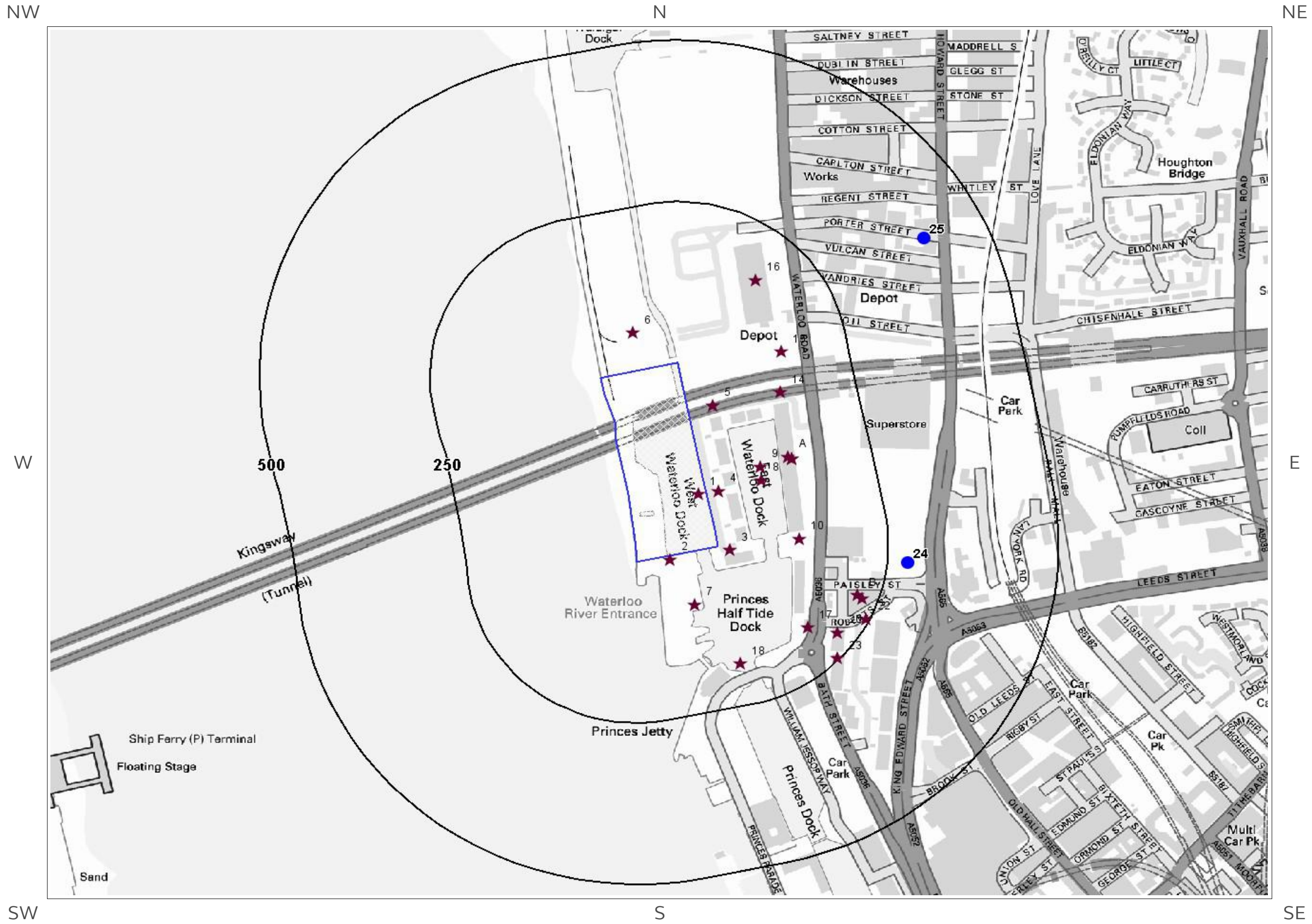
ID	Distance (m)	Direction	NGR	Details	
15	226	E	333700 391500	Site Address: 25, Vandries Street, Liverpool, Merseyside, L3 7BJ Type: Metal Recycling Site (Vehicle Dismantler) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: TLG001 EPR reference: EA/EPR/BP3796CR/A001 Operator: Gorry T L Waste Management licence No: 53667 Annual Tonnage: 416.66	Issue Date: 24/03/1995 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Revoked Site Name: Miranda Motors Correspondence Address: -
16	374	NE	333656 391781	Site Address: Unit 1, 8, Regent Road, Liverspool, L13 7BX Type: 75kte Vehicle Depollution Facility Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: USE016 EPR reference: EA/EPR/BB3401MP/A001 Operator: Used Parts Express Ltd Waste Management licence No: 401259 Annual Tonnage: 0.0	Issue Date: 26/03/2014 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Revoked Site Name: Used Parts Express Ltd Correspondence Address: -
17	446	E	333900 391600	Site Address: 76-82, Sprainger Street, Liverpool Exchange, Liverpool, Merseyside, L3 7HX Type: ELV Facility Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MWI001	Issue Date: 27/05/2005 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Suspended

ID	Distance (m)	Direction	NGR	Details	
				EPR reference: EA/EPR/NP3494CY/A001 Operator: Mwita Abdul Waste Management licence No: 50386 Annual Tonnage: 2500.0	Site Name: V W Audi Seconds Correspondence Address: -
18C	613	NE	333950 391844	Site Address: 13-17, Upper William Street, Liverpool, Merseyside, L3 7EE Type: 75kte HCI Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ALA048 EPR reference: EA/EPR/KP3398VR/A001 Operator: Alan Pearson Waste Management licence No: 101810 Annual Tonnage: 74999.0	Issue Date: 26/07/2010 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Waste Away Correspondence Address: -
19C	613	NE	333950 391844	Site Address: 13-17, Upper William Street, Liverpool, Merseyside, L3 7EE Type: 75kte HCI Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RJA006 EPR reference: EA/EPR/NB3938RD/T001 Operator: R Jackson Services (N W) Ltd Waste Management licence No: 101810 Annual Tonnage: 74999.0	Issue Date: 26/07/2010 Effective Date: 21/02/2013 Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Expired Site Name: Waste Away Skip Hire Correspondence Address: -
Not shown	846	E	334377 391280	Site Address: 11, Naylor Street, Liverpool, Merseyside, L3 6DR Type: Vehicle Depollution Facility <5000 tps Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MOO064 EPR reference: EA/EPR/CB3806SB/A001 Operator: Moore Anthony Waste Management licence No: 402340 Annual Tonnage: 5000.0	Issue Date: 29/04/2015 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Kall Autos Correspondence Address: -
Not shown	921	SE	334136 390466	Site Address: Unit 2, 1 S M M Business Park, Dock Road, Birkenhead, Merseyside, CH41 1DT Type: 75kte HCI Waste TS + treatment Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ALL149 EPR reference: EA/EPR/EB3006FJ/S002 Operator: Alliance Facilities Management Limited Waste Management licence No: 403189 Annual Tonnage: 0.0	Issue Date: 07/06/2016 Effective Date: - Modified: - Surrendered Date: 22/05/2017 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Alliance Skip Hire Correspondence Address: -
Not shown	1009	E	334500 391500	Site Address: Blackstock Street, Liverpool, Merseyside, L3 6ET Type: Physico-Chemical Treatment Facility Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CEL001 EPR reference: EA/EPR/HP3396CW/S002 Operator: Caird Enviromental Ltd Waste Management licence No: 53752 Annual Tonnage: 50000.0	Issue Date: 12/06/1989 Effective Date: - Modified: - Surrendered Date: 23/09/2003 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Caird Environmental Ltd Correspondence Address: -
Not shown	1072	N	333700 392500	Site Address: 11, Blackstone Street, Liverpool, Merseyside, L5 9TY Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SWS001 EPR reference: EA/EPR/PP3196CY/S002	Issue Date: 05/06/1995 Effective Date: - Modified: - Surrendered Date: 13/07/2000 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Shanks

ID	Distance (m)	Direction	NGR	Details	
				Operator: Shanks Northern Ltd Waste Management licence No: 53654 Annual Tonnage: 531408.98	Correspondence Address: -
Not shown	1100	E	334598 391475	Site Address: 41, Blackstock Street, Liverpool, Merseyside, L3 6EP Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: WFD001 EPR reference: EA/EPR/SP3291CV/A001 Operator: W F Doyle & Co Ltd Waste Management licence No: 53938 Annual Tonnage: 25000.0	Issue Date: 18/04/1990 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Revoked Site Name: W F Doyle & Co Ltd Correspondence Address: -
Not shown	1153	N	333769 392567	Site Address: Land/premises At, Blackstone Street, Liverpool North, Liverpool, Merseyside, L5 9TY Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CIR001 EPR reference: EA/EPR/WP3694CH/A001 Operator: Circle Liverpool Ltd Waste Management licence No: 50422 Annual Tonnage: 40000.0	Issue Date: 13/01/2006 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Blackstone Street Transfer Station Correspondence Address: -
Not shown	1291	SW	332300 390500	Site Address: 92, Birkenhead Road, Wallasey, Merseyside, CH44 7BZ Type: Metal Recycling Site (mixed MRS's) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: PJH001 EPR reference: EA/EPR/CP3996CP/A001 Operator: Hutchings P J Waste Management licence No: 53776 Annual Tonnage: 416.66	Issue Date: 02/07/1993 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Midnight Recovery Services Correspondence Address: -
Not shown	1359	N	333439 392809	Site Address: Liverpool Wastewater Treatment Works, Sandon Dock, Regent Road, Liverpool, Merseyside, L3 0BE Type: Biological Treatment Facility Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: LWT001 EPR reference: EA/EPR/SP3192CV/A001 Operator: United Utilities Water Plc Waste Management licence No: 50531 Annual Tonnage: 975000.0	Issue Date: 04/01/2008 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: To PPC Site Name: Liverpool Wastewater Treatment Works Correspondence Address: -
Not shown	1359	N	333439 392809	Site Address: Liverpool Wastewater Treatment Works, Sandon Dock, Regent Road, Liverpool, Merseyside, L3 0BE Type: - Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: LWT001 EPR reference: - Operator: United Utilities Water Plc Waste Management licence No: 50531 Annual Tonnage: 0.0	Issue Date: 04/01/2008 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: IPPC Site Name: Liverpool Wastewater Treatment Works Correspondence Address: Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Warrington, Cheshire, WA5 3LP
Not shown	1381	N	334000 392730	Site Address: Luton Street, Liverpool, Merseyside, L5 Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes	Issue Date: 07/10/1992 Effective Date: - Modified: - Surrendered Date: 18/05/2004 Expiry Date: -

ID	Distance (m)	Direction	NGR	Details	
				Environmental Permitting Regulations (Waste) Licence Number: BPL011 EPR reference: EA/EPR/LP3792CY/S002 Operator: Brock Plc. Waste Management licence No: 53426 Annual Tonnage: 25000.0	Cancelled Date: - Status: Progress Site Name: Luton Street Transfer Station Correspondence Address: -
Not shown	1468	SW	332100 390500	Site Address: - Type: Metal Recycling Site (mixed MRS's) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: LAT001 EPR reference: - Operator: L. A. Jackson Waste Management licence No: 53977 Annual Tonnage: 0.0	Issue Date: 25/08/1988 Effective Date: - Modified: - Surrendered Date: 12/09/2001 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: L. A. Jackson Correspondence Address: 158, Wheatland Lane, Wallasey, Wirral, CH44 7DG
Not shown	1468	SW	332100 390500	Site Address: 158, Wheatland Lane, Wallasey, Merseyside, CH44 7DG Type: Metal Recycling Site (mixed MRS's) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: LAT001 EPR reference: EA/EPR/XP3491CB/S002 Operator: L A Jackson Waste Management licence No: 53977 Annual Tonnage: 30000.0	Issue Date: 25/08/1988 Effective Date: - Modified: - Surrendered Date: 12/09/2001 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: L. A. Jackson Correspondence Address: -

4. Current Land Use Map



Site Outline	Current Industrial Sites
Electricity Transmission Cables	Search Buffers (m) 250 / 500
Petrol & Fuel Sites	Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 23

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	0	On Site	West Waterloo Dock	333509 391248	L3	Marine Equipment Including Boats and Ships	Industrial Products
2	5	S	Electricity Sub Station	333467 391147	L3	Electrical Features	Infrastructure and Facilities
3	17	E	Electricity Sub Station	333555 391162	L3	Electrical Features	Infrastructure and Facilities
4	18	E	Electricity Sub Station	333539 391253	L3	Electrical Features	Infrastructure and Facilities
5	37	E	Electricity Sub Station	333531 391386	L3	Electrical Features	Infrastructure and Facilities
6	59	N	Trafalgar Dock	333413 391498	L3	Marine Equipment Including Boats and Ships	Industrial Products
7	81	S	Tank	333504 391077	L3	Tanks (Generic)	Industrial Features
8	82	E	East Waterloo Dock	333601 391270	L3	Marine Equipment Including Boats and Ships	Industrial Products
9	85	E	Waterloo Quay	333600 391291	L3	Moorings and Unloading Facilities	Water
10	119	E	Electricity Sub Station	333657 391179	L3	Electrical Features	Infrastructure and Facilities
11A	128	E	Waterloo Dock	333641 391306	L3	Marine Equipment Including Boats and Ships	Industrial Products
12A	133	E	All Occasions Limousines	333646 391303	Flat 1 Waterloo Warehouse, Waterloo Road, Liverpool, L3 0BG	Vehicle Hire and Rental	Hire Services
13A	133	E	3 T L Ltd	333646 391303	Flat 145 Waterloo Warehouse, Waterloo Road, Liverpool, L3 0BH	Container and Storage	Transport, Storage and Delivery
14	137	E	Electricity Sub Station	333629 391406	L3	Electrical Features	Infrastructure and Facilities
15	152	E	Thrifty Car & Van Rental	333631 391469	Waterloo Road, Liverpool, L3 0BH	Vehicle Hire and Rental	Hire Services
16	172	NE	Depot	333593 391580	L3	Container and Storage	Transport, Storage and Delivery
17	182	SE	Electricity Sub Station	333670 391042	L3	Electrical Features	Infrastructure and Facilities
18	184	S	Princes Half Tide Dock	333571 390986	L3	Marine Equipment Including Boats and Ships	Industrial Products

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
19B	218	E	M N L Engineering Services Ltd	333743 391091	2-4, Roberts Street, Liverpool, L3 7AS	Industrial Engineers	Engineering Services
20	220	SE	A-Plant Hire Co Ltd	333713 391034	Unit 17 King Edward Industrial Estate, Gibraltar Row, Liverpool, L3 7HJ	Construction and Tool Hire	Hire Services
21B	226	E	Works	333749 391086	L3	Unspecified Works Or Factories	Industrial Features
22	244	SE	Electricity Sub Station	333755 391055	L3	Electrical Features	Infrastructure and Facilities
23	246	SE	Hire & Safety UK	333712 390994	Unit 11 King Edward Industrial Estate, Gibraltar Row, Liverpool, L3 7HJ	Construction and Tool Hire	Hire Services

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 2

The following petrol or fuel site records provided by Catalist are represented as points on the Current Land Use map:

ID	Distance (m)	Direction	NGR	Company	Address	LPG	Status
24	280	E	333817 391141	COSTCO	30, Waterloo Street, Liverpool, Merseyside, L3 7HY	No	Open
25	409	NE	333840 391643	BP	121-129, Great Howard Street, Vulcan Street, Vauxhall, Liverpool, Merseyside, L3 7AT	No	Open

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

5. Geology

5.1 Artificial Ground and Made Ground

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
TFD-XCZS	TIDAL FLAT DEPOSITS	CLAY, SILT AND SAND
TFD-S	TIDAL FLAT DEPOSITS	SAND

5.3 Bedrock and Solid Geology

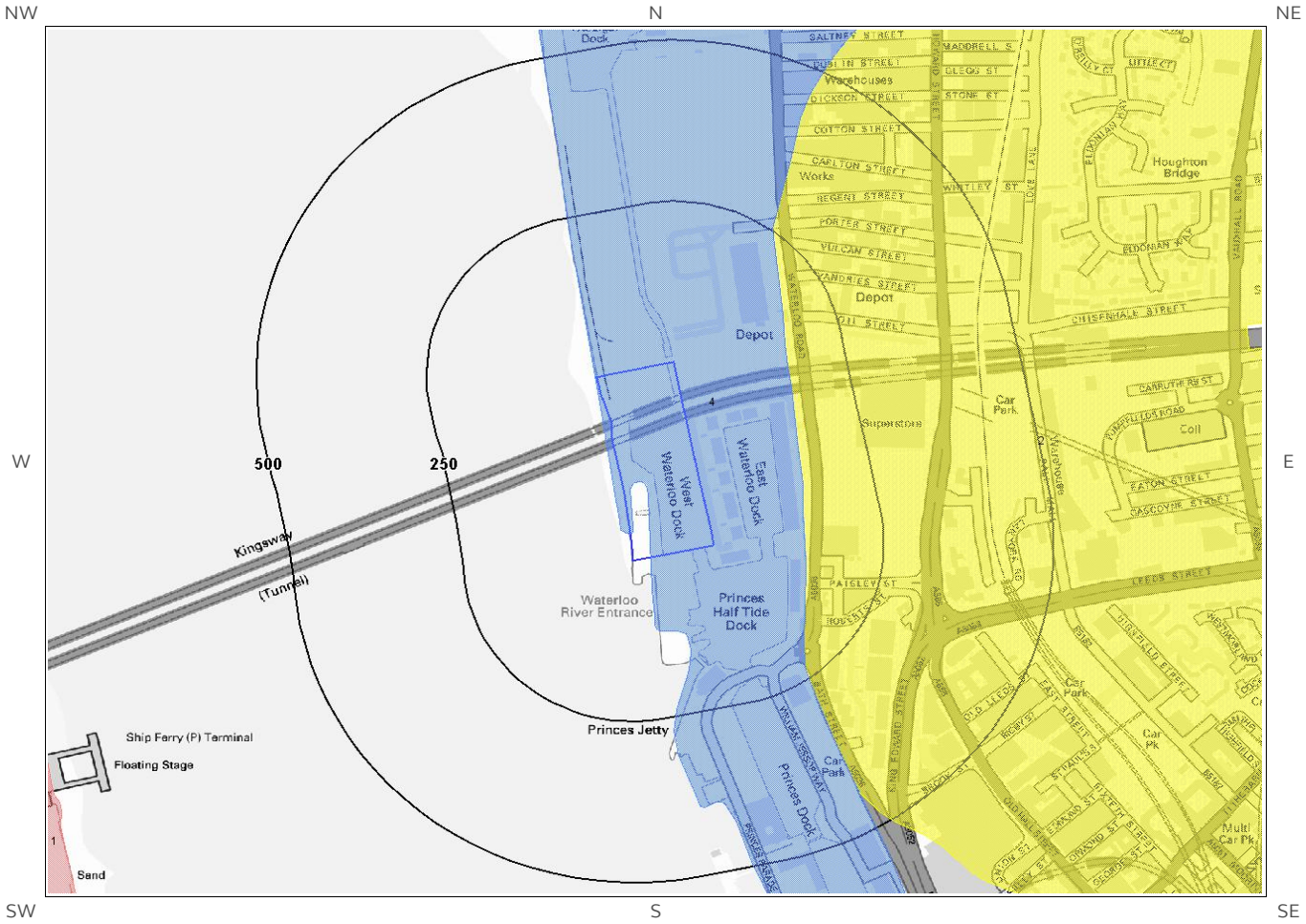
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
CHES-PESST	CHESTER FORMATION	SANDSTONE, PEBBLY (GRAVELLY)

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

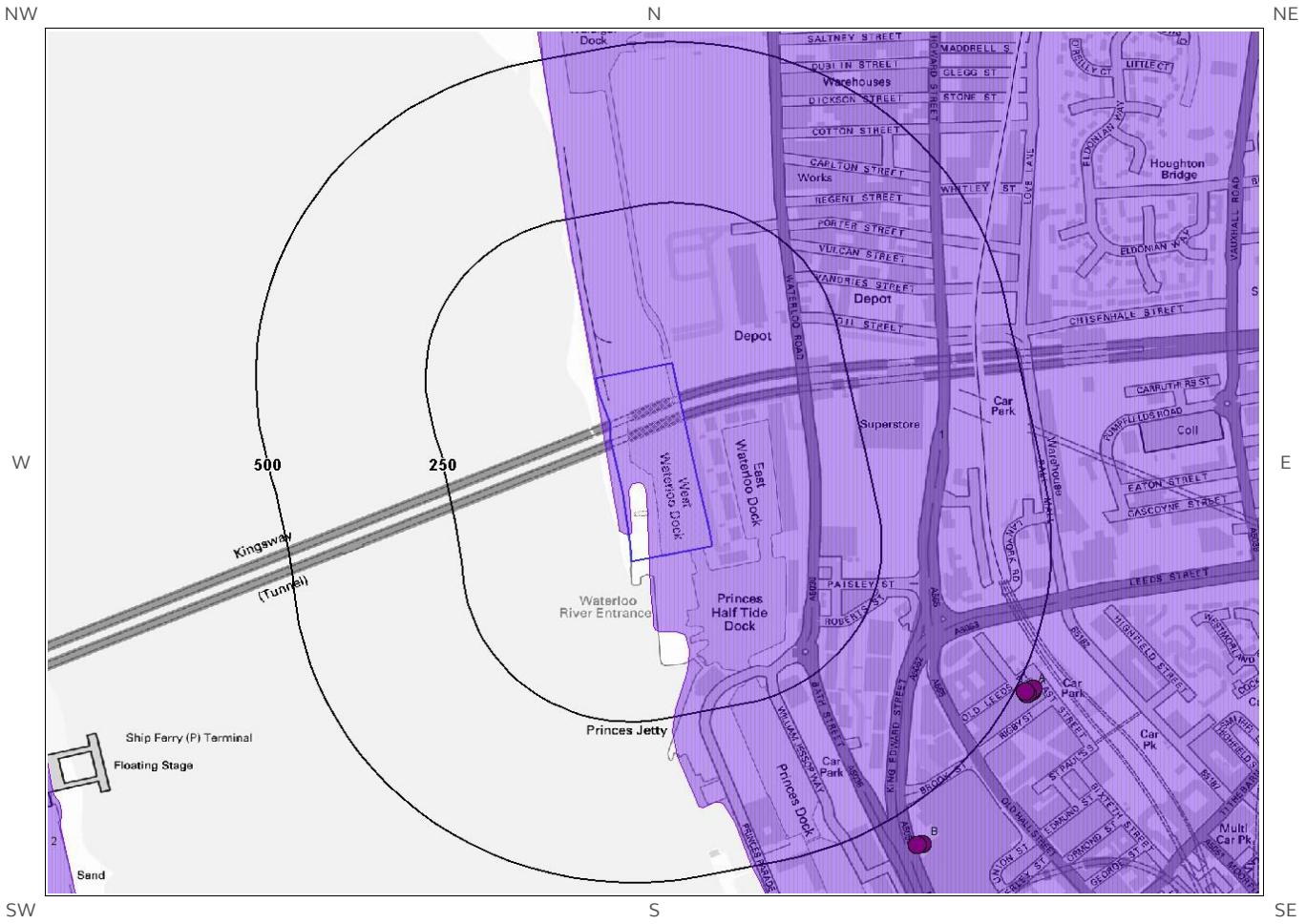
Secondary (B) Aquifer - Lower Permeability Layers

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

6b. Aquifer Within Bedrock Geology and Abstraction Licences



Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

Groundwater Abstraction Licence

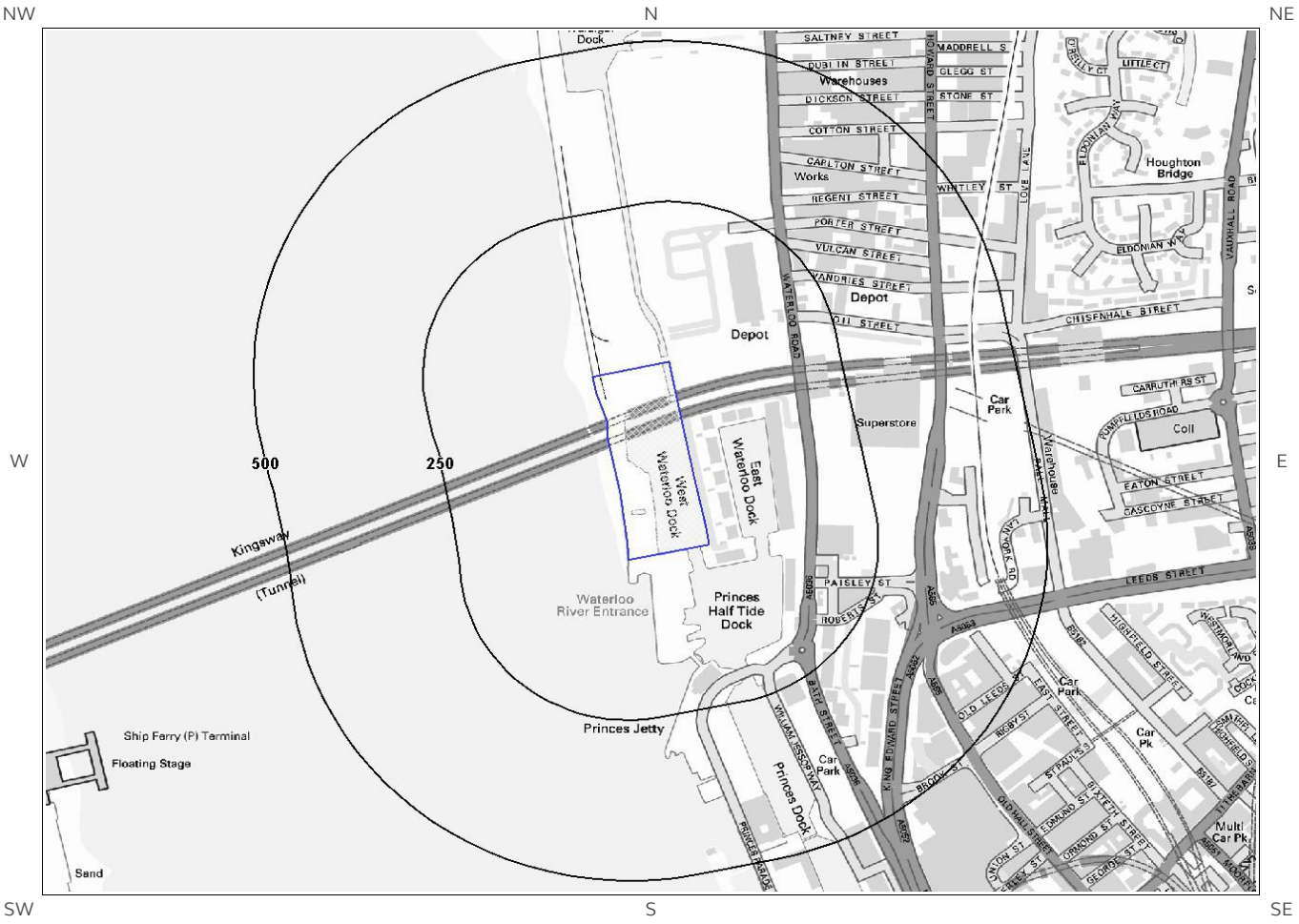
Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

Surface Water Abstraction Licence

6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licences



Site Outline

250
500
Search Buffers (m)

Source Protection Zone 1 - Inner Catchment

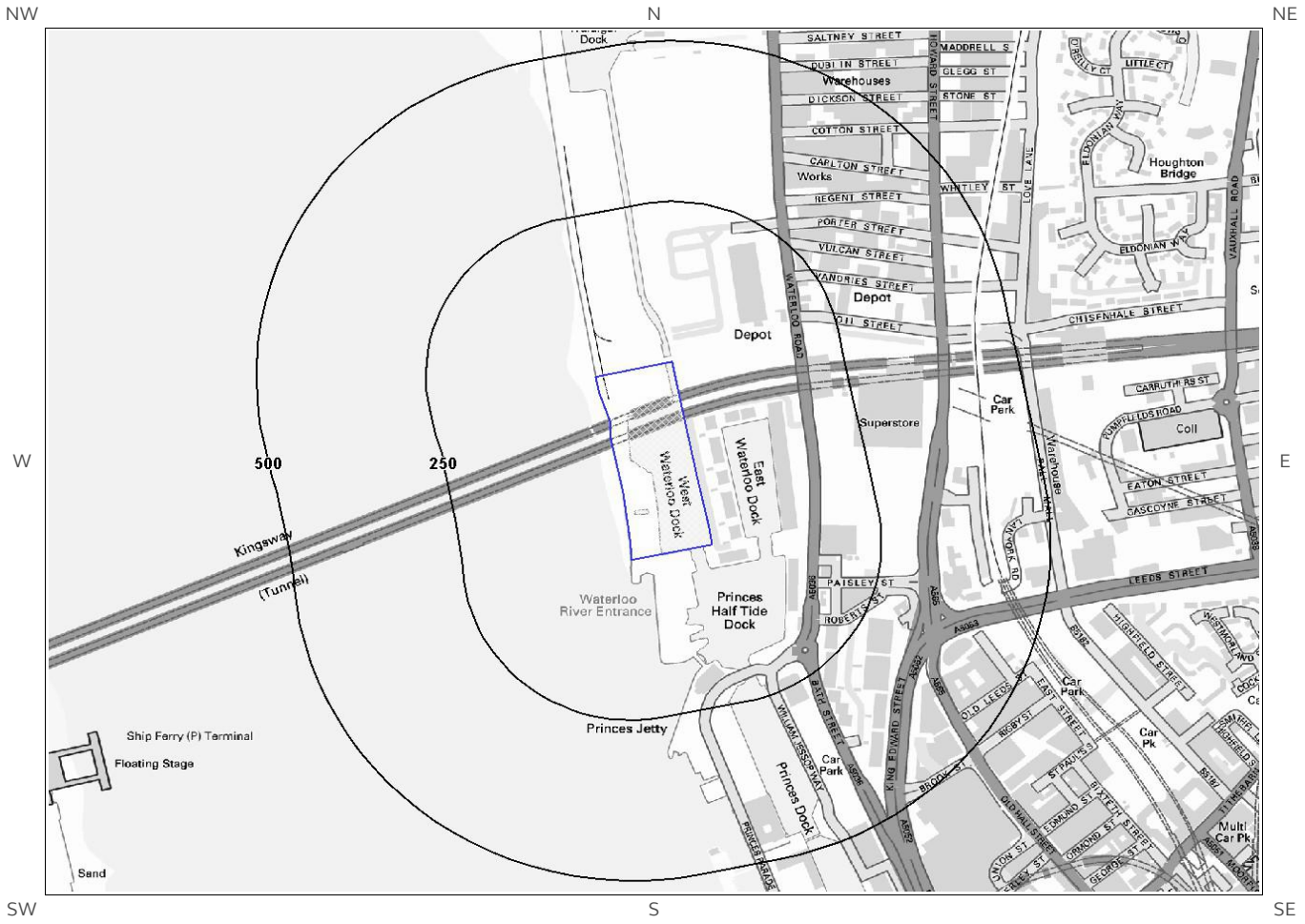
Source Protection Zone 2 - Outer Catchment

Source Protection Zone 3 - Total Catchment

Source Protection Zone 4 - Zone of Special Interest

Potable Water Abstraction Licence

6d. Hydrogeology – Source Protection Zones within confined aquifer



Source Protection Zone 1 - Inner Catchment

Source Protection Zone 2C - Outer Catchment within Confined Aquifer

Source Protection Zone 3C - Total Catchment within Confined Aquifer

Potable Water Abstraction Licence

Site Outline

250
500
Search Buffers (m)

6e. Hydrology – Watercourse Network and River Quality

NW N NE

W E

SW S SE

Site Outline

250
500
Search Buffers (m)

Tidal River

Inland River

Underground or Elevated Tidal River

Underground or Elevated Inland River

Foreshore

General Quality Assessment: Chemistry

Canal

Underground or Elevated Canal

Lock or Flight of Locks

Lake, Reservoir, or Marsh

Drain or Transfer

General Quality Assessment: Biology

6.Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Records of strata classification within the superficial geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
4	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
2	134	E	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

6.2 Aquifer within Bedrock Deposits

Records of strata classification within the bedrock geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers

6.3 Groundwater Abstraction Licences

Groundwater Abstraction Licences within 2000m of the study site — Identified

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
3A	515	SE	334000 390940	Status: Historical Licence No: 2569030066 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: BH(B) AT ST PAUL'S SQUARE OFF OLD HALL ST LIVERPOOL L3 9SY Data Type: Point Name: ECF (GENERAL PARTNER) LTD	Annual Volume (m^3): 340000 Max Daily Volume (m^3): 1700 Original Application No: - Original Start Date: 10/08/2006 Expiry Date: 31/03/2015 Issue No: 1 Version Start Date: 10/08/2006 Version End Date:
4A	519	SE	334002 390935	Status: Active Licence No: 2569030066/R01 Details: Heat Pump Direct Source: Ground Water - North West Region Point: BH(B) AT ST PAUL'S SQUARE OFF OLD HALL ST LIVERPOOL L3 9SY Data Type: Point Name: ECF (GENERAL PARTNER) LTD	Annual Volume (m^3): 340000 Max Daily Volume (m^3): 1700 Original Application No: - Original Start Date: 01/04/2015 Expiry Date: 31/03/2028 Issue No: 1 Version Start Date: 01/04/2015 Version End Date:
5A	523	SE	334011 390944	Status: Active Licence No: 2569030066/R01 Details: Heat Pump Direct Source: Ground Water - North West Region Point: BH(C) AT ST PAUL'S SQUARE OFF OLD HALL ST LIVERPOOL L3 9SY Data Type: Point Name: ECF (GENERAL PARTNER) LTD	Annual Volume (m^3): 340000 Max Daily Volume (m^3): 1700 Original Application No: - Original Start Date: 01/04/2015 Expiry Date: 31/03/2028 Issue No: 1 Version Start Date: 01/04/2015 Version End Date:
6A	524	SE	334010 390940	Status: Historical Licence No: 2569030066 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: BH(C) AT ST PAUL'S SQUARE OFF OLD HALL ST LIVERPOOL L3 9SY Data Type: Point Name: ECF (GENERAL PARTNER) LTD	Annual Volume (m^3): 340000 Max Daily Volume (m^3): 1700 Original Application No: - Original Start Date: 10/08/2006 Expiry Date: 31/03/2015 Issue No: 1 Version Start Date: 10/08/2006 Version End Date:
7B	556	SE	333840 390700	Status: Historical Licence No: 2569030065 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: PIPELINE AT GEORGES DOCK PUMPING STATION, MANN ISLAND LPOOL Data Type: Point Name: TRINITY MIRROR PLC	Annual Volume (m^3): 2.3e+006 Max Daily Volume (m^3): 6301.5 Original Application No: - Original Start Date: 28/04/2004 Expiry Date: - Issue No: 1 Version Start Date: 28/04/2004 Version End Date:
8B	556	SE	333840 390700	Status: Historical Licence No: 2569030065 Details: Heat Pump Direct Source: Ground Water - North West Region Point: PIPELINE AT GEORGES DOCK PUMPING STATION, MANN ISLAND LPOOL Data Type: Point Name: TRINITY MIRROR PLC	Annual Volume (m^3): 2.3e+006 Max Daily Volume (m^3): 6301.5 Original Application No: - Original Start Date: 28/04/2004 Expiry Date: - Issue No: 1 Version Start Date: 28/04/2004 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
9B	559	SE	333848 390702	Status: Historical Licence No: 2569030065R01 Details: Non-Evaporative Cooling Direct Source: Ground Water - North West Region Point: PIPELINE AT GEORGES DOCK PUMPING STATION, MANN ISLAND LPOOL Data Type: Point Name: TRINITY MIRROR PLC	Annual Volume (m^3): 2.3e+006 Max Daily Volume (m^3): 6301 Original Application No: - Original Start Date: 14/04/2015 Expiry Date: 31/03/2028 Issue No: 1 Version Start Date: 14/04/2015 Version End Date:
10B	559	SE	333848 390702	Status: Active Licence No: 2569030065R01 Details: Heat Pump Direct Source: Ground Water - North West Region Point: PIPELINE AT GEORGES DOCK PUMPING STATION, MANN ISLAND LPOOL Data Type: Point Name: TRINITY MIRROR PLC	Annual Volume (m^3): 2.3e+006 Max Daily Volume (m^3): 6301 Original Application No: - Original Start Date: 14/04/2015 Expiry Date: 31/03/2028 Issue No: 2 Version Start Date: 06/10/2016 Version End Date:
Not shown	890	E	334400 391400	Status: Historical Licence No: 2569030057 Details: General Washing/Process Washing Direct Source: Ground Water - North West Region Point: BOREHOLE AT 23 BLACKSTOCK STREET, LIVERPOOL Data Type: Point Name: DOWNLAND BEDDING COMPANY LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 17/01/1992 Expiry Date: - Issue No: 100 Version Start Date: 11/04/1994 Version End Date:
Not shown	1095	E	334602 391435	Status: Active Licence No: NW/069/0030/018 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE AT BLACKSTOCK STREET, LIVERPOOL Data Type: Point Name: W F Doyle Holdings Limited	Annual Volume (m^3): 76000 Max Daily Volume (m^3): 2184 Original Application No: - Original Start Date: 26/03/2018 Expiry Date: 31/03/2028 Issue No: 1 Version Start Date: 26/03/2018 Version End Date:
Not shown	1095	E	334602 391435	Status: Active Licence No: NW/069/0030/018 Details: Dust Suppression Direct Source: Ground Water - North West Region Point: BOREHOLE AT BLACKSTOCK STREET, LIVERPOOL Data Type: Point Name: W F Doyle Holdings Limited	Annual Volume (m^3): 76000 Max Daily Volume (m^3): 2184 Original Application No: - Original Start Date: 26/03/2018 Expiry Date: 31/03/2028 Issue No: 1 Version Start Date: 26/03/2018 Version End Date:
Not shown	1118	E	334630 391410	Status: Historical Licence No: 2569030032 Details: Dust Suppression Direct Source: Ground Water - North West Region Point: BOREHOLE AT BLACKSTOCK STREET, LIVERPOOL Data Type: Point Name: W F DOYLE & CO LTD	Annual Volume (m^3): 299905 Max Daily Volume (m^3): 2182 Original Application No: - Original Start Date: 03/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 22/12/1995 Version End Date:
Not shown	1118	E	334630 391410	Status: Historical Licence No: 2569030032 Details: General Washing/Process Washing Direct Source: Ground Water - North West Region Point: BOREHOLE AT BLACKSTOCK STREET, LIVERPOOL Data Type: Point Name: W F DOYLE & CO LTD	Annual Volume (m^3): 299905 Max Daily Volume (m^3): 2182 Original Application No: - Original Start Date: 03/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 22/12/1995 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1118	E	334630 391410	Status: Historical Licence No: 2569030032 Details: Dust suppression Direct Source: Ground Water - North West Region Point: "BOREHOLE AT BLACKSTOCK STREET, LIVERPOOL" Data Type: Point Name: W F DOYLE & CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 03/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 22/12/1995 Version End Date:
Not shown	1118	E	334630 391410	Status: Historical Licence No: 2569030032 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT BLACKSTOCK STREET, LIVERPOOL Data Type: Point Name: W F DOYLE & CO LTD	Annual Volume (m^3): 299905 Max Daily Volume (m^3): 2182 Original Application No: - Original Start Date: 03/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 22/12/1995 Version End Date:
Not shown	1118	E	334630 391410	Status: Historical Licence No: 2569030032 Details: General Washing/Process Washing Direct Source: Ground Water - North West Region Point: "BOREHOLE AT BLACKSTOCK STREET, LIVERPOOL" Data Type: Point Name: W F DOYLE & CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 03/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 22/12/1995 Version End Date:
Not shown	1118	E	334630 391410	Status: Historical Licence No: 2569030032 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT BLACKSTOCK STREET, LIVERPOOL" Data Type: Point Name: W F DOYLE & CO LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 03/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 22/12/1995 Version End Date:

6.4 Surface Water Abstraction Licences

Surface Water Abstraction Licences within 2000m of the study site — None identified

Database searched and no data found.

6.5 Potable Water Abstraction Licences

Potable Water Abstraction Licences within 2000m of the study site — Identified

The following Potable Water Abstraction Licences records are represented as points, lines and regions on the SPZ and Potable Water Abstraction Licences Map (6c):

ID	Distance (m)	Direction	NGR	Details	
Not shown	1095	E	334602 391435	Status: Active Licence No: NW/069/0030/018	Annual Volume (m^3): 76000 Max Daily Volume (m^3): 2184

ID	Distance (m)	Direction	NGR	Details	
				Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Ground Water - North West Region Point: BOREHOLE AT BLACKSTOCK STREET, LIVERPOOL Data Type: Point Name: W F Doyle Holdings Limited	Original Application No: - Original Start Date: 26/03/2018 Expiry Date: 31/03/2028 Issue No: 1 Version Start Date: Version End Date:

6.6 Source Protection Zones

Source Protection Zones within 500m of the study site — None identified

Database searched and no data found.

6.7 Source Protection Zones within Confined Aquifer

Source Protection Zones within the Confined Aquifer within 500m of the study site — None identified

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

Environment Agency/Natural Resources Wales information on groundwater vulnerability and soil leaching potential within 500m of the study site Identified

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Major Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
462	NE	Minor Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.

6.9 River Quality

Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site Identified

6.9.1 Biological Quality:

Database searched and no data found.

6.9.2 Chemical Quality:

Chemical quality data is based on the General Quality Assessment Headline Indicators scheme (GQAHI). In England, each chemical sample is measured for ammonia and dissolved oxygen. In Wales, the samples are measured for biological oxygen demand (BOD), ammonia and dissolved oxygen. The results are graded from A ('Very Good') to F ('Bad').

The following Chemical Quality records are shown on the Hydrology Map (6e):

					Chemical Quality Grade				
ID	Distance (m)	Direction	NGR	River Quality Grade	2005	2006	2007	2008	2009
Not shown	774	NE	333900 392100	River Name: Leeds/liverpool Canal Reach: Liverpool Docks To Wharehouse Halsall End/Start of Stretch: Start of Stretch NGR	B	C	B	C	C

6.10 Ordnance Survey MasterMap Water Network

Ordnance Survey MasterMap Water Network entries within 500m of the study site

This watercourse information is provided by Ordnance Survey MasterMap Water Network. The data provides a detailed centre line following the curve of the waterway precisely, so all distances provided in the report should be understood as measurements to the centreline rather than a measurement to the nearest point of the watercourse. Underground watercourses are inferred from entry and exit points so caution is advised in using these to indicate precise locations of underground watercourses when planning site investigation and development.

The following Ordnance Survey MasterMap Water Network records are represented on the Hydrology Map (6e):

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
1	0 On Site	Not specified	Lake, loch or reservoir.	Catchment Area: Ditton Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 51.2
2	0 On Site	Not specified	Lake, loch or reservoir.	Catchment Area: Ditton Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
14	0 On Site	Not specified	Lake, loch or reservoir.	Catchment Area: Ditton Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 51.2
15	0 On Site	Not specified	Lake, loch or reservoir.	Catchment Area: Ditton Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
3	10 N	Trafalgar Dock	Lake, loch or reservoir.	Catchment Area: Ditton Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 10.2
16	10 N	Trafalgar Dock	Lake, loch or reservoir.	Catchment Area: Ditton Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 10.2
4	69 SE	Not specified	Lake, loch or reservoir.	Catchment Area: Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 52.5
5	69 SE	Not specified	Tidal river or stream.	Catchment Area: Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
17	69 SE	Not specified	Lake, loch or reservoir.	Catchment Area: Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 52.5

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
18	69 SE	Not specified	Tidal river or stream.	Catchment Area: Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
6	78 E	Not specified	Tidal river or stream.	Catchment Area: Relationship to Ground Level: Not provided Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
19	78 E	Not specified	Tidal river or stream.	Catchment Area: Relationship to Ground Level: Not provided Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
7	200 S	Not specified	Lake, loch or reservoir.	Catchment Area: Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
20	200 S	Not specified	Lake, loch or reservoir.	Catchment Area: Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
8	433 W	River Mersey	Tidal river or stream.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
21	433 W	River Mersey	Tidal river or stream.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
9	480 S	Not specified	Lake, loch or reservoir.	Catchment Area: Aire and Calder Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 26.7
Not shown	480 S	Not specified	Lake, loch or reservoir.	Catchment Area: Aire and Calder Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 26.7

6.11 Surface Water Features

Surface water features within 250m of the study site — Identified

The following surface water records are not represented on mapping:

Distance (m)	Direction
0	On Site
0	On Site
10	N
214	S

7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)

Site Outline

Search Buffers (m)
100
250

Zone 2 Floodplain

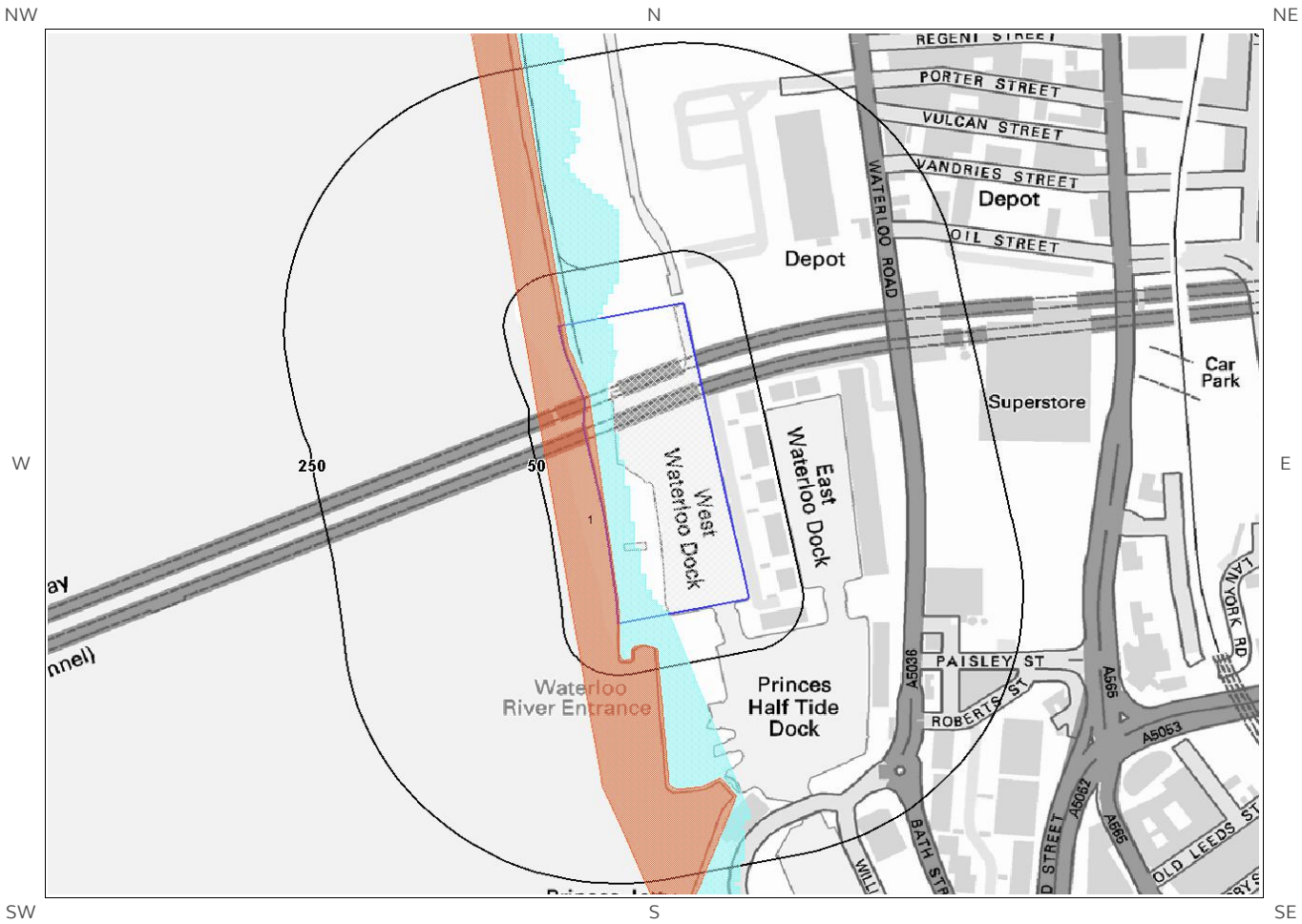
Zone 3 Floodplain

Flood Defences

Area used for Flood Storage

Area Benefiting from Flood Defences

7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Map



Site Outline

100
250
Search Buffers (m)

RoFRaS Rating

- Very Low
- Low
- Medium
- High

7 Flooding

7.1 River and Coastal Zone 2 Flooding

Environment Agency/Natural Resources Wales Zone 2 floodplain within 250m — Identified

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1A	0	On Site	29-May-2018	Zone 2 - (Fluvial /Tidal Models)

7.2 River and Coastal Zone 3 Flooding

Environment Agency/Natural Resources Wales Zone 3 floodplain within 250m — Identified

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

ID	Distance (m)	Direction	Update	Type
1A	0	On Site	30-May-2018	Zone 3 - (Fluvial Models)

7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

Highest risk of flooding onsite — High

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a High (1 in 30 or greater) chance of flooding in any given year.

Any relevant data within 250m is represented on the RoFRaS Flood map. Data to 50m is reported in the table below.

ID	Distance (m)	Direction	RoFRas flood Risk
1	0.0	On Site	High
2	0.0	On Site	Low

7.4 Flood Defences

Flood Defences within 250m of the study site — None identified

Database searched and no data found.

7.5 Areas benefiting from Flood Defences

Areas benefiting from Flood Defences within 250m of the study site — None identified

7.6 Areas benefiting from Flood Storage

Areas used for Flood Storage within 250m of the study site — None identified

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site — None identified

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

7.7.2 Highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions

Not Prone

The area is not considered to be prone to groundwater flooding based on rock type.

7.8 Groundwater Flooding Confidence Areas

British Geological Survey confidence rating in this result — Not Applicable

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

8. Designated Environmentally Sensitive Sites Map

Site Outline

100
250
Search Buffers (m)

AONB
National Park
SSSI
Special Protection Areas
Nitrate Vulnerable Zones
Green Belt
Environmentally Sensitive Areas
Special Areas of Conservation
World Heritage Sites
Nitrate Sensitive Areas
Ancient Woodland
National Nature Reserve
Local Nature Reserves
Ramsar Sites

8. Designated Environmentally Sensitive Sites

Designated Environmentally Sensitive Sites within 2000m of the study site | Identified

8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

2

The following Site of Special Scientific Interest (SSSI) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SSSI Name	Data Source
2	827	W	Mersey Narrows	Natural England
3	886	SW	Mersey Narrows	Natural England

8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

1

The following Special Protection Area (SPA) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SPA Name	Data Source
1A	826	W	Mersey Narrows & North Wirral Foreshore	Natural England

8.5 Records of Ramsar sites within 2000m of the study site:

1

The following Ramsar records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	Ramsar Site Name	Ramsar Site Status	Data Source
4A	827	W	Mersey Narrows & North Wirral Foreshore	Listed	Natural England

8.6 Records of Ancient Woodland within 2000m of the study site:

0

Database searched and no data found.

8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

0

Database searched and no data found.

8.8 Records of World Heritage Sites within 2000m of the study site:

2

The following World Heritage Site records provided by English Heritage and Cadw are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	World Heritage Site Name	Data Source
5	0	On Site	Liverpool - Maritime Mercantile City	Historic England
6	0	On Site	Liverpool - Maritime Mercantile City Buffer Zone	Historic England

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

8.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

0

Database searched and no data found.

8.14 Records of Green Belt land within 2000m of the study site:

0

Database searched and no data found.

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a Groundsure Geo Insight, available from our website. The following information has been found:

9.1.1 Shrink Swell

Maximum Shrink-Swell*[*] hazard rating identified on the study site — Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

9.1.2 Landslides

Maximum Landslide* hazard rating identified on the study site — Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

9.1.3 Soluble Rocks

Maximum Soluble Rocks* hazard rating identified on the study site — Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

* This indicates an automatically generated 50m buffer and site.

9.1.4 Compressible Ground

Maximum Compressible Ground* hazard rating identified on the study site — Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.

9.1.5 Collapsible Rocks

Maximum Collapsible Rocks* hazard rating identified on the study site — Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

9.1.6 Running Sand

Maximum Running Sand*[*] hazard rating identified on the study site — Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

* This indicates an automatically generated 50m buffer and site.

9.2 Radon

9.2.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

The radon data in this report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland. The dataset was created using long-term radon measurements in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland, combined with geological data. The dataset is considered accurate to 50m to allow for the margin of error in geological lines, and the findings of this report supercede any answer given in the less accurate Indicative Atlas of Radon in Great Britain, which simplifies the data to give the highest risk within any given 1km grid square. As such, the radon atlas is considered indicative, whereas the data given in this report is considered definitive.

9.2.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing
ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

10. Mining

10.1 Coal Mining

Coal mining areas within 75m of the study site — None identified

Database searched and no data found.

10.2 Non-Coal Mining

Non-Coal Mining areas within 50m of the study site boundary — None identified

Database searched and no data found.

10.3 Brine Affected Areas

Brine affected areas within 75m of the study site — None identified
Guidance: No Guidance Required.

Contact Details

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Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:

https://www.groundsure.com/terms-and-conditions-may25-2018