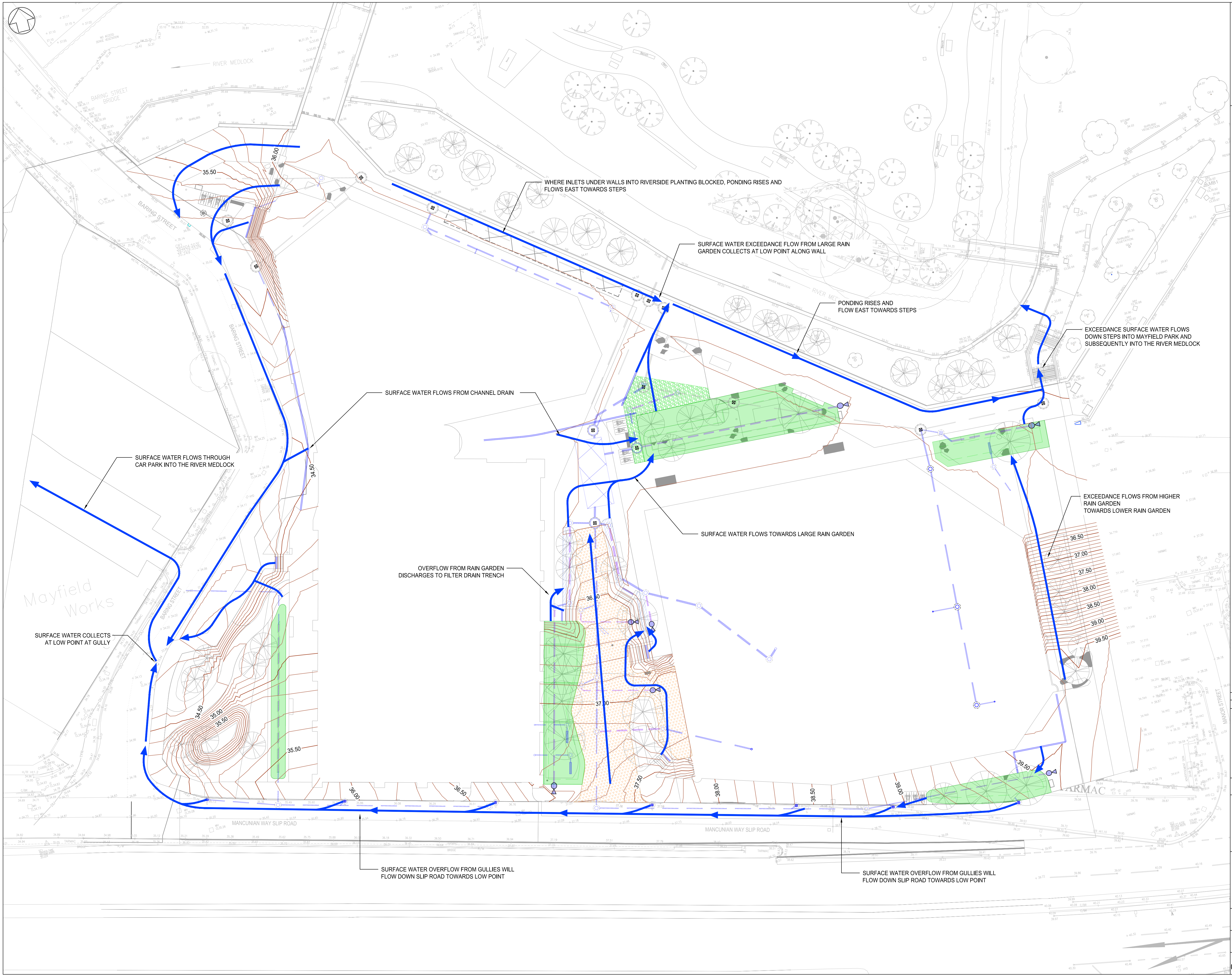


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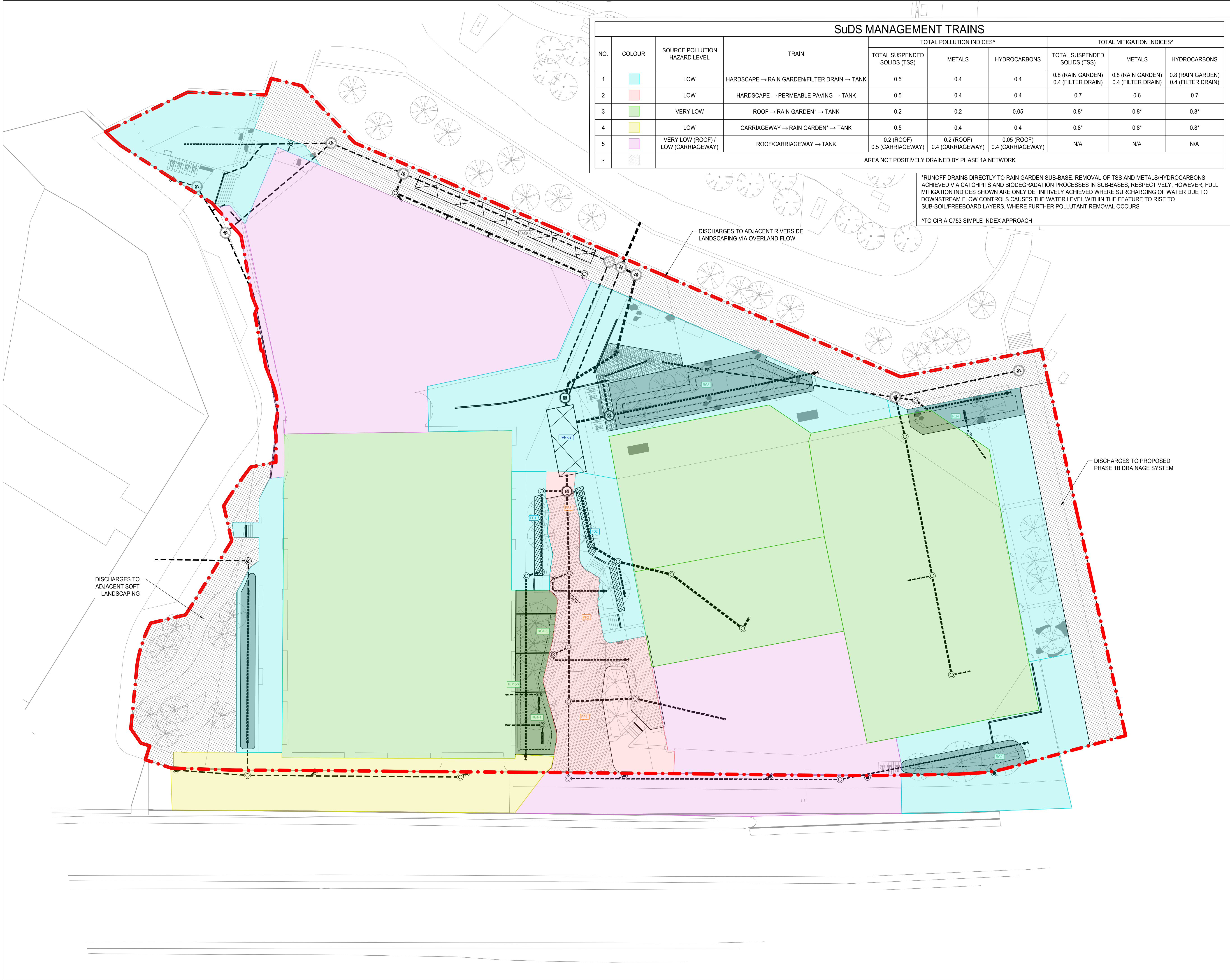
MAYFIELD PHASE 1A

TITLE

PROPOSED EXCEEDANCE FLOW ROUTES

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CE PROJECT No.

1076-27

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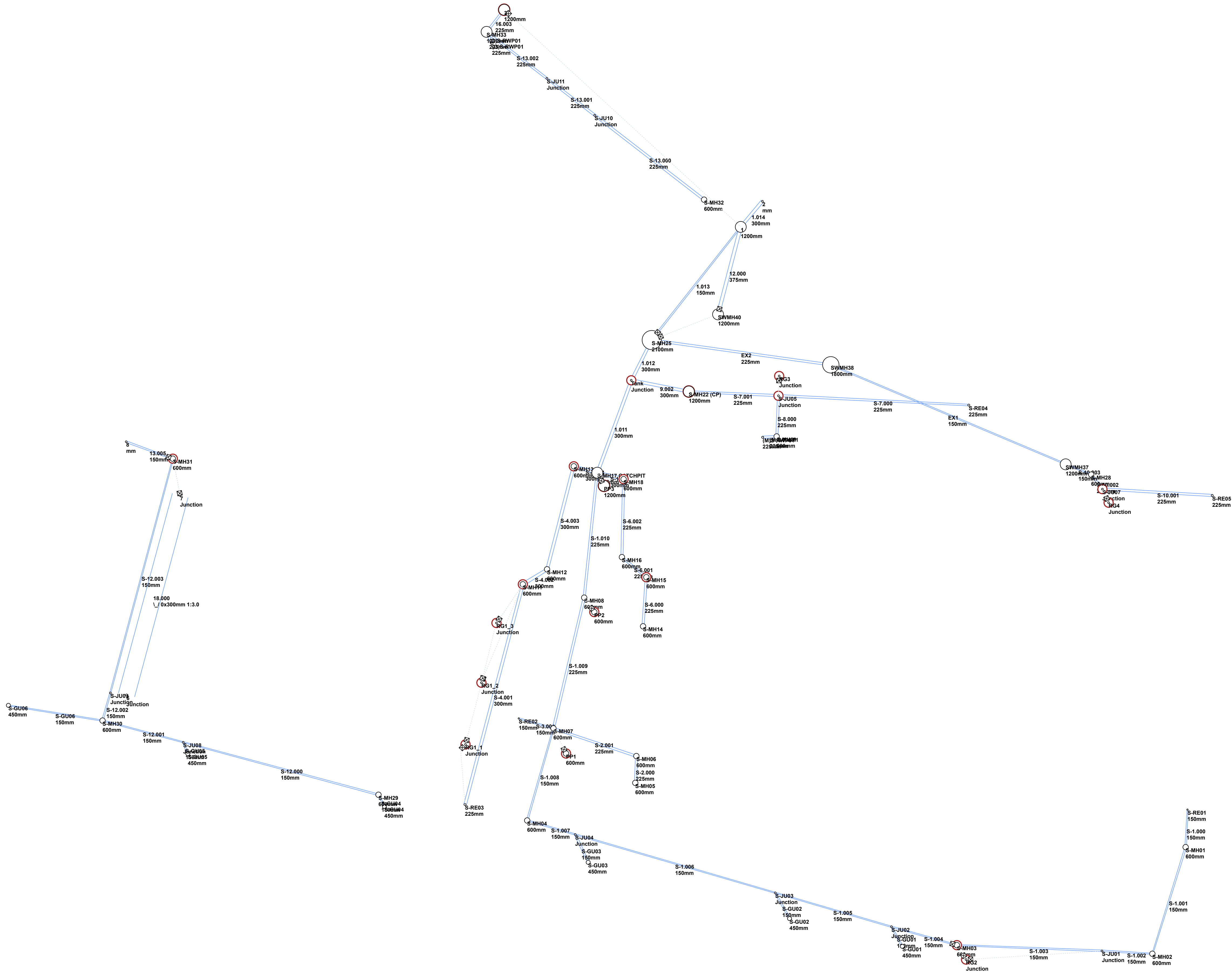
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REV

P01

Appendix D

Permanent Drainage Model Schematic and Results



Flow+ v10.8 Copyright © 1988-2024 Causeway Technologies Ltd

Links (Input)

Flow+ v10.8 Copyright © 1988-2024 Causeway Technologies Ltd

Links (Input)

Rainfall Methodology	FSR	Drain Down Time (mins)	1440
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	3.8
Summer CV	1.000	30 year (l/s)	7.4
Winter CV	1.000	100 year (l/s)	9.0
Analysis Speed	Detailed	Check Discharge Volume	x
Skip Steady State	x		

Storm Durations

Site Makeup	Greenfield	SPR	0.47
Greenfield Method	IH124	Region	10
Positively Drained Area (ha)	0.687	Growth Factor 1 year	0.87
SAAR (mm)	879	Growth Factor 30 year	1.70
Soil Index	4	Growth Factor 100 year	2.08

Pre-development Discharge Rate

Betterment (%)	0	Q 30 year (l/s)	7.4
QBar	4.3	Q 100 year (l/s)	9.0
Q 1 year (l/s)	3.8		

Node S-MH03 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	✓	Diameter (m)	0.030
Downstream Link	S-1.004	Invert Level (m)	37.746	Discharge Coefficient	0.600

Node S-MH25 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.013	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0095-4300-1200-4300
Invert Level (m)	34.100	Min Outlet Diameter (m)	0.150
Design Depth (m)	1.200	Min Node Diameter (mm)	1200
Design Flow (l/s)	4.3		

Node S-MH25 Offline Orifice Control

Flap Valve	x	Invert Level (m)	35.334	Discharge Coefficient	0.600
Loop to Node	SWMH40	Diameter (m)	0.300		

Node SWMH40 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	33.925	Product Number	CTL-SHE-0302-5800-1900-5800
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.375
Design Flow (l/s)	58.0	Min Node Diameter (mm)	

Node 3 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node	1	Sump Available	✓
Invert Level (m)	33.529	Product Number	CTL-SHE-0125-7500-1200-7500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	7.5	Min Node Diameter (mm)	1200

Node RG1_1 Offline Orifice Control

Flap Valve	x	Design Depth (m)	0.200	Discharge Coefficient	0.600
Loop to Node	S-RE03	Design Flow (l/s)	0.5		
Invert Level (m)	36.850	Diameter (m)	0.023		

Node RG1_2 Offline Orifice Control

Flap Valve	x	Design Depth (m)	0.200	Discharge Coefficient	0.600
Loop to Node	S-MH11	Design Flow (l/s)	0.4		
Invert Level (m)	36.650	Diameter (m)	0.020		

Node RG1_3 Offline Orifice Control

Flap Valve	x	Design Depth (m)	0.200	Discharge Coefficient	0.600
Loop to Node	S-MH11	Design Flow (l/s)	0.5		
Invert Level (m)	36.450	Diameter (m)	0.023		

Node RG1_1 Offline Weir Control

Flap Valve	x	Invert Level (m)	37.000	Discharge Coefficient	0.590
Loop to Node	RG1_2	Width (m)	0.800		

Node RG1_2 Offline Weir Control

Flap Valve	x	Invert Level (m)	36.850	Discharge Coefficient	0.590
Loop to Node	RG1_3	Width (m)	0.800		

Node 7 Offline Orifice Control

Flap Valve	x	Design Depth (m)	0.300	Discharge Coefficient	0.600
Loop to Node	S-MH31	Design Flow (l/s)	0.8		
Invert Level (m)	34.560	Diameter (m)	0.026		

Node RG2 Offline Orifice Control

Flap Valve	x	Design Depth (m)	0.200	Discharge Coefficient	0.600
Loop to Node	S-MH03	Design Flow (l/s)	0.9		
Invert Level (m)	38.950	Diameter (m)	0.031		

Node RG2 Offline Orifice Control

Flap Valve	x	Invert Level (m)	39.050	Discharge Coefficient	0.600
Loop to Node	S-JU01	Diameter (m)	0.225		

Node RG3 Offline Orifice Control

Flap Valve	x	Invert Level (m)	35.800	Discharge Coefficient	0.600
Loop to Node	S-JU05	Diameter (m)	0.500		

Node RG3 Offline Orifice Control

Flap Valve	x	Design Depth (m)	0.300	Discharge Coefficient	0.600
Loop to Node	S-JU05	Design Flow (l/s)	1.8		
Invert Level (m)	35.710	Diameter (m)	0.040		

Node RG3 Offline Orifice Control

Flap Valve	x	Invert Level (m)	35.860	Discharge Coefficient	0.600
Loop to Node	S-JU05	Diameter (m)	0.300		

Node 7 Offline Orifice Control

Flap Valve	x	Invert Level (m)	34.760	Discharge Coefficient	0.600
Loop to Node	S-MH31	Diameter (m)	0.150		

Node PP1 Offline Orifice Control

Flap Valve	x	Design Depth (m)	0.300	Discharge Coefficient	0.600
Loop to Node	S-MH07	Design Flow (l/s)	12.0		
Invert Level (m)	36.640	Diameter (m)	0.065		

Node PP2 Offline Orifice Control

Flap Valve	x	Invert Level (m)	36.110	Discharge Coefficient	0.600
Loop to Node	S-MH08	Diameter (m)	0.050		

Node PP3 Offline Orifice Control

Flap Valve	x	Diameter (m)	0.150
Loop to Node	S-MH17 CATCHPIT	Discharge Coefficient	0.600
Invert Level (m)	35.620		

Node RG1_3 Offline Weir Control

Flap Valve	x	Invert Level (m)	36.650	Discharge Coefficient	0.590
Loop to Node	S-MH11	Width (m)	0.800		

Node RG4 Offline Orifice Control

Flap Valve	x	Design Depth (m)	0.200	Discharge Coefficient	0.600
Loop to Node	S-JU07	Design Flow (l/s)	0.7		
Invert Level (m)	35.900	Diameter (m)	0.027		

Node RG4 Offline Orifice Control

Flap Valve	x	Invert Level (m)	36.000	Discharge Coefficient	0.600
Loop to Node	S-JU07	Diameter (m)	0.225		

Node S-MH31 Online Orifice Control

Flap Valve	x	Invert Level (m)	33.950	Diameter (m)	0.065
Downstream Link	13.005	Design Depth (m)	0.860	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	6.0		

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	34.134
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	748

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	40.0	0.0	1.200	40.0	0.0	1.201	0.0	0.0

Node PP2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	36.110	Slope (1:X)	27.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	23	Depth (m)	0.300
Safety Factor	2.0	Width (m)	7.000	Inf Depth (m)	
Porosity	0.30	Length (m)	18.000		

Node RG1_1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	36.850
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	33.1	0.0	0.250	50.1	0.0

Node RG1_2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	36.650
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	14.0	0.0	0.250	24.2	0.0

Node RG1_3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	36.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	19.8	0.0	0.250	30.1	0.0

Node S-MH11 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	788
Side Inf Coefficient (m/hr)	0.00000	Link	S-4.001
Safety Factor	2.0	Surround Shape	Drainage Layer
Porosity	1.00	Diameter (mm)	3730
Invert Level (m)	34.610		

Node PP3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	35.620	Slope (1:X)	29.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	16	Depth (m)	0.300
Safety Factor	2.0	Width (m)	4.250	Inf Depth (m)	
Porosity	0.30	Length (m)	14.400		

Node RG2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	38.950
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	35.7	0.0	0.200	58.6	0.0

Node S-MH03 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	272
Side Inf Coefficient (m/hr)	0.00000	Link	S-1.003
Safety Factor	2.0	Surround Shape	Drainage Layer
Porosity	0.30	Diameter (mm)	1690
Invert Level (m)	37.746		

Node RG4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	35.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	43.3	0.0	0.200	66.4	0.0

Node S-MH15 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	S-6.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	34.650	Surround Shape	Filter Drain
Safety Factor	2.0	Time to half empty (mins)	512	Diameter (mm)	675

Node S-MH18 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	S-6.002
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	34.598	Surround Shape	Filter Drain
Safety Factor	2.0	Time to half empty (mins)	720	Diameter (mm)	675

Node S-MH31 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	56
Side Inf Coefficient (m/hr)	0.00000	Link	S-12.003
Safety Factor	2.0	Surround Shape	Drainage Layer
Porosity	0.30	Diameter (mm)	1970
Invert Level (m)	33.950		

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	36.640	Slope (1:X)	20.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	18	Depth (m)	0.300
Safety Factor	2.0	Width (m)	12.000	Inf Depth (m)	
Porosity	0.30	Length (m)	11.500		

Node RG3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	35.710
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	71.1	0.0	0.300	126.0	0.0

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	33.529
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	56

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	55.8	0.0	1.200	55.8	0.0	1.201	0.0	0.0

Node S-JU07 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	766
Side Inf Coefficient (m/hr)	0.00000	Link	S-10.001
Safety Factor	2.0	Surround Shape	Drainage Layer
Porosity	0.30	Diameter (mm)	2865
Invert Level (m)	34.612		

Node S-MH13 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	S-4.003
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	34.527	Surround Shape	Filter Drain
Safety Factor	2.0	Time to half empty (mins)	632	Diameter (mm)	675

Node S-JU05 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	828
Side Inf Coefficient (m/hr)	0.00000	Link	S-7.000
Safety Factor	2.0	Surround Shape	Drainage Layer
Porosity	0.30	Diameter (mm)	8600
Invert Level (m)	34.569		

Node S-MH22 (CP) Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	856
Side Inf Coefficient (m/hr)	0.00000	Link	S-7.001
Safety Factor	2.0	Surround Shape	Drainage Layer
Porosity	0.30	Diameter (mm)	8600
Invert Level (m)	34.506		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	92.521	26.180	1 year 720 minute summer	6.859	1.838
1 year 15 minute winter	64.927	26.180	1 year 720 minute winter	4.609	1.838
1 year 30 minute summer	60.022	16.984	1 year 960 minute summer	5.653	1.489
1 year 30 minute winter	42.121	16.984	1 year 960 minute winter	3.745	1.489
1 year 60 minute summer	40.398	10.676	1 year 1440 minute summer	4.127	1.106
1 year 60 minute winter	26.839	10.676	1 year 1440 minute winter	2.773	1.106
1 year 120 minute summer	24.980	6.602	30 year 15 minute summer	226.195	64.005
1 year 120 minute winter	16.596	6.602	30 year 15 minute winter	158.733	64.005
1 year 180 minute summer	19.271	4.959	30 year 30 minute summer	147.452	41.724
1 year 180 minute winter	12.527	4.959	30 year 30 minute winter	103.475	41.724
1 year 240 minute summer	15.301	4.043	30 year 60 minute summer	98.615	26.061
1 year 240 minute winter	10.165	4.043	30 year 60 minute winter	65.517	26.061
1 year 360 minute summer	11.775	3.030	30 year 120 minute summer	59.946	15.842
1 year 360 minute winter	7.654	3.030	30 year 120 minute winter	39.827	15.842
1 year 480 minute summer	9.342	2.469	30 year 180 minute summer	45.598	11.734
1 year 480 minute winter	6.207	2.469	30 year 180 minute winter	29.640	11.734
1 year 600 minute summer	7.682	2.101	30 year 240 minute summer	35.759	9.450
1 year 600 minute winter	5.249	2.101	30 year 240 minute winter	23.758	9.450

Rainfall					
Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 360 minute summer	26.939	6.932	100 year +30% CC 720 minute summer	25.431	6.816
30 year 360 minute winter	17.511	6.932	100 year +30% CC 720 minute winter	17.091	6.816
30 year 480 minute summer	20.981	5.545	100 year +30% CC 960 minute summer	20.606	5.426
30 year 480 minute winter	13.940	5.545	100 year +30% CC 960 minute winter	13.650	5.426
30 year 600 minute summer	17.039	4.661	100 year +30% CC 1440 minute summer	14.661	3.929
30 year 600 minute winter	11.642	4.661	100 year +30% CC 1440 minute winter	9.853	3.929
30 year 720 minute summer	15.093	4.045	100 year +40% CC 15 minute summer	408.473	115.584
30 year 720 minute winter	10.143	4.045	100 year +40% CC 15 minute winter	286.647	115.584
30 year 960 minute summer	12.278	3.233	100 year +40% CC 30 minute summer	268.775	76.054
30 year 960 minute winter	8.133	3.233	100 year +40% CC 30 minute winter	188.614	76.054
30 year 1440 minute summer	8.788	2.355	100 year +40% CC 60 minute summer	180.954	47.821
30 year 1440 minute winter	5.906	2.355	100 year +40% CC 60 minute winter	120.222	47.821
100 year +30% CC 15 minute summer	379.296	107.328	100 year +40% CC 120 minute summer	110.370	29.168
100 year +30% CC 15 minute winter	266.173	107.328	100 year +40% CC 120 minute winter	73.327	29.168
100 year +30% CC 30 minute summer	249.577	70.622	100 year +40% CC 180 minute summer	83.953	21.604
100 year +30% CC 30 minute winter	175.142	70.622	100 year +40% CC 180 minute winter	54.572	21.604
100 year +30% CC 60 minute summer	168.029	44.405	100 year +40% CC 240 minute summer	65.765	17.380
100 year +30% CC 60 minute winter	111.634	44.405	100 year +40% CC 240 minute winter	43.693	17.380
100 year +30% CC 120 minute summer	102.486	27.084	100 year +40% CC 360 minute summer	49.370	12.705
100 year +30% CC 120 minute winter	68.089	27.084	100 year +40% CC 360 minute winter	32.092	12.705
100 year +30% CC 180 minute summer	77.956	20.061	100 year +40% CC 480 minute summer	38.291	10.119
100 year +30% CC 180 minute winter	50.674	20.061	100 year +40% CC 480 minute winter	25.439	10.119
100 year +30% CC 240 minute summer	61.068	16.138	100 year +40% CC 600 minute summer	30.992	8.477
100 year +30% CC 240 minute winter	40.572	16.138	100 year +40% CC 600 minute winter	21.176	8.477
100 year +30% CC 360 minute summer	45.843	11.797	100 year +40% CC 720 minute summer	27.387	7.340
100 year +30% CC 360 minute winter	29.799	11.797	100 year +40% CC 720 minute winter	18.406	7.340
100 year +30% CC 480 minute summer	35.556	9.396	100 year +40% CC 960 minute summer	22.191	5.844
100 year +30% CC 480 minute winter	23.622	9.396	100 year +40% CC 960 minute winter	14.700	5.844
100 year +30% CC 600 minute summer	28.779	7.872	100 year +40% CC 1440 minute summer	15.789	4.232
100 year +30% CC 600 minute winter	19.663	7.872	100 year +40% CC 1440 minute winter	10.611	4.232

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	S-JU05	S-7.001	S-MH22 (CP)	-8.3	0.667	-0.199	0.3444	
60 minute summer	S-MH22 (CP)	9.002	Tank	-15.6	0.525	-0.065	0.4517	
120 minute winter	Tank	1.012	S-MH25	10.5	0.406	0.114	0.3482	
120 minute winter	S-RE05	S-10.001	S-JU07	-0.1	-0.007	-0.001	0.1804	
60 minute summer	S-JU07	S-10.002	S-MH28	-1.4	0.376	-0.027	0.0468	
60 minute summer	S-MH28	S-10.003	SWMH37	-1.7	-0.115	-0.045	0.0520	
15 minute summer	SWMH37	EX1	SWMH38	16.0	1.065	0.940	0.4759	
30 minute summer	SWMH38	EX2	S-MH25	12.5	0.584	0.384	0.7868	
15 minute summer	S-MH25	Hydro-Brake®	1	4.3				
15 minute summer	S-MH25	Orifice	SWMH40	0.0				0.0
15 minute summer	SWMH40	Hydro-Brake®	1	0.0				
60 minute summer	1	1.014	2	10.8	0.685	0.151	0.0577	89.8
15 minute summer	S-GU04	S-GU04	S-MH29	0.0	0.000	0.000	0.0000	
15 minute summer	S-MH29	S-12.000	S-JU08	0.0	0.000	0.000	0.0000	
15 minute summer	S-GU05	S-GU05	S-JU08	0.0	0.000	0.000	0.0000	
15 minute summer	S-JU08	S-12.001	S-MH30	0.0	0.000	0.000	0.0347	
15 minute summer	S-GU06	S-GU06	S-MH30	0.0	0.000	0.000	0.0396	
15 minute summer	S-MH30	S-12.002	S-JU09	6.5	0.900	0.370	0.0228	
15 minute summer	S-JU09	S-12.003	S-MH31	6.4	0.611	0.362	0.3254	
30 minute summer	S-MH31	Orifice	8	3.5				5.6
15 minute summer	S-MH32	S-13.000	S-JU10	0.0	0.000	0.000	0.0000	
15 minute summer	S-JU10	S-13.001	S-JU11	0.0	0.000	0.000	0.0000	
15 minute summer	S-JU11	S-13.002	S-MH33	0.0	0.000	0.000	0.0161	
15 minute summer	(O)S-RWP01	(O)S-RWP01	S-MH33	0.1	-0.098	0.003	0.0046	

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	8	1	33.896	0.000	3.5	0.0000	0.0000	OK
Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	7	Orifice	S-MH31	0.0				0.0

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
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180 minute summer	S-RE01	136	38.173	0.049	0.1	0.0009	0.0000	OK
180 minute summer	S-MH01	136	38.173	0.090	0.3	0.0254	0.0000	OK
180 minute summer	S-MH02	136	38.173	0.213	0.5	0.0602	0.0000	SURCHARGED
60 minute summer	S-JU01	50	38.068	0.163	3.4	0.0000	0.0000	FLOOD RISK
180 minute summer	S-MH03	136	38.173	0.426	3.1	2.6594	0.0000	SURCHARGED
180 minute summer	S-GU01	136	37.487	0.030	0.0	0.0047	0.0000	OK
180 minute summer	S-JU02	136	37.487	0.019	1.2	0.0000	0.0000	OK
15 minute summer	S-GU02	1	36.970	0.000	0.0	0.0000	0.0000	OK
180 minute summer	S-JU03	136	36.947	0.019	1.2	0.0000	0.0000	OK
15 minute summer	S-GU03	1	36.186	0.000	0.0	0.0000	0.0000	OK
180 minute summer	S-JU04	136	36.016	0.019	1.2	0.0000	0.0000	OK
15 minute summer	S-MH04	10	35.858	0.085	16.3	0.0241	0.0000	OK
15 minute summer	S-MH05	10	35.622	0.115	16.3	0.0325	0.0000	OK
15 minute summer	S-MH06	10	35.592	0.095	16.2	0.0268	0.0000	OK
15 minute summer	S-RE02	1	35.513	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S-MH07	10	35.505	0.106	36.0	0.0300	0.0000	OK
240 minute winter	S-MH08	228	35.377	0.399	9.0	0.1130	0.0000	SURCHARGED
240 minute winter	S-RE03	228	35.377	0.536	11.5	0.0214	0.0000	SURCHARGED
240 minute winter	S-MH11	228	35.377	0.767	15.6	48.0673	0.0000	SURCHARGED
240 minute winter	S-MH12	228	35.377	0.784	7.6	0.2219	0.0000	SURCHARGED
240 minute winter	S-MH13	228	35.377	0.850	7.5	1.9213	0.0000	SURCHARGED
240 minute winter	S-MH17 CATCHPIT	228	35.377	0.868	15.1	0.9815	0.0000	SURCHARGED
240 minute winter	S-RE04	228	35.377	0.691	0.5	0.0276	0.0000	SURCHARGED
240 minute winter	(M)S-RWP01	228	35.377	0.152	0.1	0.0061	0.0000	OK
240 minute winter	S-MH20	228	35.377	0.162	0.2	0.0458	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	S-RE01	S-1.000	S-MH01	-0.2	-0.065	-0.009	0.0306	
120 minute summer	S-MH01	S-1.001	S-MH02	-0.4	-0.031	-0.021	0.1717	
120 minute summer	S-MH02	S-1.002	S-JU01	-0.7	-0.127	-0.038	0.0973	
60 minute summer	S-JU01	S-1.003	S-MH03	3.4	0.279	0.189	0.2797	
180 minute summer	S-MH03	Orifice	S-JU02	1.2				
15 minute summer	S-GU01	S-GU01	S-JU02	-0.1	-0.252	-0.006	0.0037	
180 minute summer	S-JU02	S-1.005	S-JU03	1.2	0.945	0.033	0.0169	
15 minute summer	S-GU02	S-GU02	S-JU03	0.0	0.000	0.000	0.0015	
180 minute summer	S-JU03	S-1.006	S-JU04	1.2	0.946	0.033	0.0291	
15 minute summer	S-GU03	S-GU03	S-JU04	0.0	0.000	0.000	0.0016	
180 minute summer	S-JU04	S-1.007	S-MH04	1.2	0.836	0.033	0.0149	
15 minute summer	S-MH04	S-1.008	S-MH07	16.2	1.650	0.538	0.1030	
15 minute summer	S-MH05	S-2.000	S-MH06	16.2	0.898	0.539	0.0532	
15 minute summer	S-MH06	S-2.001	S-MH07	16.1	0.943	0.307	0.1637	
15 minute summer	S-RE02	S-3.000	S-MH07	0.0	0.000	0.000	0.0052	
15 minute summer	S-MH07	S-1.009	S-MH08	35.8	1.912	0.405	0.2808	
15 minute summer	S-MH08	S-1.010	S-MH17 CATCHPIT	38.5	2.019	0.436	0.3887	
15 minute summer	S-RE03	S-4.001	S-MH11	63.8	1.503	0.596	1.1651	
15 minute summer	S-MH11	S-4.002	S-MH12	40.8	0.852	0.499	0.2183	
15 minute summer	S-MH12	S-4.003	S-MH13	43.0	0.899	0.515	0.8209	
15 minute summer	S-MH13	S-4.004	S-MH17 CATCHPIT	40.5	0.820	0.444	0.1877	
15 minute summer	S-MH17 CATCHPIT	1.011	Tank	94.0	2.494	0.452	0.7595	
30 minute summer	S-RE04	S-7.000	S-JU05	-3.7	-0.182	-0.095	0.8293	
120 minute summer	(M)S-RWP01	(M)S-RWP1	S-MH20	-0.2	-0.124	-0.005	0.0234	
120 minute summer	S-MH20	S-8.000	S-JU05	-0.4	-0.012	-0.002	0.1256	

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S-JU05	S-7.001	S-MH22 (CP)	-29.5	0.863	-0.711	0.3905	
15 minute summer	S-MH22 (CP)	9.002	Tank	-46.1	0.917	-0.192	0.4519	
120 minute summer	Tank	1.012	S-MH25	10.3	0.341	0.112	0.3482	
15 minute summer	S-RE05	S-10.001	S-JU07	-4.4	-0.160	-0.085	0.4788	
15 minute summer	S-JU07	S-10.002	S-MH28	-18.7	-0.742	-0.362	0.0801	
15 minute summer	S-MH28	S-10.003	SWMH37	-20.1	-1.140	-0.519	0.0530	
15 minute summer	SWMH37	EX1	SWMH38	18.9	1.083	1.113	0.4915	
15 minute winter	SWMH38	EX2	S-MH25	14.9	0.771	0.458	0.7868	
240 minute winter	S-MH25	Hydro-Brake®	1	4.4				
240 minute winter	S-MH25	Orifice	SWMH40	3.8				11.2
240 minute winter	SWMH40	Hydro-Brake®	1	3.8				
180 minute winter	1	1.014	2	11.7	0.702	0.165	0.0615	296.0
15 minute summer	S-GU04	S-GU04	S-MH29	0.0	0.000	0.000	0.0000	
15 minute summer	S-MH29	S-12.000	S-JU08	0.0	0.000	0.000	0.0646	
15 minute summer	S-GU05	S-GU05	S-JU08	0.0	0.000	0.000	0.0073	
60 minute summer	S-JU08	S-12.001	S-MH30	-1.2	-0.133	-0.065	0.1127	
15 minute summer	S-GU06	S-GU06	S-MH30	0.0	0.000	0.000	0.0911	
15 minute summer	S-MH30	S-12.002	S-JU09	14.7	1.097	0.836	0.0552	
15 minute summer	S-JU09	S-12.003	S-MH31	13.9	0.835	0.785	0.4676	
30 minute summer	S-MH31	Orifice	8	5.7				14.0
15 minute summer	S-MH32	S-13.000	S-JU10	0.0	0.000	0.000	0.0000	
15 minute summer	S-JU10	S-13.001	S-JU11	0.0	0.000	0.000	0.0005	
15 minute summer	S-JU11	S-13.002	S-MH33	-0.1	-0.036	-0.002	0.0309	
15 minute summer	(O)S-RWP01	(O)S-RWP01	S-MH33	0.2	-0.164	0.005	0.0092	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	8	1	33.896	0.000	5.4	0.0000	0.0000	OK
Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	7	Orifice	S-MH31	3.8				2.3

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1 minute winter	S-RE01	S-1.000	S-MH01	-1.2	-0.206	-0.070	0.0724	
1 minute summer	S-MH01	S-1.001	S-MH02	-2.6	-0.170	-0.146	0.2155	
1 minute summer	S-MH02	S-1.002	S-JU01	-3.6	-0.238	-0.201	0.0973	
1 minute summer	S-JU01	S-1.003	S-MH03	7.7	0.522	0.433	0.2797	
1 minute summer	S-MH03	Orifice	S-JU02	2.0				
1 minute summer	S-GU01	S-GU01	S-JU02	-0.1	-0.257	-0.008	0.0047	
1 minute summer	S-JU02	S-1.005	S-JU03	2.0	1.096	0.055	0.0239	
1 minute summer	S-GU02	S-GU02	S-JU03	0.0	0.000	0.000	0.0021	
1 minute summer	S-JU03	S-1.006	S-JU04	2.0	1.097	0.055	0.0410	
1 minute summer	S-GU03	S-GU03	S-JU04	0.0	0.000	0.000	0.0022	
1 minute summer	S-JU04	S-1.007	S-MH04	2.0	0.964	0.055	0.0226	
1 minute summer	S-MH04	S-1.008	S-MH07	27.1	1.796	0.901	0.1584	
1 minute summer	S-MH05	S-2.000	S-MH06	27.3	0.983	0.906	0.0814	
1 minute summer	S-MH06	S-2.001	S-MH07	27.1	1.042	0.515	0.2487	
1 minute summer	S-RE02	S-3.000	S-MH07	-1.6	-0.115	-0.088	0.0694	
1 minute summer	S-MH07	S-1.009	S-MH08	58.5	2.042	0.663	0.4443	
1 minute summer	S-MH08	S-1.010	S-MH17 CATCHPIT	60.6	2.032	0.687	0.5475	
1 minute summer	S-RE03	S-4.001	S-MH11	105.5	1.695	0.987	1.7566	
1 minute winter	S-MH11	S-4.002	S-MH12	43.2	0.834	0.528	0.2198	
1 minute winter	S-MH12	S-4.003	S-MH13	46.0	0.903	0.552	0.8209	
1 minute winter	S-MH13	S-4.004	S-MH17 CATCHPIT	41.5	0.840	0.455	0.1877	
1 minute summer	S-MH17 CATCHPIT	1.011	Tank	119.6	2.648	0.575	0.7595	
1 minute summer	S-RE04	S-7.000	S-JU05	-6.0	-0.256	-0.155	0.8293	
1 minute summer	(M)S-RWP01	(M)S-RWP1	S-MH20	-2.4	-0.505	-0.062	0.0610	
1 minute summer	S-MH20	S-8.000	S-JU05	-4.0	-0.107	-0.020	0.1775	

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	8	1	33.896	0.000	7.3	0.0000	0.0000	OK
Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	7	Orifice	S-MH31	7.0				3.7

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Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S-MH33	11	35.038	0.082	86.0	0.0930	0.0000	OK
60 minute winter	3	59	34.494	0.965	50.8	54.9495	0.0000	OK
180 minute summer	S-MH14	112	35.917	0.917	12.0	0.2594	0.0000	FLOOD RISK
180 minute summer	S-MH15	112	35.916	1.266	11.5	1.4849	0.0000	FLOOD RISK
180 minute summer	S-MH16	112	35.915	1.288	11.0	0.3644	0.0000	FLOOD RISK
180 minute summer	S-MH18	112	35.913	1.390	9.9	2.5426	0.0000	FLOOD RISK
30 minute summer	PP2	22	36.570	0.460	10.0	2.8538	0.0000	OK
180 minute summer	PP3	112	35.913	0.293	3.3	1.3142	0.0000	OK
15 minute summer	RG1_1	1	36.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	RG1_2	1	36.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	RG1_3	1	36.450	0.000	0.0	0.0000	0.0000	OK
60 minute summer	RG2	37	39.149	0.199	18.0	9.3983	0.0000	OK
30 minute summer	RG3	20	35.921	0.211	59.2	19.0713	0.0000	OK
60 minute summer	RG4	40	36.069	0.169	12.8	8.9915	0.0000	OK
30 minute summer	PP1	22	37.052	0.412	13.3	3.3382	0.0000	OK
15 minute summer	6	11	35.403	0.156	15.5	0.0000	0.0000	OK
30 minute summer	7	19	34.860	0.300	13.4	0.0000	0.7396	FLOOD

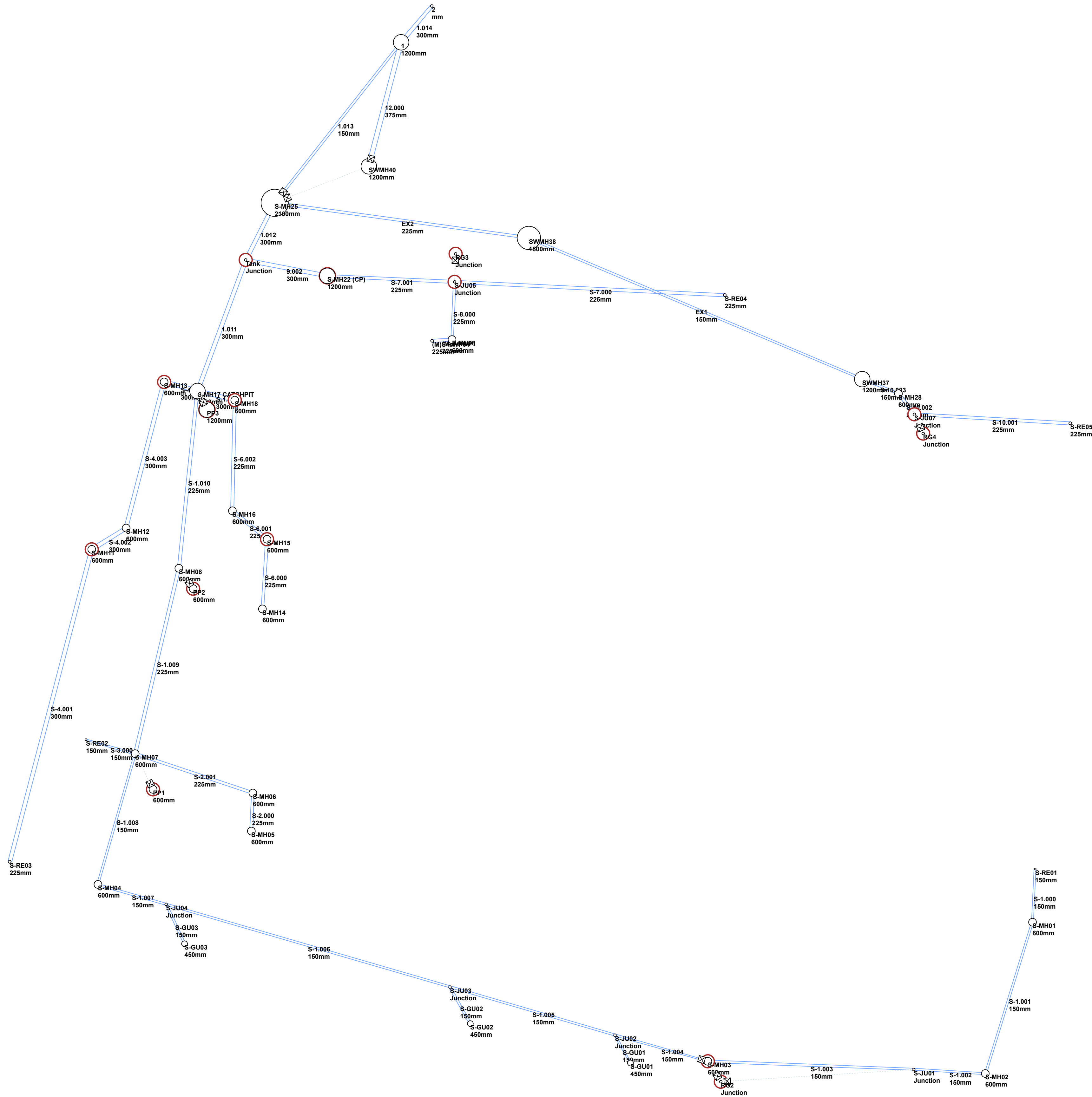
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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	8	1	33.896	0.000	7.6	0.0000	0.0000	OK
Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	7	Orifice	S-MH31	7.0				4.0

Appendix E

Temporary Drainage Model Schematic and Results



Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S-RE01		5.00	39.485	150	385113.303	397485.892	1.361
S-MH01			39.549	600	385113.102	397481.783	1.466
S-MH02			39.542	600	385109.461	397470.098	1.582
S-JU01			38.068		385103.945	397470.407	0.163
S-MH03			39.163	600	385088.070	397471.042	1.417
S-GU01		5.00	37.842	450	385082.106	397470.909	0.385
S-JU02			37.631		385080.911	397473.062	0.163
S-GU02		5.00	38.325	450	385069.761	397473.951	1.355
S-JU03			37.091		385068.192	397476.776	0.163
S-GU03		5.00	37.541	450	385047.727	397480.117	1.355
S-JU04			36.160		385046.306	397483.168	0.163
S-MH04	0.044	5.00	37.251	600	385041.052	397484.703	1.478
S-MH05	0.044	5.00	37.084	600	385052.879	397488.824	1.577
S-MH06			37.047	600	385052.996	397491.762	1.550
S-RE02		5.00	37.053	150	385040.131	397495.883	1.540
S-MH07			37.058	600	385043.922	397494.801	1.659
S-MH08			36.575	600	385047.290	397509.121	1.597
S-RE03	0.014	5.00	37.130	225	385034.244	397486.454	2.289
S-MH11			36.100	600	385040.574	397510.583	1.490
S-MH12	0.009	5.00	36.100	600	385043.226	397512.228	1.507
S-MH13			36.100	600	385046.152	397523.513	1.573
S-MH17 CATCHPIT			36.079	1200	385048.725	397522.813	1.570
S-RE04		5.00	36.130	225	385089.374	397530.223	1.444
(M)S-RWP01		5.00	36.065	225	385066.819	397526.693	0.840
S-MH20			36.061	600	385068.349	397526.785	0.846
S-JU05	0.042	5.00	36.030		385068.546	397531.244	1.487
S-MH22 (CP)	0.046	5.00	36.029	1200	385058.739	397531.709	1.598
Tank			36.060		385052.441	397532.939	1.926
S-RE05		5.00	36.099	225	385116.015	397520.318	1.366
S-JU07			36.099		385103.995	397521.012	1.487
S-MH28			36.082	600	385102.767	397522.607	1.490
SWMH37	0.106	5.00	36.043	1200	385099.973	397523.731	1.592
SWMH38			36.073	1800	385074.275	397534.635	1.895
S-MH25			36.089	2100	385054.679	397537.348	1.989
SWMH40		5.00	36.045	1200	385061.935	397540.166	2.120
1			36.080	1200	385064.424	397549.746	4.080
2			36.080		385066.790	397552.553	4.095
S-MH14	0.055	5.00	36.136	600	385053.731	397505.980	1.136
S-MH15			36.108	600	385054.090	397511.362	1.458
S-MH16			36.170	600	385051.417	397513.561	1.543
S-MH18			36.063	600	385051.601	397522.106	1.540
PP2			36.575	600	385048.392	397507.541	0.465
PP3			36.079	1200	385049.454	397521.374	0.459
RG2	0.040		39.150		385089.071	397469.464	0.200
RG3	0.086		36.010		385068.626	397533.408	0.300
RG4	0.028		36.100		385104.673	397519.528	0.200
PP1			37.058	600	385045.301	397492.043	0.418

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S-1.000	S-RE01	S-MH01	4.114	0.600	38.124	38.083	0.041	100.3	150	5.07	50.0
S-1.001	S-MH01	S-MH02	12.239	0.600	38.083	37.960	0.123	99.5	150	5.27	50.0
S-1.002	S-MH02	S-JU01	5.525	0.600	37.960	37.905	0.055	100.5	150	5.36	50.0
S-1.003	S-JU01	S-MH03	15.888	0.600	37.905	37.746	0.159	99.9	150	5.63	50.0
S-1.004	S-MH03	S-JU02	7.439	0.600	37.746	37.468	0.278	26.8	150	5.69	50.0
S-GU01	S-GU01	S-JU02	2.463	0.600	37.457	37.468	-0.011	-223.9	150	5.04	50.0
S-1.005	S-JU02	S-JU03	13.250	0.600	37.468	36.928	0.540	24.5	150	5.80	50.0
S-GU02	S-GU02	S-JU03	3.232	0.600	36.970	36.928	0.042	77.0	150	5.05	50.0
S-1.006	S-JU03	S-JU04	22.801	0.600	36.928	35.997	0.931	24.5	150	5.98	50.0
S-GU03	S-GU03	S-JU04	3.366	0.600	36.186	35.997	0.189	17.8	150	5.02	50.0
S-1.007	S-JU04	S-MH04	5.474	0.600	35.997	35.773	0.224	24.4	150	6.03	50.0
S-1.008	S-MH04	S-MH07	10.497	0.600	35.773	35.474	0.299	35.1	150	6.13	50.0
S-2.000	S-MH05	S-MH06	2.941	0.600	35.507	35.497	0.010	294.1	225	5.06	50.0
S-2.001	S-MH06	S-MH07	9.569	0.600	35.497	35.399	0.098	97.6	225	5.19	50.0
S-3.000	S-RE02	S-MH07	3.942	0.600	35.513	35.474	0.039	101.1	150	5.07	50.0
S-1.009	S-MH07	S-MH08	14.711	0.600	35.399	34.978	0.421	34.9	225	6.24	50.0
S-1.010	S-MH08	S-MH17 CATCHPIT	13.767	0.600	34.978	34.584	0.394	34.9	225	6.35	50.0
S-4.001	S-RE03	S-MH11	24.945	0.600	34.841	34.610	0.231	108.0	300	5.27	50.0
S-4.002	S-MH11	S-MH12	3.121	0.600	34.610	34.593	0.017	183.6	300	5.32	50.0
S-4.003	S-MH12	S-MH13	11.657	0.600	34.593	34.527	0.066	176.6	300	5.48	50.0
S-4.004	S-MH13	S-MH17 CATCHPIT	2.666	0.600	34.527	34.509	0.018	148.1	300	5.52	50.0
1.011	S-MH17 CATCHPIT	Tank	10.786	0.600	34.509	34.134	0.375	28.8	300	6.41	50.0
S-7.000	S-RE04	S-JU05	20.853	0.600	34.686	34.569	0.117	178.2	225	5.36	50.0
(M)S-RWP1	(M)S-RWP01	S-MH20	1.533	0.600	35.225	35.216	0.009	170.3	225	5.03	50.0
S-8.000	S-MH20	S-JU05	4.464	0.600	35.215	34.543	0.672	6.6	225	5.04	50.0
S-7.001	S-JU05	S-MH22 (CP)	9.818	0.600	34.569	34.506	0.063	155.8	225	5.51	50.0
9.002	S-MH22 (CP)	Tank	6.417	0.600	34.431	34.134	0.297	21.6	300	5.54	50.0
1.012	Tank	S-MH25	4.944	0.600	34.134	34.100	0.034	145.4	300	6.47	50.0
S-10.001	S-RE05	S-JU07	12.040	0.600	34.733	34.612	0.121	99.5	225	5.15	50.0
S-10.002	S-JU07	S-MH28	2.013	0.600	34.612	34.592	0.020	100.7	225	5.18	50.0
S-10.003	S-MH28	SWMH37	3.012	0.600	34.592	34.451	0.141	21.4	150	5.20	50.0
EX1	SWMH37	SWMH38	27.916	0.600	34.509	34.253	0.256	109.0	150	5.69	50.0
EX2	SWMH38	S-MH25	19.783	0.600	34.178	34.100	0.078	253.6	225	6.09	50.0
1.013	S-MH25	1	15.769	0.600	34.100	32.000	2.100	7.5	150	6.54	50.0
12.000	SWMH40	1	9.898	0.600	33.925	32.000	1.925	5.1	375	5.02	50.0
1.014	1	2	3.671	0.600	32.000	31.985	0.015	242.0	300	6.60	50.0
S-6.000	S-MH14	S-MH15	5.394	0.600	35.000	34.650	0.350	15.4	225	5.03	50.0
S-6.001	S-MH15	S-MH16	3.461	0.600	34.650	34.627	0.023	150.5	225	5.08	50.0
S-6.002	S-MH16	S-MH18	8.547	0.600	34.627	34.598	0.029	294.7	225	5.27	50.0
S-1.011	S-MH18	S-MH17 CATCHPIT	2.961	0.600	34.523	34.509	0.014	211.5	300	5.32	50.0

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	1440
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	38.8
Summer CV	1.000	30 year (l/s)	90.5
Winter CV	1.000	100 year (l/s)	114.1
Analysis Speed	Detailed	Check Discharge Volume	x
Skip Steady State	x		

Storm Durations											
15	30	60	120	180	240	360	480	600	720	960	1440
Return Period (years)	Climate Change (CC %)		Additional Area (A %)		Additional Flow (Q %)						
1	0		0		0						
30	0		0		0						
100	30		0		0						
100	40		0		0						

Pre-development Discharge Rate

Site Makeup	Brownfield	Time of Concentration (mins)	5.00
Brownfield Method	MRM	Betterment (%)	0
Contributing Area (ha)	0.230	Q 1 year (l/s)	38.8
PIMP (%)	100	Q 30 year (l/s)	90.5
CV	1.000	Q 100 year (l/s)	114.1

Node S-MH03 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	✓	Diameter (m)	0.030
Downstream Link	S-1.004	Invert Level (m)	37.746	Discharge Coefficient	0.600

Node S-MH25 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.013	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0095-4300-1200-4300
Invert Level (m)	34.100	Min Outlet Diameter (m)	0.150
Design Depth (m)	1.200	Min Node Diameter (mm)	1200
Design Flow (l/s)	4.3		

Node S-MH25 Offline Orifice Control

Flap Valve	x	Invert Level (m)	35.334	Discharge Coefficient	0.600
Loop to Node	SWMH40	Diameter (m)	0.300		

Node SWMH40 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	33.925	Product Number	CTL-SHE-0302-5800-1900-5800
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.375
Design Flow (l/s)	58.0	Min Node Diameter (mm)	

Node RG2 Offline Orifice Control

Flap Valve	x	Design Depth (m)	0.200	Discharge Coefficient	0.600
Loop to Node	S-MH03	Design Flow (l/s)	0.9		
Invert Level (m)	38.950	Diameter (m)	0.031		

Node RG2 Offline Orifice Control

Flap Valve	x	Invert Level (m)	39.050	Discharge Coefficient	0.600
Loop to Node	S-JU01	Diameter (m)	0.225		

Node PP2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	36.110	Slope (1:X)	27.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0	Width (m)	7.000	Inf Depth (m)	
Porosity	0.30	Length (m)	18.000		

Node S-MH11 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Link	S-4.001
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	34.610	Surround Shape	Sub-base
Safety Factor	2.0	Time to half empty (mins)	704	Diameter (mm)	3730

Node PP3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	35.620	Slope (1:X)	29.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0	Width (m)	4.250	Inf Depth (m)	
Porosity	0.30	Length (m)	14.400		

Node RG2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	38.950
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	35.7	0.0	0.200	58.6	0.0

Node S-MH03 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	272
Side Inf Coefficient (m/hr)	0.00000	Link	S-1.003
Safety Factor	2.0	Surround Shape	Drainage Layer
Porosity	0.30	Diameter (mm)	1690
Invert Level (m)	37.746		

Node RG4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	35.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	43.3	0.0	0.200	66.4	0.0

Node S-MH15 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	S-6.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	34.650	Surround Shape	Filter Drain
Safety Factor	2.0	Time to half empty (mins)	432	Diameter (mm)	675

Node S-MH18 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	S-6.002
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	34.598	Surround Shape	Filter Drain
Safety Factor	2.0	Time to half empty (mins)	636	Diameter (mm)	675

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	36.640	Slope (1:X)	20.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0	Width (m)	12.000	Inf Depth (m)	
Porosity	0.30	Length (m)	11.500		

Node RG3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	35.710
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	71.1	0.0	0.300	126.0	0.0

Node S-JU07 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	654
Side Inf Coefficient (m/hr)	0.00000	Link	S-10.001
Safety Factor	2.0	Surround Shape	Drainage Layer
Porosity	0.30	Diameter (mm)	2865
Invert Level (m)	34.612		

Node S-MH13 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	S-4.003
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	34.527	Surround Shape	Filter Drain
Safety Factor	2.0	Time to half empty (mins)	548	Diameter (mm)	675

Node S-JU05 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	732
Side Inf Coefficient (m/hr)	0.00000	Link	S-7.000
Safety Factor	2.0	Surround Shape	Drainage Layer
Porosity	0.30	Diameter (mm)	8600
Invert Level (m)	34.569		

Node S-MH22 (CP) Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	764
Side Inf Coefficient (m/hr)	0.00000	Link	S-7.001
Safety Factor	2.0	Surround Shape	Drainage Layer
Porosity	0.30	Diameter (mm)	8600
Invert Level (m)	34.506		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	92.521	26.180	1 year 120 minute summer	24.980	6.602
1 year 15 minute winter	64.927	26.180	1 year 120 minute winter	16.596	6.602
1 year 30 minute summer	60.022	16.984	1 year 180 minute summer	19.271	4.959
1 year 30 minute winter	42.121	16.984	1 year 180 minute winter	12.527	4.959
1 year 60 minute summer	40.398	10.676	1 year 240 minute summer	15.301	4.043
1 year 60 minute winter	26.839	10.676	1 year 240 minute winter	10.165	4.043

CIVICENGINEERS		Civic Engineers Ltd 77 Dale Street Manchester M1 2HG	File: 24.10.04 - SW Drainage Model Network: 1076-27 - Proposed SW Designer: HCM Checked: - 05/11/2024	Page 8 Mayfield Phase 1a Proposed SW Drainage Temporary Model Results	
Rainfall					
Event Peak Intensity (mm/hr) Average Intensity (mm/hr)			Event Peak Intensity (mm/hr) Average Intensity (mm/hr)		
1 year 360 minute summer			100 year +30% CC 120 minute summer		
1 year 360 minute winter			100 year +30% CC 120 minute winter		
1 year 480 minute summer			100 year +30% CC 180 minute summer		
1 year 480 minute winter			100 year +30% CC 180 minute winter		
1 year 600 minute summer			100 year +30% CC 240 minute summer		
1 year 600 minute winter			100 year +30% CC 240 minute winter		
1 year 720 minute summer			100 year +30% CC 360 minute summer		
1 year 720 minute winter			100 year +30% CC 360 minute winter		
1 year 960 minute summer			100 year +30% CC 480 minute summer		
1 year 960 minute winter			100 year +30% CC 480 minute winter		
1 year 1440 minute summer			100 year +30% CC 600 minute summer		
1 year 1440 minute winter			100 year +30% CC 600 minute winter		
30 year 15 minute summer			100 year +30% CC 720 minute summer		
30 year 15 minute winter			100 year +30% CC 720 minute winter		
30 year 30 minute summer			100 year +30% CC 960 minute summer		
30 year 30 minute winter			100 year +30% CC 960 minute winter		
30 year 60 minute summer			100 year +30% CC 1440 minute summer		
30 year 60 minute winter			100 year +30% CC 1440 minute winter		
30 year 120 minute summer			100 year +40% CC 15 minute summer		
30 year 120 minute winter			100 year +40% CC 15 minute winter		
30 year 180 minute summer			100 year +40% CC 30 minute summer		
30 year 180 minute winter			100 year +40% CC 30 minute winter		
30 year 240 minute summer			100 year +40% CC 60 minute summer		
30 year 240 minute winter			100 year +40% CC 60 minute winter		
30 year 360 minute summer			100 year +40% CC 120 minute summer		
30 year 360 minute winter			100 year +40% CC 120 minute winter		
30 year 480 minute summer			100 year +40% CC 180 minute summer		
30 year 480 minute winter			100 year +40% CC 180 minute winter		
30 year 600 minute summer			100 year +40% CC 240 minute summer		
30 year 600 minute winter			100 year +40% CC 240 minute winter		
30 year 720 minute summer			100 year +40% CC 360 minute summer		
30 year 720 minute winter			100 year +40% CC 360 minute winter		
30 year 960 minute summer			100 year +40% CC 480 minute summer		
30 year 960 minute winter			100 year +40% CC 480 minute winter		
30 year 1440 minute summer			100 year +40% CC 600 minute summer		
30 year 1440 minute winter			100 year +40% CC 600 minute winter		
100 year +30% CC 15 minute summer			100 year +40% CC 720 minute summer		
100 year +30% CC 15 minute winter			100 year +40% CC 720 minute winter		
100 year +30% CC 30 minute summer			100 year +40% CC 960 minute summer		
100 year +30% CC 30 minute winter			100 year +40% CC 960 minute winter		
100 year +30% CC 60 minute summer			100 year +40% CC 1440 minute summer		
100 year +30% CC 60 minute winter			100 year +40% CC 1440 minute winter		

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	S-JU05	144	34.646	0.103	2.9	1.3259	0.0000	OK
180 minute summer	S-MH22 (CP)	144	34.646	0.215	5.1	2.9252	0.0000	OK
180 minute summer	Tank	148	34.646	0.512	16.1	19.4412	0.0000	SURCHARGED
15 minute summer	S-RE05	1	34.733	0.000	0.0	0.0000	0.0000	OK
120 minute winter	S-JU07	116	34.648	0.036	1.1	0.0527	0.0000	OK
180 minute summer	S-MH28	156	34.648	0.056	1.1	0.0160	0.0000	OK
180 minute summer	SWMH37	148	34.651	0.200	5.5	0.2267	0.0000	OK
180 minute summer	SWMH38	144	34.648	0.470	5.5	1.1950	0.0000	SURCHARGED
180 minute summer	S-MH25	152	34.646	0.546	10.8	1.8902	0.0000	SURCHARGED
15 minute summer	SWMH40	1	33.925	0.000	0.0	0.0000	0.0000	OK
60 minute winter	1	141	32.054	0.053	4.3	0.0605	0.0000	OK
30 minute winter	2	88	32.034	0.049	4.3	0.0000	0.0000	OK
15 minute summer	S-MH14	10	35.038	0.038	8.3	0.0107	0.0000	OK
15 minute summer	S-MH15	10	34.731	0.081	8.3	0.0306	0.0000	OK
15 minute summer	S-MH16	10	34.710	0.083	8.2	0.0236	0.0000	OK
180 minute summer	S-MH18	144	34.646	0.123	2.8	0.0821	0.0000	OK
15 minute summer	PP2	1	36.110	0.000	0.0	0.0000	0.0000	OK
15 minute summer	PP3	1	35.620	0.000	0.0	0.0000	0.0000	OK
180 minute summer	RG2	124	39.036	0.086	2.0	3.5089	0.0000	OK
180 minute summer	RG3	116	35.807	0.097	4.3	7.7881	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S-JU05	S-7.001	S-MH22 (CP)	5.5	0.722	0.133	0.0751	
15 minute summer	S-MH22 (CP)	9.002	Tank	11.8	1.586	0.049	0.2929	
960 minute summer	Tank	1.012	S-MH25	8.6	0.337	0.094	0.3482	
15 minute summer	S-RE05	S-10.001	S-JU07	0.0	0.000	0.000	0.0073	
240 minute summer	S-JU07	S-10.002	S-MH28	1.3	0.416	0.026	0.0103	
180 minute winter	S-MH28	S-10.003	SWMH37	1.9	0.140	0.049	0.0344	
15 minute summer	SWMH37	EX1	SWMH38	15.6	1.070	0.917	0.4296	
15 minute summer	SWMH38	EX2	S-MH25	13.3	0.656	0.411	0.7868	
60 minute winter	S-MH25	Hydro-Brake®	1	4.3				
15 minute summer	S-MH25	Orifice	SWMH40	0.0				0.0
15 minute summer	SWMH40	Hydro-Brake®	1	0.0				
30 minute winter	1	1.014	2	4.3	0.542	0.060	0.0292	43.5
15 minute summer	S-MH14	S-6.000	S-MH15	8.3	1.002	0.062	0.0464	
15 minute summer	S-MH15	S-6.001	S-MH16	8.2	0.628	0.194	0.0453	
15 minute summer	S-MH16	S-6.002	S-MH18	8.2	0.663	0.271	0.1051	
15 minute summer	S-MH18	S-1.011	S-MH17 CATCHPIT	8.2	0.639	0.107	0.0381	
15 minute summer	PP2	Orifice	S-MH08	0.0				0.0
15 minute summer	PP3	Orifice	S-MH17 CATCHPIT	0.0				0.0
180 minute summer	RG2	Orifice	S-MH03	0.5				6.0
15 minute summer	RG2	Orifice	S-JU01	0.0				0.0
180 minute summer	RG3	Orifice	S-JU05	0.5				0.6
180 minute summer	RG3	Orifice	S-JU05	0.9				12.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	RG4	124	35.958	0.058	1.4	2.6837	0.0000	OK
15 minute summer	PP1	1	36.640	0.000	0.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RG3	Orifice	S-JU05	0.0				0.0
180 minute summer	RG4	Orifice	S-JU07	0.3				4.1
15 minute summer	RG4	Orifice	S-JU07	0.0				0.0
15 minute summer	PP1	Orifice	S-MH07	0.0				0.0

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
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180 minute summer	S-RE01	136	38.173	0.049	0.1	0.0009	0.0000	OK
180 minute summer	S-MH01	136	38.173	0.090	0.3	0.0254	0.0000	OK
180 minute summer	S-MH02	136	38.173	0.213	0.5	0.0602	0.0000	SURCHARGED
60 minute summer	S-JU01	50	38.068	0.163	3.4	0.0000	0.0000	FLOOD RISK
180 minute summer	S-MH03	136	38.173	0.426	3.1	2.6594	0.0000	SURCHARGED
180 minute summer	S-GU01	136	37.487	0.030	0.0	0.0047	0.0000	OK
180 minute summer	S-JU02	136	37.487	0.019	1.2	0.0000	0.0000	OK
15 minute summer	S-GU02	1	36.970	0.000	0.0	0.0000	0.0000	OK
180 minute summer	S-JU03	136	36.947	0.019	1.2	0.0000	0.0000	OK
15 minute summer	S-GU03	1	36.186	0.000	0.0	0.0000	0.0000	OK
180 minute summer	S-JU04	136	36.016	0.019	1.2	0.0000	0.0000	OK
15 minute summer	S-MH04	10	35.858	0.085	16.3	0.0241	0.0000	OK
15 minute summer	S-MH05	10	35.622	0.115	16.3	0.0324	0.0000	OK
15 minute summer	S-MH06	10	35.591	0.094	16.2	0.0265	0.0000	OK
15 minute summer	S-RE02	1	35.513	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S-MH07	10	35.499	0.100	32.3	0.0283	0.0000	OK
240 minute winter	S-MH08	240	35.122	0.144	6.5	0.0408	0.0000	OK
240 minute winter	S-RE03	236	35.123	0.282	1.1	0.0113	0.0000	OK
240 minute winter	S-MH11	240	35.122	0.512	9.6	25.3799	0.0000	SURCHARGED
240 minute winter	S-MH12	240	35.122	0.529	9.3	0.1498	0.0000	SURCHARGED
240 minute winter	S-MH13	240	35.122	0.595	9.1	1.2488	0.0000	SURCHARGED
240 minute winter	S-MH17 CATCHPIT	240	35.122	0.613	9.3	0.6936	0.0000	SURCHARGED
240 minute winter	S-RE04	240	35.122	0.436	0.5	0.0175	0.0000	SURCHARGED
15 minute summer	(M)S-RWP01	1	35.225	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S-MH20	1	35.215	0.000	0.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	S-RE01	S-1.000	S-MH01	-0.2	-0.065	-0.009	0.0306	
120 minute summer	S-MH01	S-1.001	S-MH02	-0.4	-0.031	-0.021	0.1717	
120 minute summer	S-MH02	S-1.002	S-JU01	-0.7	-0.127	-0.038	0.0973	
60 minute summer	S-JU01	S-1.003	S-MH03	3.4	0.279	0.189	0.2797	
180 minute summer	S-MH03	Orifice	S-JU02	1.2				
15 minute summer	S-GU01	S-GU01	S-JU02	-0.1	-0.252	-0.006	0.0037	
180 minute summer	S-JU02	S-1.005	S-JU03	1.2	0.945	0.033	0.0169	
15 minute summer	S-GU02	S-GU02	S-JU03	0.0	0.000	0.000	0.0015	
180 minute summer	S-JU03	S-1.006	S-JU04	1.2	0.946	0.033	0.0291	
15 minute summer	S-GU03	S-GU03	S-JU04	0.0	0.000	0.000	0.0016	
180 minute summer	S-JU04	S-1.007	S-MH04	1.2	0.836	0.033	0.0149	
15 minute summer	S-MH04	S-1.008	S-MH07	16.2	1.650	0.538	0.1030	
15 minute summer	S-MH05	S-2.000	S-MH06	16.2	0.904	0.539	0.0529	
15 minute summer	S-MH06	S-2.001	S-MH07	16.1	0.988	0.307	0.1563	
15 minute summer	S-RE02	S-3.000	S-MH07	0.0	0.000	0.000	0.0038	
15 minute summer	S-MH07	S-1.009	S-MH08	32.2	1.875	0.364	0.2524	
15 minute summer	S-MH08	S-1.010	S-MH17 CATCHPIT	31.9	1.954	0.362	0.2605	
15 minute summer	S-RE03	S-4.001	S-MH11	5.0	0.789	0.047	0.5150	
60 minute summer	S-MH11	S-4.002	S-MH12	-21.3	-0.503	-0.260	0.2198	
60 minute summer	S-MH12	S-4.003	S-MH13	-20.9	0.460	-0.251	0.8209	
60 minute summer	S-MH13	S-4.004	S-MH17 CATCHPIT	-21.7	-0.310	-0.238	0.1877	
15 minute summer	S-MH17 CATCHPIT	1.011	Tank	57.6	1.890	0.277	0.7406	
30 minute winter	S-RE04	S-7.000	S-JU05	-2.7	-0.131	-0.068	0.7713	
15 minute summer	(M)S-RWP01	(M)S-RWP1	S-MH20	0.0	0.000	0.000	0.0000	
15 minute summer	S-MH20	S-8.000	S-JU05	0.0	0.000	0.000	0.0888	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	RG4	80	36.019	0.119	4.5	5.9719	0.0000	OK
15 minute summer	PP1	1	36.640	0.000	0.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RG3	Orifice	S-JU05	0.0				0.0
120 minute summer	RG4	Orifice	S-JU07	0.5				7.3
120 minute summer	RG4	Orifice	S-JU07	0.9				1.6
15 minute summer	PP1	Orifice	S-MH07	0.0				0.0

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
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180 minute summer	S-RE01	136	38.866	0.742	0.7	0.0134	0.0000	SURCHARGED
180 minute summer	S-MH01	136	38.866	0.783	1.3	0.2215	0.0000	SURCHARGED
180 minute summer	S-MH02	136	38.866	0.906	1.9	0.2563	0.0000	SURCHARGED
15 minute summer	S-JU01	18	38.068	0.163	7.0	0.0000	0.0000	FLOOD RISK
180 minute summer	S-MH03	136	38.865	1.119	4.5	5.8795	0.0000	FLOOD RISK
180 minute summer	S-GU01	136	37.492	0.035	0.0	0.0055	0.0000	OK
180 minute summer	S-JU02	136	37.492	0.024	2.0	0.0000	0.0000	OK
15 minute summer	S-GU02	1	36.970	0.000	0.0	0.0000	0.0000	OK
180 minute summer	S-JU03	136	36.952	0.024	2.0	0.0000	0.0000	OK
15 minute summer	S-GU03	1	36.186	0.000	0.0	0.0000	0.0000	OK
180 minute summer	S-JU04	136	36.021	0.024	2.0	0.0000	0.0000	OK
15 minute summer	S-MH04	10	35.903	0.130	27.5	0.0366	0.0000	OK
15 minute summer	S-MH05	10	35.669	0.162	27.4	0.0459	0.0000	OK
15 minute summer	S-MH06	10	35.629	0.132	27.3	0.0372	0.0000	OK
180 minute summer	S-RE02	116	35.547	0.034	0.2	0.0006	0.0000	OK
180 minute summer	S-MH07	116	35.547	0.148	18.9	0.0418	0.0000	OK
180 minute summer	S-MH08	116	35.544	0.566	18.9	0.1601	0.0000	SURCHARGED
180 minute summer	S-RE03	116	35.539	0.698	4.6	0.0279	0.0000	SURCHARGED
180 minute summer	S-MH11	116	35.539	0.929	31.3	26.4183	0.0000	SURCHARGED
180 minute summer	S-MH12	116	35.539	0.946	30.1	0.2677	0.0000	SURCHARGED
180 minute summer	S-MH13	116	35.539	1.012	29.3	2.3492	0.0000	SURCHARGED
180 minute summer	S-MH17 CATCHPIT	116	35.539	1.030	30.1	1.1645	0.0000	SURCHARGED
180 minute summer	S-RE04	116	35.551	0.865	0.9	0.0346	0.0000	SURCHARGED
120 minute winter	(M)S-RWP01	84	35.546	0.321	1.1	0.0129	0.0000	SURCHARGED
120 minute winter	S-MH20	86	35.546	0.331	2.1	0.0936	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	S-RE01	S-1.000	S-MH01	-1.2	-0.207	-0.070	0.0724	
60 minute summer	S-MH01	S-1.001	S-MH02	-2.6	-0.170	-0.146	0.2155	
60 minute summer	S-MH02	S-1.002	S-JU01	-3.6	-0.238	-0.201	0.0973	
30 minute summer	S-JU01	S-1.003	S-MH03	7.7	0.522	0.433	0.2797	
180 minute summer	S-MH03	Orifice	S-JU02	2.0				
15 minute summer	S-GU01	S-GU01	S-JU02	-0.1	-0.257	-0.008	0.0047	
180 minute summer	S-JU02	S-1.005	S-JU03	2.0	1.096	0.055	0.0239	
15 minute summer	S-GU02	S-GU02	S-JU03	0.0	0.000	0.000	0.0021	
180 minute summer	S-JU03	S-1.006	S-JU04	2.0	1.097	0.055	0.0410	
15 minute summer	S-GU03	S-GU03	S-JU04	0.0	0.000	0.000	0.0022	
180 minute summer	S-JU04	S-1.007	S-MH04	2.0	0.964	0.055	0.0226	
15 minute summer	S-MH04	S-1.008	S-MH07	27.1	1.796	0.901	0.1584	
15 minute summer	S-MH05	S-2.000	S-MH06	27.3	0.993	0.906	0.0805	
15 minute summer	S-MH06	S-2.001	S-MH07	27.1	1.085	0.515	0.2388	
15 minute summer	S-RE02	S-3.000	S-MH07	-0.4	0.219	-0.023	0.0182	
15 minute summer	S-MH07	S-1.009	S-MH08	53.8	2.095	0.609	0.3821	
15 minute summer	S-MH08	S-1.010	S-MH17 CATCHPIT	53.5	2.165	0.605	0.4470	
120 minute summer	S-RE03	S-4.001	S-MH11	10.9	0.488	0.102	1.7566	
30 minute summer	S-MH11	S-4.002	S-MH12	-54.6	-0.938	-0.668	0.2198	
30 minute summer	S-MH12	S-4.003	S-MH13	-53.0	-0.753	-0.636	0.8209	
30 minute summer	S-MH13	S-4.004	S-MH17 CATCHPIT	-54.1	-0.768	-0.593	0.1877	
15 minute summer	S-MH17 CATCHPIT	1.011	Tank	76.1	2.082	0.366	0.7595	
30 minute summer	S-RE04	S-7.000	S-JU05	-6.5	-0.228	-0.167	0.8293	
60 minute winter	(M)S-RWP01	(M)S-RWP1	S-MH20	-1.6	-0.262	-0.040	0.0610	
120 minute summer	S-MH20	S-8.000	S-JU05	-2.6	-0.094	-0.013	0.1775	

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S-JU05	S-7.001	S-MH22 (CP)	-28.1	0.915	-0.678	0.3905	
15 minute summer	S-MH22 (CP)	9.002	Tank	-32.2	2.043	-0.134	0.4519	
180 minute summer	Tank	1.012	S-MH25	31.0	0.441	0.337	0.3482	
15 minute summer	S-RE05	S-10.001	S-JU07	-6.1	-0.154	-0.117	0.4788	
15 minute summer	S-JU07	S-10.002	S-MH28	-32.6	-0.819	-0.629	0.0801	
15 minute summer	S-MH28	S-10.003	SWMH37	-36.5	-2.071	-0.943	0.0530	
30 minute summer	SWMH37	EX1	SWMH38	30.9	1.753	1.816	0.4915	
30 minute summer	SWMH38	EX2	S-MH25	29.0	0.751	0.894	0.7868	
180 minute summer	S-MH25	Hydro-Brake®	1	4.7				
180 minute summer	S-MH25	Orifice	SWMH40	38.4				83.4
180 minute summer	SWMH40	Hydro-Brake®	1	38.4				
180 minute summer	1	1.014	2	43.2	1.018	0.607	0.1555	309.0
15 minute summer	S-MH14	S-6.000	S-MH15	34.1	1.268	0.256	0.1426	
15 minute summer	S-MH15	S-6.001	S-MH16	33.8	0.894	0.801	0.1376	
15 minute summer	S-MH16	S-6.002	S-MH18	33.5	1.009	1.114	0.3399	
15 minute summer	S-MH18	S-1.011	S-MH17 CATCHPIT	32.4	0.840	0.426	0.2085	
15 minute summer	PP2	Orifice	S-MH08	0.0				0.0
15 minute summer	PP3	Orifice	S-MH17 CATCHPIT	0.0				0.0
60 minute summer	RG2	Orifice	S-MH03	0.8				6.9
60 minute summer	RG2	Orifice	S-JU01	9.3				10.8
30 minute summer	RG3	Orifice	S-JU05	23.5				18.6
30 minute summer	RG3	Orifice	S-JU05	1.4				10.3

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	RG4	40	36.055	0.155	11.9	8.1142	0.0000	OK
15 minute summer	PP1	1	36.640	0.000	0.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	RG3	Orifice	S-JU05	3.6				1.3
60 minute summer	RG4	Orifice	S-JU07	0.6				6.9
60 minute summer	RG4	Orifice	S-JU07	4.3				5.6
15 minute summer	PP1	Orifice	S-MH07	0.0				0.0

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	S-JU05	112	35.595	1.052	35.0	37.4340	0.0000	SURCHARGED
180 minute summer	S-MH22 (CP)	112	35.584	1.153	20.1	18.9209	0.0000	SURCHARGED
180 minute summer	Tank	112	35.581	1.447	39.6	45.6190	0.0000	SURCHARGED
30 minute winter	S-RE05	21	36.056	1.323	4.8	0.0529	0.0000	FLOOD RISK
60 minute summer	S-JU07	35	36.048	1.436	20.7	7.1100	0.0000	FLOOD RISK
30 minute winter	S-MH28	21	36.048	1.456	25.8	0.4120	0.0000	FLOOD RISK
30 minute summer	SWMH37	20	36.043	1.592	63.9	1.8006	1.4472	FLOOD
120 minute summer	SWMH38	78	35.595	1.417	25.8	3.6069	0.0000	SURCHARGED
180 minute summer	S-MH25	112	35.570	1.470	55.5	5.0935	0.0000	SURCHARGED
180 minute summer	SWMH40	112	34.214	0.289	50.9	0.3273	0.0000	OK
180 minute summer	1	112	32.219	0.219	55.8	0.2478	0.0000	OK
180 minute summer	2	112	32.169	0.184	55.9	0.0000	0.0000	OK
180 minute summer	S-MH14	112	35.589	0.589	12.0	0.1667	0.0000	SURCHARGED
180 minute summer	S-MH15	112	35.588	0.938	12.0	1.0343	0.0000	SURCHARGED
180 minute summer	S-MH16	112	35.587	0.960	11.1	0.2717	0.0000	SURCHARGED
180 minute summer	S-MH18	112	35.585	1.062	10.6	1.8822	0.0000	SURCHARGED
15 minute summer	PP2	1	36.110	0.000	0.0	0.0000	0.0000	OK
15 minute summer	PP3	1	35.620	0.000	0.0	0.0000	0.0000	OK
60 minute summer	RG2	37	39.149	0.199	18.0	9.3990	0.0000	OK
30 minute summer	RG3	21	35.907	0.197	51.6	17.5882	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S-JU05	S-7.001	S-MH22 (CP)	-28.5	0.934	-0.686	0.3905	
15 minute summer	S-MH22 (CP)	9.002	Tank	33.6	2.055	0.140	0.4519	
180 minute summer	Tank	1.012	S-MH25	39.7	0.564	0.432	0.3482	
30 minute summer	S-RE05	S-10.001	S-JU07	-8.3	-0.209	-0.160	0.4788	
15 minute summer	S-JU07	S-10.002	S-MH28	-34.3	-0.864	-0.663	0.0801	
15 minute summer	S-MH28	S-10.003	SWMH37	-39.2	-2.227	-1.013	0.0530	
15 minute summer	SWMH37	EX1	SWMH38	31.8	1.807	1.872	0.4915	
15 minute summer	SWMH38	EX2	S-MH25	29.9	0.760	0.921	0.7868	
180 minute summer	S-MH25	Hydro-Brake®	1	4.7				
180 minute summer	S-MH25	Orifice	SWMH40	50.9				105.3
180 minute summer	SWMH40	Hydro-Brake®	1	51.0				
180 minute summer	1	1.014	2	55.9	1.111	0.786	0.1842	332.2
15 minute summer	S-MH14	S-6.000	S-MH15	36.7	1.277	0.276	0.1479	
15 minute summer	S-MH15	S-6.001	S-MH16	36.5	0.926	0.862	0.1376	
15 minute summer	S-MH16	S-6.002	S-MH18	36.1	1.035	1.200	0.3399	
15 minute summer	S-MH18	S-1.011	S-MH17 CATCHPIT	33.8	0.860	0.444	0.2085	
15 minute summer	PP2	Orifice	S-MH08	0.0				0.0
15 minute summer	PP3	Orifice	S-MH17 CATCHPIT	0.0				0.0
60 minute summer	RG2	Orifice	S-MH03	0.9				7.0
60 minute summer	RG2	Orifice	S-JU01	10.4				12.1
30 minute summer	RG3	Orifice	S-JU05	25.9				20.4
30 minute summer	RG3	Orifice	S-JU05	1.4				10.4

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	RG4	39	36.067	0.167	12.8	8.8713	0.0000	OK
15 minute summer	PP1	1	36.640	0.000	0.0	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	RG3	Orifice	S-JU05	4.6				1.7
60 minute summer	RG4	Orifice	S-JU07	0.6				6.9
60 minute summer	RG4	Orifice	S-JU07	5.6				6.5
15 minute summer	PP1	Orifice	S-MH07	0.0				0.0

Appendix F

2023 Site Investigation

Job Title

Phase 1A, Mayfield, Manchester

Prepared for

LandsecU + I

Report Type

Geotechnical and Geoenvironmental
Interpretative Report

Date

2 February 2024



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Geotechnical and Geoenvironmental Interpretative Report

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1. Introduction

Civic Earth Limited was appointed on 19 October 2023 by Civic Engineers on behalf of LandsecU+I (the Client) to undertake a supplementary Phase 2 site investigation and provide a Geotechnical and Geoenvironmental Interpretative Report (GGIR) for the proposed redevelopment of Plots M, N and O of the Mayfield Phase 1A Development area (herein referred to as "the site"). The Phase 1A development area forms part of the wider Mayfield Development.

The following reports have previously been produced for the site:

- BuroHappold (2017) Geoenvironmental and Geotechnical Desk Study, Mayfield Regeneration. 10 August 2017. Reference 035548¹.
- ROC (2019) Phase 2 Site Investigation. Mayfield Plot M. 09 December 2019. Reference LD/AS/P2/3986².
- ROC (2020) Phase 2 Site Investigation. Plots O + N, Mayfield. 18 December 2020. Revision 3. Reference LD/AS/ 4134-ROC-XX-XX-RP-ES-P2SI1³.
- ROC (2021) Phase 3a Remediation Strategy, Plots O, M and N. 15 January 2021. Revision 2. Reference 4153-ROC-XX-XX-RP-ES-P3RS1⁴.
- ROC (2021) Mayfield Park, Mayfield, Manchester. Phase 3A Remediation Strategy. Reference 4153-ROC-XX-XX-RP-ES-P3RS1. Revision 2. 16 March 2021⁵.
- E3P (2021) Mayfield Park and Plots O, N and M. Remediation and Enabling Works Verification. November 2021. Reference 14-575-R1-Rev1⁶.
- Civic Earth (2023) Mayfield Phase 1a. Local Authority and Environment Agency comments on the Applications for Mayfield Phase 1A Technical Note. 24 August 2023. Reference E01001_TN001⁷.

The above reports have been used as supporting information in the preparation of this GGIR, and reference should be made to the reports for full details of the investigations and assessments completed for the site.

The aim of this report is to provide:

- A brief summary of the site history, anticipated geology and historical ground investigation data, hydrogeological setting and preliminary risk assessment and conceptual site model and remediation works completed as part of the enabling works;
- A summary of the ground and groundwater conditions encountered during the supplementary Phase 2 site investigation, and analysis and interpretation of chemical and geotechnical laboratory testing carried out as part of the site investigation;
- Recommendations with respect to potential material reuse and waste disposal and the geotechnical design of the project.

It is recommended that this report is submitted to the Local Authority to support the Planning Applications made in relation to the site, namely Application 137263/FO/2023 (Plot O, also referred to as Poulton), Application 137349/JO/2023 (Plot M, also referred to as Republic) and Application 137350/JO/2023 (Plot N, also referred to as MSCP).

¹ BuroHappold (2017) *Geoenvironmental and Geotechnical Desk Study, Mayfield Regeneration*. 10 August 2017. Reference 035548.

² ROC (2019) *Phase 2 Site Investigation. Mayfield Plot M*. 09 December 2019. Reference LD/AS/P2/3986.

³ ROC (2020) *Phase 2 Site Investigation. Plots O + N, Mayfield*. 18 December 2020. Reference LD/AS/ 4134-ROC-XX-XX-RP-ES-P2SI1. Revision 3.

⁴ ROC (2020) *Phase 3a Remediation Strategy, Plots O, M and N*. 17 December 2020. Reference 4153-ROC-XX-XX-RP-ES-P3RS1.

⁵ ROC (2021) *Mayfield Park, Mayfield, Manchester. Phase 3A Remediation Strategy*. Reference 4153-ROC-XX-XX-RP-ES-P3RS1 Revision 2. 16 March 2021.

⁶ E3P (2021) *Mayfield Park and Plots O, N and M. Remediation and Enabling Works Verification*. November 2021. Reference 14-575-R1-Rev1.

⁷ Civic Earth (2023) *Mayfield Phase 1a. Local Authority and Environment Agency comments on the Applications for Mayfield Phase 1A Technical Note*. 24 August 2023. Reference E01001_TN001.

2. Site Context

2.1 Site Location

The site is located off Baring Street in Manchester. The approximate postcode for the site is M12 6HW. The National Grid coordinates for the approximate centre of the site are 385047E, 397539N and the site is approximately 0.85 ha in size. The site location is illustrated in Plate 1.

Plate 1: Approximate Site Location Plan (©OpenStreetMap Contributors)



2.2 Site Description

The site is roughly rectangular in shape and bounded to the north by Mayfield Park and the River Medlock, to the east by the Phase 1B area of the Mayfield Development (currently undeveloped land), to the south by Mancunian Way (A635) and to the west by Baring Street. The site is currently an unoccupied parcel of land following the recent completion of earthworks across the wider Mayfield Development. It is understood that these earthworks were carried out across Mayfield Park to the north and the Phase 1A area. An attenuation basin has been excavated in the north west of site.

The site is made up of two relatively flat areas, with current ground levels in the western part of the site ranging from approximately +31.6m above Ordnance Datum (mOD) in the north western area of the site to +36.1mOD in the south western area of the site. A steep slope upwards separates the flat area in the western part of the site to eastern part. Ground levels within the eastern half of the site range from +35.3mOD to +37.2mOD. The site slopes up to connect with a pedestrian walkway running adjacent to the southern boundary.

2.3 Proposed Development

It is understood that the current proposal for the redevelopment of the site will include the development of the following three plots;

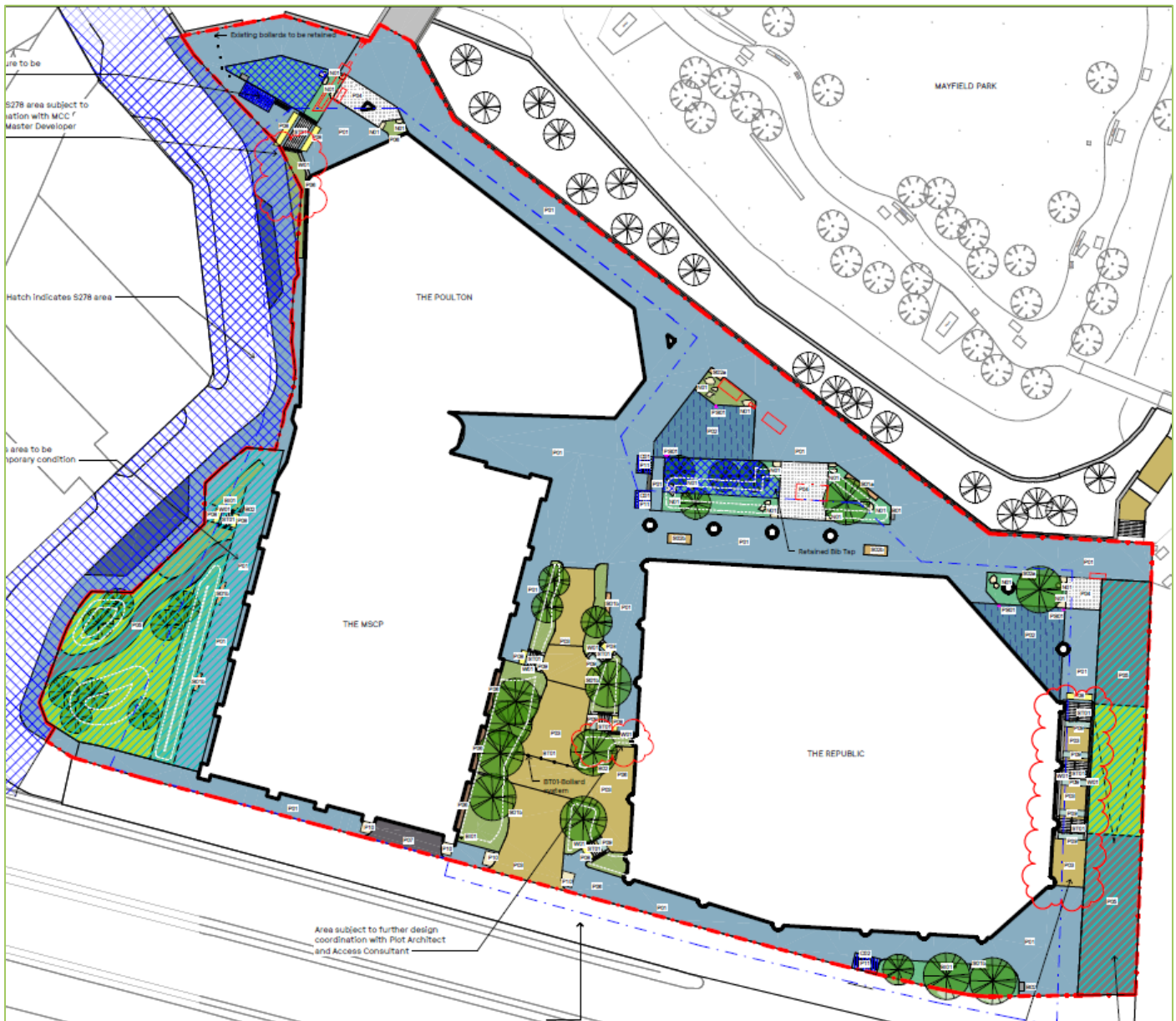
- Plot M, also known as The Republic building, is a proposed 11 storey high building situated in the eastern part of the site.

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- Plot N, also known as the MSCP building, is a proposed 9 storey high car park with a basement level situated in the southwest of the site.
- Plot O, known as The Poulton building, is a proposed 9 storey high building with a basement level situated in the northwest part of the site.

The locations of the plots within the site are illustrated in Plate 2. Localised areas of soft landscaping are proposed around the plots including a rain garden to the west of the MSCP.

Plate 2: Conceptual Sketch for Proposed Redevelopment (Studio Egret West Site Wide Landscape Content Plan)



3. Summary of Previous Desk Study and Ground Investigations

3.1 BuroHappold Desk Study

A desk study was previously carried out for the wider Mayfield Development by BuroHappold Engineering (BuroHappold) in 2017¹, which included the site as part of the 'Southern Zone' and 'River Zone'. With reference to the desk study, the site was historically occupied by a Water Meter Works across the southwest of the site, a Tannery across the north of the site, the latter of which was subsequently developed into part of Chapelfield Rubber Works including tanks. The wider Mayfield Development and surrounding area were predominantly historically occupied by industrial activities.

The BuroHappold preliminary risk assessment identified the historical site uses as well as more recent site uses (workshops, factories, car parks etc.) as potential sources of contamination including asbestos, heavy metals and hydrocarbons as well as the anticipated Made Ground underlying the site due to the various historical developments. The risks to human health were considered to be low to moderate with the risks to controlled waters (the underlying Principal aquifer of the Chester Sandstone Formation and adjacent River Medlock) also considered to be low to moderate.

3.2 Previous Ground Investigations

The BuroHappold desk study¹ states that a ground investigation was carried out at the wider Mayfield Development by Ground Investigation & Piling Limited (GIP) in April 2017 which comprised the excavation of seven window sample boreholes and associated monitoring and testing. However, the factual data from the ground investigation is not included within the BuroHappold desk study and Civic Earth have therefore not been able to review this information and ascertain which boreholes, if any, were carried out within the Phase 1A site boundary.

With reference to the ROC Plot O and N ground investigation report³, a historical ground investigation was carried out within Plots O and N by REC Limited in 2019. The scope of the REC ground investigation included four window sample boreholes up to a maximum depth of 5m below ground level (mbgl) (WS01 to WS04), six trial pits to depths up to 2.1mbgl (TP01 to TP05) and seven boreholes up to depths of 25.0mbgl (BH01, BH02, BH03A, BH04 to BH04B, BH05). It is noted that the factual data from the investigation is not included within the ROC report³. The ROC report also noted that the REC report did not include coordinates for the exploratory hole locations and therefore the locations were used as a reference only.

Intrusive ground investigations were carried out across the site by ROC in 2019² and 2020³ and the exploratory hole locations within the site are illustrated in Plate 3. The scope of the ROC 2019 investigation within Plot M included four boreholes to depths up to 20mbgl (BH101 to BH104) and six windowless sample boreholes (WS101 to 106). The ROC 2020 investigation within Plots O and N, as well as the off-site area of the historical Mayfield Baths, included six boreholes to depths up to 25mbgl (BH105 to BH110), five shallow trial pit excavations (TP101 to TP105) and ten trial trenches (TT01 to TT10).

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It is understood that the objectives of the investigation were to determine the ground and groundwater profiles at the site, to target Made Ground surrounding key historical features identified at the site including the Water Meter Works and Chimney, obtain geotechnical information to aid the river wall design (BH109 and BH110) and delineate below ground features within the footprint of the historical Mayfield Baths (TT01 to TT10).

3.3 Ground Conditions

The ROC report³ summarises that the REC 2019 investigation encountered Made Ground across Plots O and N up to a maximum depth of 5.50mbgl, and typically comprised asphalt overlying gravelly sand or gravelly clay with gravel comprising concrete, limestone and brick. Natural soils were encountered below the Made Ground and were described as sandy clay, sandy gravel or fine to medium sand. The sandstone bedrock was reported at depths between 2.80m and 5.50mbgl. It was noted that at shallow depths, the bedrock was recovered as 'red sand becoming reddish brown gravel of sandstone'. At depths greater than 7.0mbgl, the sandstone was described as 'very weak to weak becoming medium strong orangish red sandstone'. It was also noted that frequent bands of heavily weathered rock were recorded as reddish brown gravel (of sandstone) and core recovery was typically low.

It is understood that the former Mayfield baths site (located in the northwest area) was subsequently fully exposed and excavated by Salford Archaeology as part pre-commencement planning condition discharge relating to archaeological surveys. It is understood that these works revealed the majority of the swimming baths structure and ancillary walls / drainage were still largely intact and that a visual inspection of the area was completed by engineers from RoC Consulting to assess what (if any) areas of potential contamination had been revealed, although no visual or olfactory evidence of significantly impacted soils was noted during this inspection.

Summaries of the ground conditions encountered at Plot M and Plots O and N during the ROC 2019 and 2020 investigations are provided in Table 1 and Table 2 respectively.

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Table 1: Summary of ROC Ground Conditions for Plot M²

Stratum	Top of Stratum (mbgl) [mOD]	Thickness (m)
Concrete slab / grey and brown slightly clayey slightly sandy gravel / soft to firm grey brown slightly sandy to very sandy slightly gravelly to gravelly clay / slightly sandy organic clay with rootlets..... Gravel is angular to subangular fine to coarse of brick, timber, concrete, glass, slate and ash. Occasional brick cobbles noted. Thickness not proven in WS102, WS103, WS104. [MADE GROUND]	0.00 [38.88 to 33.20]	0.30 to 4.10
Firm light brown mixed grey slightly gravelly sandy clay. Gravel is angular to subangular fine to coarse of various lithologies including rare brick. Encountered in BH101 only. [MADE GROUND – REWORKED ALLUVIUM] *	1.50 [35.43]	2.60
Very dense orangish brown slightly clayey gravelly SAND / very gravelly sand. Gravel is angular to subangular fine to coarse of sandstone. Sand is fine to coarse. Thickness proven in BH101 to BH104 only. [WEATHERED SANDSTONE]	0.30 to 4.10 [37.88 to 32.79]	0.60 to 1.90
Extremely weak reddish brown SANDSTONE, completely weathered, recovered as sand within drilling flush. Frequent sand filled fractures and horizons of distinctly weathered sandstone.	0.90 to 6.00 [36.38 to 30.93]	6.15 to 8.4
Becoming very weak and distinctly weathered. Frequent clay and gravel filled fractures. [CHESTER SANDSTONE FORMATION]	10.90 to 12.15 [27.98 to 22.00]	Proven to 21.0mbgl [13.20mOD]

*Recorded as "Reworked Clay" by ROC, interpreted to be anthropogenically reworked Alluvium.

Table 2: Summary of ROC Ground Conditions for Plot N + O³

Stratum	Top of Stratum (mbgl) [mOD]	Thickness (m)
Asphalt / concrete / brick fill / ceramic blocks / light grey brown gravel / silty gravel and cobbles / slightly clayey sandy gravel / orange brown slightly clayey slightly silty gravelly sand / soft brown slightly gravelly sandy clay. Gravel is angular fine to coarse of brick, glass, slate, concrete, ash, quartz, sandstone, clinker, mudstone, ceramic and limestone. [MADE GROUND]	0.00 [35.55 to 33.24]	1.70 to 7.30
Soft brown slightly gravelly clayey silty SAND / slightly silty sandy GRAVEL / GRAVEL. Gravel is subangular to rounded fine to medium of various lithologies. Encountered in borehole BH108, BH109A, BH110 and TP104 only. [ALLUVIUM]	1.70 to 5.50 [33.02 to 29.84]	>0.30 to 3.70
Very dense reddish orange brown very gravelly SAND. Gravel is fine to coarse angular sandstone. Encountered in borehole BH109A and TP102. [WEATHERED SANDSTONE] *	1.90 to 7.20 [33.12 to 28.25]	>1.40 to >3.25
Extremely weak reddish brown SANDSTONE, completely weathered, recovered as sand within drilling flush. Frequent sand filled fractures and horizons of distinctly weathered sandstone.	5.40 to 7.30 [29.32 to 27.64]	2.41.27 to 11.50
Becoming very weak and distinctly weathered. Frequent clay and gravel filled fractures.	7.87 to 18.50 [27.47 to 16.65]	Proven to 25.00mbgl [9.72mOD]

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Stratum	Top of Stratum (mbgl) [mOD]	Thickness (m)
Becoming extremely weak and completely weathered, recovered as sand. Encountered in BH110 only. [CHESTER SANDSTONE FORMATION]	11.20 [24.14]	Proven to 17.50mbgl [17.84mOD]

*Logged as "Sherwood Sandstone; Extremely weak" and "suspected weathered bedrock" on ROC borehole records; interpreted to be weathered sandstone deposits.

3.4 Groundwater Conditions

No groundwater strikes were recorded during the ROC investigation within Plot M; however, subsequent groundwater monitoring indicated resting groundwater levels at approximately 33.7mOD within the Chester Sandstone Formation².

Groundwater strikes were recorded in boreholes BH108 at 6.0mbgl (rising to 5.35mbgl) and in borehole BH109A at 6.0mbgl (rising to 5.4mbgl) during the ROC investigation within Plots O and N³. Subsequent groundwater monitoring reported groundwater tables within the Made Ground, superficial deposits and Chester Sandstone Formation at depths between 3.57mbgl and 5.40mbgl.

3.5 Ground Contamination

The ROC report³ summarises that chemical analysis of the soils undertaken as part of the REC 2019 investigation indicated elevated concentrations of arsenic and benzo(a)pyrene at boreholes BH04 and BH02 respectively.

The chemical assessment undertaken by ROC for Plot M² highlighted evidence of asbestos containing material in the Made Ground in borehole WS103 (at 0.007% by weight). No other exceedances against the commercial end-use assessment threshold criteria were recorded.

Asbestos fibres were also encountered within the Made Ground during the ROC investigation for Plots O and N³ in exploratory holes TT03 (two samples), TPP02 (two samples) and BH109A. In addition, chrysotile cement (quantified at 15% by weight) was identified at trial trenches TT01 and TT03. Elevated concentrations of lead were recorded within the three locations in the Made Ground across the site, considered to be hotspots by ROC. Elevated total petroleum hydrocarbons (TPH) were identified within the Made Ground across the site at 13 locations; however, the concentrations did not exceed the screening criteria.

3.6 Groundwater Contamination

The ROC Plot M report² states that the groundwater chemical testing results from groundwater within the sandstone aquifer were compared with published Environmental Quality Standards (EQS) for freshwater and to World Health Organisation (WHO) guidelines; no exceedances of the screening criteria were identified.

ROC identified groundwater at depths between 3.57m and 5.58mbgl within the Made Ground during the Plot O and N investigation. The Made Ground water body was identified to directly overlie the weathered bedrock at most locations across the site, or granular river deposits in locations close to the River Medlock. As such, ROC considered this to present a potential pathway for mobilised contaminants within groundwater to migrate towards the bedrock aquifer, due to the extent and permeability of the granular deposits. A program of surface and groundwater sampling was subsequently completed by ROC and the results of the chemical analysis compared against the EQS, WHO guidelines and UK Drinking Water Standards (UK DWS).

Exceedances of mercury and polycyclic aromatic hydrocarbons (PAHs) were identified against the assessment criteria in water samples from the Made Ground from boreholes BH106 and BH107, whilst elevated arsenic, mercury, cadmium and fluoranthene were recorded in the water samples from the sandstone bedrock and glacial till at boreholes BH105, BH108 and BH110. It was considered likely by ROC that the contaminants detected in the natural strata had migrated downwards from the overlying Made Ground; however, it was noted that with the exception of arsenic at a single location (BH110), the exceedances were 'relatively low in comparison to the

screening levels' and considered to present a low risk to controlled waters. Excavation of the Made Ground at borehole BH110, considered to be the source of the elevated arsenic groundwater concentrations, was recommended to mitigate the risks to controlled waters.

A Technical Note was subsequently produced by ROC and submitted to the Environment Agency (EA) which summarised the ground investigation works completed and further evaluated the potential risks considered to be present to controlled waters and recommended for re-use criteria for the identified contaminants of concern (arsenic, chromium, lead, benzo(a)pyrene and benzo(b)fluoranthene) to be derived for inclusion into the site's remediations strategy (see Section 3.8).

3.7 Ground Gas

A maximum carbon dioxide concentration of 4.8%v/v was recorded during the ROC investigation at Plot M² and a maximum methane concentration of 3.6%v/v. Peak flow rates were recorded to typically range between 0.0L/hr and 1.0L/hr. The report concluded this related to aerobic processes of recently exposed organic material to the atmosphere, and therefore concluded that the ground gas regime at Plot M was Characteristic Situation 1.

The ROC report provided to Civic Earth for Plots O and N³ includes four ground gas monitoring rounds. A maximum carbon dioxide concentration of 5.1%v/v was recorded with gas flow rates between 0.0L/hr and 0.2L/hr. No methane concentrations were recorded. The report concluded that ground gas protection measures were not necessary as whilst a marginal exceedance of 5%v/v of carbon dioxide was recorded in single location, a basement structure is proposed across Plot O office footprint which will remove the potential source of ground gases (the Made Ground), and an open-air multistorey car park is proposed at Plot N.

3.8 Remediation Strategy and Proposed Enabling Works

Following completion of the ROC ground investigations across the site and the wider Mayfield Development, two remediation strategies were produced by ROC; the first for Mayfield Park to the north and northeast of the site, and the second for the site (Plots M, N and O).

The remediation strategy for Mayfield Park and the site generally included; capping layers in areas of soft landscaping to mitigate the risks to human health; removal of grossly contaminated / impacted soils during excavation of Made Ground to top of natural strata; on-site treatment and re-use of Made Ground soils; excavation of Made Ground at specific borehole locations to mitigate the risks to controlled waters; and installation of barrier pipes for new water supply pipework. Ground gas protection measures were not considered to be necessary as the ground gas monitoring results indicated Characteristic Situation 1 would be applicable to the site in accordance with CIRIA C665.

A programme of enabling works was proposed across the site in order to resolve and remove below ground obstruction risks, which was set out. These works were proposed to comprise:

- Excavation and "turning over" of made ground deposits until natural alluvial strata is uncovered, with all below ground structures broken out in the process (within footprints of Plots N and M).
- Excavation and "turning over" of made ground materials within the footprint of the proposed Poulton building with excavations continuing to the underlying Sandstone bedrock.

It was proposed that soils excavated during the enabling earthworks process would be taken to an onsite processing facility where they would be sorted and segregated based on their constituent type / properties with deleterious, contaminated or unsuitable soils to be stockpiled for removal from site to a suitably licensed waste facility. Brick, concrete and other recyclable material won during these enabling works were to be processed on site for reuse as engineered fill within the wider earthworks process.

It was intended that all excavations completed during the enabling earthworks would be re-instated using approved site won material, with the material needing to meet the requirements of the RoC Consulting Earthworks Specification and comply with the chemical specification for reuse outlined within the Phase 3a Remediation

Strategy report.

Following completion of enabling earthworks the site will be left for the main works contractor to commence construction of the offices / multi storey car park including the construction phase elements of the remediation requirements (i.e. soft landscaping).

The remediation strategy for Mayfield Park also included a technical note⁸ specific to residual contamination associated with Ardwick Tannery which was present across Plot M. The ROC technical note⁸ summarises that the animal tanning operations were underway since c.1850 and expanded in size during the period leading up to the 1890s, with tan pits in the south and east of the tannery removed and constructed on top of, suggesting the tan pits were moved internally within the new structures. The tannery was subsequently cleared and developed between 1890 and 1908 into Chapelfield Indian Rubber works.

The ROC technical note⁸ outlined that "no evidence of any animal products or residual organic material was noted in any of the exploratory holes formed across [Mayfield Park and Plot M]" and subsequent chemical analysis works in the tannery area revealed minor elevated concentrations of heavy metals and PAHs. The composition of the Made Ground in the area of the tannery was reported to be of typical demolition type material. ROC concluded that the residual risks posed by the historical tannery were low to the identified receptors based on the "comprehensive" historical development into other works and the lack of evidence of deleterious organic and animal material identified during the ground investigation works. However, it was noted that the proposed development of the Mayfield Park / Plot M areas included limited potential for significant bulk earthwork operations, and therefore potential exposure of potential residual tannery waste which may not be the case for the site subject to this report. It was therefore recommended by ROC that a watching brief be put in place with specific emergency control measures in the event that tannery related contamination is observed during excavation works, and materials excavated from the tannery area not be re-used until they have been suitably inspected and verified as being free from potential tannery related contamination.

The tannery watching brief and discovery strategy included visual inspection of soils for the presence of animal bones, animal hair, animal carcass or flesh, animal hides and significant quantities of deleterious or organic rich materials or sludge. Should any of the above be encountered, operations would cease, and the excavation backfilled with at least 1m thickness of unimpacted material, and the location and spatial extent recorded. The area would then be investigated, removed and remediated in accordance with the guidance document "Guidance on assessing risk of Tannery Contamination on building land" with appropriate approvals and sanctions from regulatory authorities⁹.

3.9 Enabling and Remediation Works Validation

Enabling and Remediation works were subsequently carried out across the site and the wider Mayfield Development and validated by E3P¹⁰. The E3P report states that following contamination hotspot removal, the "full depth of Made Ground deposits in Plots O, N and M were subsequently excavated, processed and validated before being reused as fill." In addition, the report states that "Plot O in particular was excavated down to bedrock to inspect its capacity to validate the bearing capacity of the horizon works proceed over the extent of influence zone of the basement foundation structure." The E3P report also states that "soft spots were delineated and suitable granular material was up filled and compacted...".

The E3P report identifies that elevated concentrations of arsenic above the reuse criteria were recorded in crushed material originating from an area of the culvert. It is understood that agreement was reached with the Environment Agency to reuse this material in Plot M beneath buildings. The E3P report⁶ states that if the construction is delayed at any point, an impermeable membrane should be placed across Plot M to ensure no infiltration potential arises as a result of surface water and that a slight grading would ensure no pooling of water occurs.

It is understood that the E3P validation report demonstrating that the remediation and validation works have been

⁸ ROC (2021) *Technical Note 1.1. Residual Tannery Contamination on Mayfield Park, Manchester*. Reference 4153-ROC_XX_XX_RP_ES_TM1.1. 3 February 2021.

⁹ PHE (2014) *Guidance on assessing risk of anthrax on building land*. September 2014.

¹⁰ E3P (2021) *Mayfield Parks and Plots M, N and O. Validation Report*. Reference 14-575-R1-Rev1. November 2021.

completed in accordance with the ROC remediation strategies^{4,5} has been submitted to and agreed by the Local Planning Authority.

3.10 Regulatory Queries During the Revised Planning Application Process

A technical note was subsequently produced by Civic Earth in response to queries raised by the EA that the proposed scope of varied works for Plot N may result in an adverse risk or impact to controlled water resources⁷. A summary of the EA concerns and Civic Earth's responses is provided below:

- Details of the composition and risks associated with any material exhumed within the footprint of Plot N and the resulting void. As outlined in the E3P report, the enabling and remediation works at Plot N were carried out in accordance with the regulatory approved remediation strategy⁶. The resulting void was backfilled using site-won Made Ground and site-won crushed hard material that was subject to validation testing to demonstrate that the material met the regulatory approved re-use criteria for placement below buildings/ hardstanding. Whilst a basement is now proposed to be included, the development will still comprise a building and hardstanding which will mitigate the potential risk of contaminant leaching from the material, therefore the previously agreed condition of the site with respect to controlled waters will remain. Material excavated from the proposed basement excavation was anticipated to comprise the validated site-won material which is likely to be acceptable for re-use as engineered fill beneath buildings/hardstanding in accordance with the currently approved remediation strategy⁶; this material would be subject to further validation testing in accordance with the strategy. The resulting void will be used for the construction of the building and therefore the potential risk to controlled waters would not be increased by the introduction of the basement.
- Details as the intentions for the exhumed materials i.e. whether these are to be disposed of off-site in a controlled manner, stored on-site and/or are intended to be reutilised. It was advised that the cut and fill volumes for the site would be defined as the detailed design progresses. Where there is a need for fill material, excavated material will be processed and validated in accordance with the regulatory approved remediation strategy⁶. Where there is a need to dispose of surplus material from site, this will be to an appropriate licensed facility under the appropriate duty of care. Should it become apparent that there is a potential use for this material across the wider scheme, then its reuse would be subject to assessment and a remediation strategy for the proposed area of reuse. Should there be a requirement to temporarily store excavated material, either prior to off-site disposal or prior to reuse within the Phase 1a area or the wider site, then it would be stored in accordance with waste management requirements and in a designated stockpile area. In accordance with the approved remediation strategy, material would not be stored in close proximity to the River Medlock, and measures would be implemented by the Contractor, to control surface water run-off and protect the underlying aquifer.

In addition to the above EA queries, the Local Planning Authority requested clarification as to what gas protection measures are proposed for Plots N and O as E3P has indicated that ground gas protection measures were required, which was contrary to the approved ROC remediation strategy. E3P had confirmed in their report that the full depth of Made Ground deposits in Plots O, N and M were excavated processed and validated before being reused as fill. In addition, there is no information presented within the E3P report to indicate that site conditions were different to those encountered during the previous ground investigations at the site. Therefore, it was considered that the previous assessment undertaken by ROC still stands and that ground gas protection measures are required for these plots based on the E3P report.

4. Supplementary Phase 2 Site Investigation

4.1 Introduction

The supplementary site investigation comprising 15 cable percussion boreholes was undertaken between 6 November and 13 November 2023. The investigation works were undertaken to:

- Provide further information on the level of the upper surface of the sandstone across the development plots to inform foundation design.
- Provide further information on the material overlying the sandstone in order to inform foundation design and evaluate opportunities for material reuse and/or requirements for waste disposal.
- Investigate the potential feasibility of utilising infiltration within the rain garden proposed in an area to the west of the proposed building in Plot N.

Two additional rotary open holes were undertaken on 22 January 2024 within Plot N to fill in data gaps and confirm the level of the sandstone in the vicinity of borehole BH211 where the sandstone was encountered shallower than expected based on the reported depth of the enabling works excavation. These additional boreholes were drilled approximately 2m into the sandstone to provide further indication as to whether bedrock had been reached.

A summary of the intrusive works completed at the site are summarised in Table 3.

Table 3: Summary of Exploratory Hole Locations

Location Reference	Target Plot	Ground Level (mOD)	Base Depths (mbgl)	Base Levels (mOD)
BH201	Plot M	35.86	3.45	32.41
BH202	Plot M	36.45	3.45	33.00
BH203	Plot M	36.04	2.45	33.59
BH204	Plot M	35.98	2.45	33.53
BH205	Plot M	35.84	2.95	32.89
BH206	Plot N	34.30 ¹	6.45	27.85 ¹
BH207	Plot N	34.55	5.95	28.60
BH208	Plot N	34.50 ¹	2.45	32.05 ¹
BH209	Plot N	34.52	5.45	29.07
BH210	Plot N	34.57	3.95	30.62
BH211	Plot N	34.58	3.95	30.53
BH212	Plot N	34.56	3.45	31.11
BH213	Plot N and proposed rain garden	34.46	2.45	32.01
BH214	Plot N	34.54	2.95	31.59
BH215	Plot N	34.55	2.95	31.60
BH216	Plot N	34.55 ¹	5.50	29.05 ¹

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Location Reference	Target Plot	Ground Level (mOD)	Base Depths (mbgl)	Base Levels (mOD)
BH217	Plot N	34.41 ¹	6.60	27.81 ¹

Notes: 1 = Borehole level based on estimation from topographical survey plan.

It is noted that due to the steep slopes of the attenuation pond within Plot O, it was proposed to undertake boreholes BH206 and BH208 to the north of the plot, outside the site hoarding. However, due to the presence of utilities within the public walkways, feasible locations were unable to be identified for the boreholes and the boreholes were subsequently repositioned within Plot N, at positions specified by the Structural and Civil Engineer.

Prior to breaking ground, each exploratory hole was cleared for buried services by a specialist utility contractor utilising a cable avoidance tool (CAT) and signal generator. Additionally, an unexploded ordnance (UXO) briefing and on-site supervision was provided by a specialist UXO contractor in accordance with the recommendations of the Detailed UXO Risk Assessment¹¹ for the site.

The investigation was undertaken in general accordance with the requirements of BS 5930:2015+A1:2020¹² and BS 10175:2011+A2:2017¹³. The exploratory hole records are included in Appendix A and an exploratory hole location plan is included in Appendix B. In-situ Standard Penetration Tests (SPTs) were carried out within each cable percussion borehole.

4.2 Ground Gas and Groundwater Monitoring

Within Plot N, a layer of potential organic material, which was considered to be a potential source of ground gas, was encountered in borehole BH206 at a depth of between 3.0mbgl and the upper surface of the sandstone. Given the depth of this material and that it is located outside of the building footprint, it is anticipated that it will not be removed as part of the construction works. Therefore, a monitoring well was installed with the response zone within the organic material (and below the estimated depth of excavation during enabling works based on the E3P report⁶) to enable ground gas monitoring to be undertaken. A summary of the monitoring well installed is provided in Table 4

Table 4: Summary of Monitoring Well Response Zones

Location Reference	Target Zone	Response	Response Zone Top Depth (mbgl)	Response Zone Base Depth (mbgl)	Response Zone Top Level (mOD)	Response Zone Base Level (mOD)
BH206	Made Ground		4.0	5.7	30.3	28.6

A total of three ground gas and groundwater monitoring rounds have been undertaken as part of the supplementary site investigation. The monitoring rounds were undertaken on the 14 December, 19 December and 28 December 2023 and the monitoring record is included in Appendix C.

4.3 Infiltration Testing

An infiltration falling head test was carried out in borehole BH213 on 13 November 2023 and the results of the test are included in Appendix C.

4.4 Chemical Laboratory Soil Testing

Selected soil samples were submitted to i2 Analytical Limited (a UKAS and MCERTS accredited laboratory) for chemical soil testing. The analysis included the following determinants, and the results are included in Appendix D.

¹¹ Brimstone (2023) *Phase 1a and 1b, Mayfield, Stage 2 Detailed UXO Risk Assessment*. 03 November 2023. Reference DRA-23-1612-CIVE01R-Phase1AandPhase1B, Mayfield.

¹² British Standards Institution (2015) *Code of practice for ground investigations*. BS 5930:2015+A1:2020.

¹³ British Standards Institution (2017) *Investigation of potentially contaminated sites – Code of practice*. BS 10175:2011+A2:2017.

- 20 Nr. pH
- 20 Nr. soil organic matter (SOM);
- 20 Nr. total sulphate as SO₄;
- 20 Nr. total cyanide;
- 20 Nr. heavy metals (antimony, arsenic, barium, beryllium, boron, cadmium, chromium (III and VI), copper, lead, mercury, nickel, selenium, vanadium and zinc;
- 20 Nr. polycyclic aromatic hydrocarbons (PAH);
- 20 Nr. Total petroleum hydrocarbons (TPH) ;
- 20 Nr. total monohydric phenols;
- 20 Nr. BTEX compounds (benzene, toluene, ethylbenzene, xylenes);
- 7 Nr. waste acceptability criteria (WAC) (single stage);
- 20 Nr. asbestos screen and identification; and
- 6 Nr. asbestos quantification.

2 Nr. soil samples were submitted for leachate analysis for a similar suite of contaminants to the above from selected samples collected from the proposed Rain Garden area.

4.5 Geotechnical Laboratory Analysis

Selected soil samples from BH213 within the proposed Rain Garden area were submitted to Geolabs Limited (a UKAS accredited laboratory) for geotechnical testing in general accordance with BS 137714. The following tests were scheduled, and the results are included in Appendix E:

- 3 Nr. particle size distribution (PSD) (wet sieve); and
- 3 Nr. PSD sedimentation (by pipette);

¹⁴ British Standard (2018). *Methods of testing for soils for civil engineering purposes*. BS 1377:2018.

5. Ground and Groundwater Conditions

5.1 Summary of Ground Model

A summary of the ground conditions encountered during the supplementary Phase 2 site investigation for Plots M and N are provided in Table 5 and Table 6 respectively.

Table 5: Summary of Phase 2 Site Investigation Ground Conditions for Plot M (BH201 to BH205)

Stratum	Top of Stratum (mbgl) [mOD]	Thickness (m)
Soft to firm dark grey mottled grey to grey mottled black, orange brown, red brown and blue grey sandy gravelly to very gravelly clay. Gravel is rounded to angular fine to coarse of flint, brick, concrete and sandstone. Sand is fine to medium. Occasional cobbles of brick and concrete and rare wood fragments notes. And / or Medium dense to very dense grey to dark brown clayey to very clayey gravelly sand. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of brick, flint, sandstone and concrete. Occasional cobbles of brick, flint and concrete and pockets of sandy gravelly clay noted. [MADE GROUND – POSSIBLE ENGINEERED FILL]	0.00 [36.45 to 35.84]	1.20 to 2.90
Very dense red brown to yellow brown clayey gravelly SAND / gravelly SAND. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of sandstone. Encountered in BH202, BH203 and BH205 only. [WEATHERED CHESTER SANDSTONE FORMATION]	2.40 to 2.50 [34.84 to 33.44]	0.10 to 0.50
Very weak red brown SANDSTONE. Thickness not proved within boreholes BH201 to BH205. [CHESTER SANDSTONE FORMATION]	1.70 to 2.90 [34.34 to 32.96]	>0.75

Table 6: Summary of Phase 2 Site Investigation Ground Conditions for Plot N (BH206 to BH215)

Stratum	Top of Stratum (mbgl) [mOD]	Thickness (m)
Soft to firm light grey to dark grey and dark brown mottled black gravelly very sandy clay / sandy very gravelly clay / gravelly sandy clay. Sand is fine to medium. Gravel is subrounded to angular fine to coarse of flint, brick, concrete and sandstone. Occasional cobbles of brick and concrete noted. And / Or Loose to dense grey, grey brown, brown, light brown and dark brown occasionally mottled orange brown gravelly clayey sand / gravelly very clayey sand / clayey very gravelly sand. Sand is fine to coarse. Gravel is rounded to angular fine to coarse of flint, brick, concrete and sandstone. Occasional cobbles of brick and concrete noted. [MADE GROUND – POSSIBLE ENGINEERED FILL]	0.00 [34.58 to 34.30]	1.10 to 5.50
Soft dark grey mottled back gravelly sandy clay. Sand is fine to medium. Gravel is subangular to angular fine to coarse of flint, brick and concrete. Encountered in BH206 only. [MADE GROUND with potential organic content]	3.00 [31.30]	3.00

Stratum	Top of Stratum (mbgl) [mOD]	Thickness (m)
Medium dense to very dense grey brown to orange brown gravelly very clayey SAND / clayey very gravelly SAND. Sand is fine to medium. Gravel is subrounded to angular fine to coarse of flint and sandstone. Encountered BH209, BH210 and BH214. [ALLUVIUM]	1.10 to 4.00 [33.44 to 30.52]	1.00 to 1.40
Very weak red brown SANDSTONE. Thickness not proved within BH206 to BH217. [CHESTER SANDSTONE FORMATION]	1.70 to 5.50 [32.85 to 28.30]	>2.10

5.2 Made Ground – Possible Engineered Fill

During the enabling works, site won Made Ground was placed across the majority of the site as engineered fill. The ground investigation has sought to identify the extent of Possible Engineered Fill based on visual observations and materials exhibiting similar characteristics have been included in this stratum. It is noted that in Section 6, further analysis of this material has been undertaken based on the estimated levels of excavation during the enabling works, indicating that some of the material is residual Made Ground and wasn't excavated, despite it being visually similar. This is not unexpected given that the engineered fill comprised site won Made Ground.

Possible Engineered Fill was encountered from surface at each exploratory hole location and ranged in thickness from 1.2m to 5.5m. The stratum comprised both cohesive and granular soils of variable consistency and density. Thicker Possible Engineered Fill was encountered within the western part of the site in boreholes BH207 and BH209.

SPT N60 values for the cohesive Possible Engineered Fill soils ranged from 6 to 31 corresponding to consistencies of 'soft' to 'very stiff'. Correlated undrained shear strength (c_u) values range from 27kPa to 140kPa (assuming $f_1 = 4.5^{15}$).

Granular soils within the Possible Engineered Fill recorded typical SPT N60 values ranging from 4 to >46 corresponding to a relative density of 'loose to dense'¹⁶. A summary of the SPT N60 values and undrained shear strengths versus levels are provided in Plate 4 and Plate 5 respectively.

¹⁵ Stroud, M. A. (1974) *The Standard Penetration Test in Insensitive Clays and Soft Rocks*. Proceedings of the European Symposium on Penetration Testing, Stockholm. June 5-7, 1974 2(2):367-375

¹⁶ British Standards Institute (2015). BS 5930:2015 *Code of Practice for Ground Investigations*.

Plate 4. SPT N60 versus Level (mOD) for Made Ground – Possible Engineered Fill

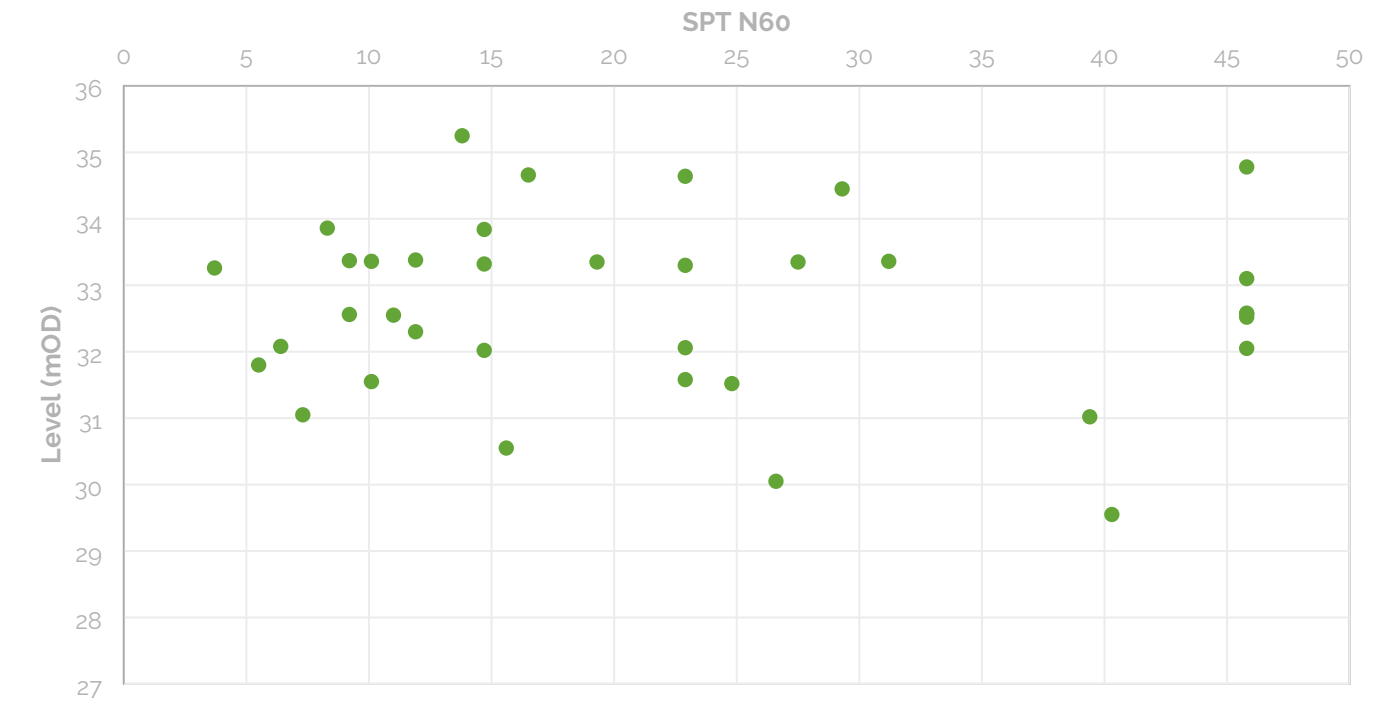
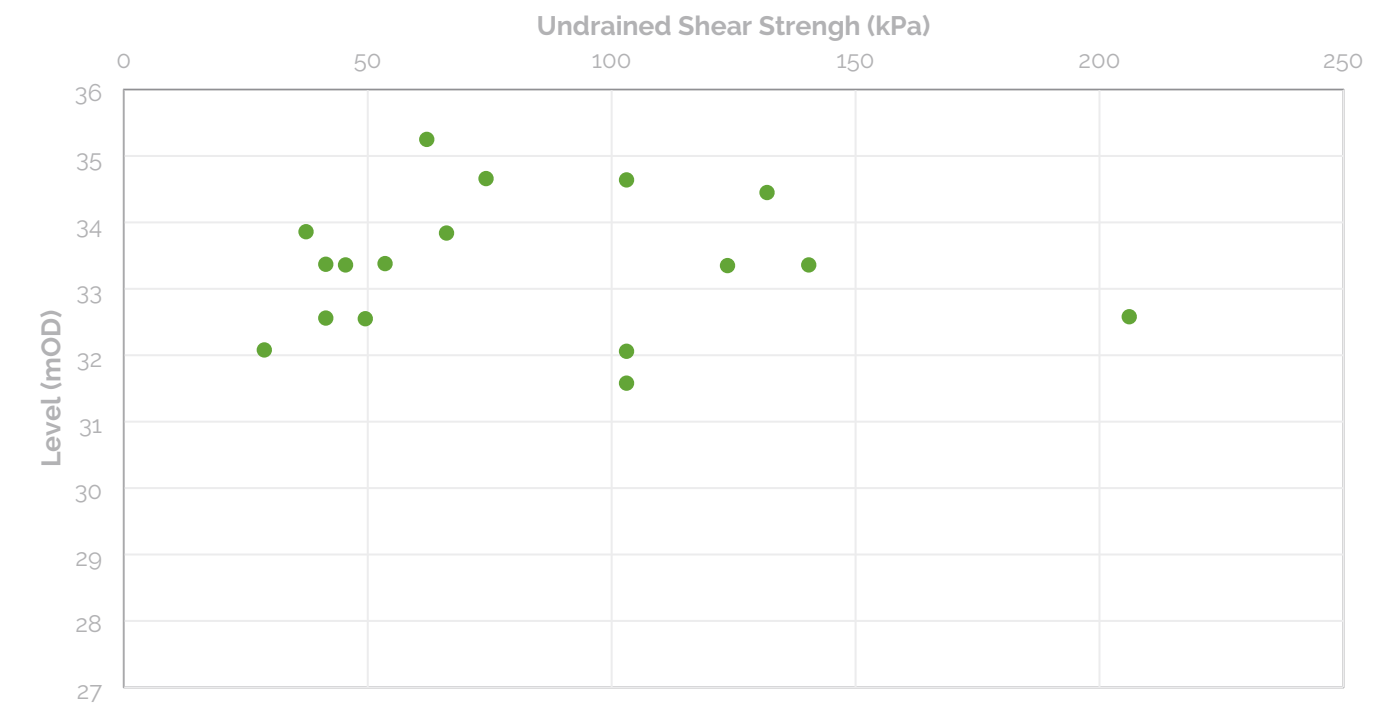


Plate 5. Undrained Shear Strength versus Level (mOD) for Made Ground – Possible Engineered Fill



5.3 Made Ground with potential organic material

Made Ground with potential organic material was encountered beneath the Possible Engineered Fill in borehole BH206 which was positioned slightly outside the footprint of Plot N. The Made Ground was recorded to be 3m in thickness and comprises cohesive deposits with potential organic material.

SPT N60 values for the Made Ground soils range from 3 to 15 corresponding to consistencies of 'very soft to firm'.

Correlated c_u values range from 18 to 67.5kPa (assuming $F_1 = 4.5^{11}$). A summary of the SPT N60 values and undrained shear strengths versus levels are provided in Plate 6 and Plate 7 respectively.

Plate 6. SPT N60 versus Level (mOD) for Made Ground

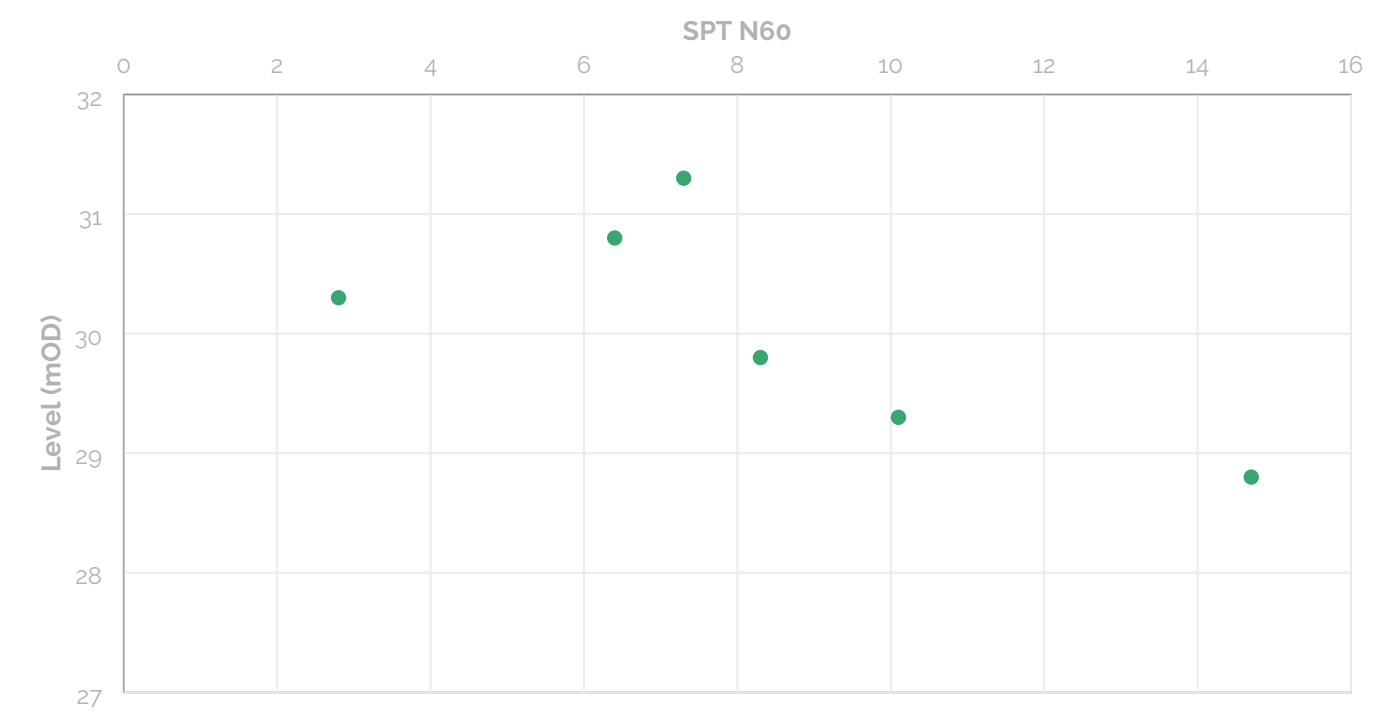


Plate 7. Undrained Shear Strength versus Level (mOD) for Made Ground



5.4 Alluvium

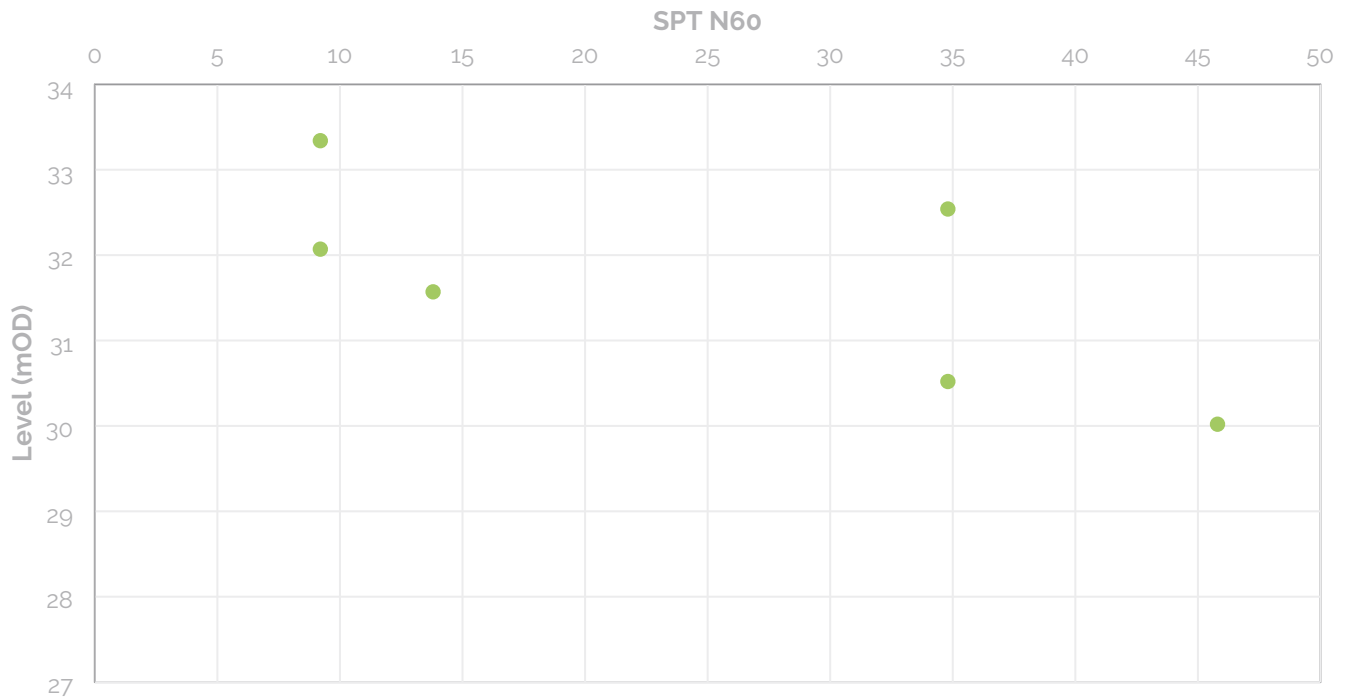
Superficial deposits of Alluvium were recorded within boreholes BH209, BH210 and BH214 within the west of the site in the footprint of Plot N. The deposits ranged between 1.00m and 1.40m in thickness. The stratum comprised

20

horizons of gravelly very clayey sand or clayey very gravelly sand.

SPTs undertaken within the stratum recorded N60 values between 9 and 46, correlating to a relative density of 'loose to dense'¹². A summary of the SPT N60 values versus levels are provided in Plate 8.

Plate 8. SPT N60 versus Level (mOD)



5.5 Chester Sandstone Formation

Completely Weathered Chester Sandstone Formation was encountered in boreholes BH202 and BH205 within the east of the site, recovered as red brown to yellow brown gravelly sand. The deposits ranged in thickness between 0.1m and 0.5m, situated above the more competent bedrock of the Chester Sandstone Formation.

Due to the limited thickness of the Weathered Chester Sandstone Formation, one SPT was undertaken which recorded an SPT N60 value of 46, corresponding to a relative density of 'dense'¹².

The competent bedrock was encountered at each borehole location at depths ranging between 1.70m to 2.90mbgl (34.34m to 32.96mOD) in the east of the site to 1.70m to 5.5mbgl (32.50m to 28.30mOD) in west of the site. The bedrock encountered comprised very weak red brown sandstone.

5.6 Visual and Olfactory Potential Contamination

No visual or olfactory signs of potential contamination were noted within the boreholes during the supplementary site investigation. The presence of foreign materials such as bricks, concrete, etc. was noted within the Possible Engineered Fill and Made Ground; however, the presence of this material is not unexpected given the historical redevelopment of the site.

5.7 Ground Gas

Three rounds of ground gas monitoring have been undertaken between 14 December and 28 December 2023 and the results are summarised in Table 7.

Table 7: Summary of Ground Gas Conditions

Location	Target Stratum	Maximum Steady Flow Rate (L/hr)	Maximum Steady CO ₂ (% vol. in air)	Maximum CH ₄ (% vol. in air)
BH206	Made Ground	0.3	4.2	0.0

5.8 Groundwater

Groundwater was encountered during the supplementary site investigation as detailed in Table 8.

Table 8: Summary of Groundwater Strikes during Site Investigation

Location	Stratum	Strike (mbgl)	Depth (mOD)	Strike Level	Depth after 20 Mins (mbgl)	Level after 20 Mins (mOD)	Rise in Depth after 20 Mins (m)
BH201	Possible Engineered Fill	0.40	35.46	-	-	-	-
BH206	Possible Engineered Fill	5.20	29.10	4.80	29.50	0.40	
BH209	Possible Engineered Fill	2.50	32.02	2.35	32.17	0.15	
BH210	Possible Engineered Fill	0.60	33.97	-	-	-	-

Three rounds of groundwater monitoring round has been undertaken following completion of the site investigation as part of the ground gas monitoring and the results are summarised in Table 9.

Table 9: Summary of Groundwater Monitoring

Location	Stratum	Groundwater Depth (mbgl)	Groundwater Level (mOD)
BH206	Made Ground	5.00 to 5.25	29.30 to 29.05

5.9 Infiltration Testing

An infiltration test (falling head test) was carried out during the ground investigation works on 13 November 2023 within borehole BH213. The test was undertaken within the top 0.5m of the Possible Engineered Fill to coincide with the level of the proposed Rain Garden, as specified by the Civil and Structural Engineer. Three PSD tests were undertaken on the material around the level of the proposed Rain Garden and recorded the material as being a silty clayey gravelly sand.

A summary of the PSD testing undertaken on the Engineered Fill (Possible) is included in Table 10.

Table 10: Summary of PSD Testing – Made Ground – Possible Engineered Fill

Number of Tests	Cobble Content (%)	Gravel Content (%)	Sand Content (%)	Silt Content (%)	Clay Content (%)
3	0.0 to 7.1	41.9 to 57.8	28.7 to 36.7	7.9 to 11.8	5.6 to 9.4

The test failed to fully drain after 3 hours, however, an indicative permeability of 2.32×10^{-6} was calculated, which correlates to a material with a relatively 'low' permeability¹⁷ indicative of 'very fine sands, organic and inorganic silts, m

¹⁷ CIRIA C515 (2000) Groundwater Control – Design and Practice

ixtures of sand silty and clay, glacial till and stratified clay deposits'.¹⁸

¹⁸ Terzaghi K., Peck R. B. and Mesri G. (1996) *Soil Mechanics in Engineering Practice*

6. Ground Model Summary

Based on the ground conditions encountered during the Civic Earth and RoC Investigations^{2,3}, the formation level based on the latest levels provided to Civic Earth, have been compared against current ground level and the level of top of the Chester Sandstone Formation, along with an estimate of the base of excavation during enabling works from the E3P report⁶. This has been summarised for each borehole to evaluate the potential thickness of residual Made Ground or Alluvium that main remain on site following the enabling works and the anticipated stratum at formation level. This summary is presented in Table 11 below.

Table 11: Ground Condition Review Summary

Ref	Ground Level (mOD)	Level to Top of Sandstone (mOD)	Level to Top of Alluvium (mOD)	Estimated Base of Enabling Works Excavation (mOD)	Comments	Estimated Thickness of Residual MG/AL following enabling works (m)	Proposed Formation Level (mOD)	Anticipated Stratum at Formation Level
Plot M								
BH201	35.86	32.96		32.8	Sandstone encountered at similar level to estimated base of enabling works excavation	0.2	34.95	Engineered Fill over Made Ground
BH202	36.45	33.95			Location understood to be outside area of enabling works excavation.	2.5	36.25 to 34.95	Made Ground
BH203	36.04	34.84		36.6	Enabling works cut level is indicated to be above current ground level, suggesting there has been further cut undertaken post-enabling works.	1.7	34.75	Sandstone
BH204	35.98	34.08		34.1	Sandstone encountered at similar level to estimated base of enabling works excavation.		34.95	Engineered Fill
BH205	35.84	33.44		33.3	Sandstone encountered at similar level to estimated base of enabling works excavation.		34.95	Engineered Fill
BH101	35.60	32.80		32.5	Enabling works cut level is indicated to be into top of sandstone.		34.95	Engineered Fill
BH102	35.80	32.90		32.6	Enabling works cut level is indicated to be into top of sandstone.		34.95	Engineered Fill
BH103	35.80	32.80		33.4	Enabling works cut level is indicated to be terminated in Made Ground.	0.6	34.95 to 35.25	Engineered Fill over Made Ground
BH104	36.60	37.90		34.3	Enabling works cut level is indicated to be into top of sandstone.		35.25	Engineered Fill
Plot N and O								
BH206	34.30	28.30		30.5	Made Ground recorded below the estimated Enabling Contractor's base of excavation. Visual variation in composition to overlying material observed suggesting material below estimated base of Enabling Contractor's excavation is residual in-situ original Made Ground.	2.2	Outside Building Footprint	
BH207	34.55	29.05		29.7	Made Ground recorded below the estimated Enabling Contractor's base of excavation; no visual variation in composition to overlying material.	0.7	30.5	Engineered Fill over Made Ground
BH208	34.50	32.50		33.0	Made Ground recorded below the estimated Enabling Contractor's base of	0.5	30.5	Sandstone

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Ref	Ground Level (mOD)	Level to Top of Sandstone (mOD)	Level to Top of Alluvium (mOD)	Estimated Base of Enabling Works Excavation (mOD)	Comments	Estimated Thickness of Residual MG/AL following enabling works (m)	Proposed Formation Level (mOD)	Anticipated Stratum at Formation Level
					excavation; no visual variation in composition to overlying material.			
BH209	34.52	29.52	30.52	32.3	Made Ground recorded below the estimated Enabling Contractor's base of excavation. Visual variation in composition to overlying material observed suggesting material below estimated base of Enabling Contractor's excavation is residual in-situ original Made Ground.	2.8	30.5	Alluvium
BH210	34.57	31.07	32.07	33.2	Made Ground recorded below the estimated Enabling Contractor's base of excavation. Visual variation in composition to overlying material observed suggesting material below estimated base of Enabling Contractor's excavation is residual in-situ original Made Ground.	2.1	30.5	Sandstone
BH211	34.58	31.48		30.6	Sandstone encountered at approximately 0.9m higher level than the estimated base of enabling works excavation indicating either error in excavation level survey or potential below ground obstruction.	-0.9	30.5	Sandstone
BH212	34.55	31.55		31.5	Sandstone encountered at similar level to estimated base of enabling works excavation.		30.5	Sandstone
BH213	34.46	32.46			Location understood to be outside area of enabling works excavation.	2.0	Outside Building Footprint	
BH214	34.54	32.04	33.44		Location understood to be outside area of enabling works excavation.	2.5	30.5	Sandstone
BH215	34.56	32.86		33.5	Made Ground recorded below the estimated Enabling Contractor's base of excavation. Visual variation in composition to overlying material observed suggesting material below estimated base of Enabling Contractor's excavation is residual in-situ original Made Ground.	0.6	30.5	Sandstone
BH216	34.55	31.15		29.56	Sandstone encountered at approximately 1.6m higher level than estimated base of enabling works excavation indicating either error in	-1.6	30.5	Sandstone

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Ref	Ground Level (mOD)	Level to Top of Sandstone (mOD)	Level to Top of Alluvium (mOD)	Estimated Base of Enabling Works Excavation (mOD)	Comments	Estimated Thickness of Residual MG/AL following enabling works (m)	Proposed Formation Level (mOD)	Anticipated Stratum at Formation Level
					excavation level survey or potential below ground obstruction (it is noted that the sandstone was proven to 2m below this level indicating natural ground).			
BH217	34.40	29.80		32.95	Made Ground recorded below the estimated Enabling Contractor's base of excavation; no visual variation in composition to overlying material.	3.15	30.5	Sandstone
BH105	31.70	28.20		28.9	Enabling works cut level is indicated to be terminated in Made Ground.	0.7	30.8	Engineered Fill over Made Ground
BH106	31.80	27.80		28.1	Enabling works cut level is indicated to be terminated in Made Ground.	0.3	30.8	Engineered Fill over Made Ground
BH107	34.10	27.60		30.5	Enabling works cut level is indicated to be terminated in Made Ground.	2.9	30.5	Engineered Fill / Made Ground
BH108	34.50	29.32	33.02	33.0	Enabling works cut level is indicated to be terminated in Alluvium.	3.7	30.5	Alluvium

Notes:

Ground Level of historical boreholes estimated from 2022 topographical survey.

Estimated Contractor Cut Level Based on PP O'Connor 2020 Plot M, N, O Total Cut Levels. Drawing No. MNOFL001 Revision.

Based on the table above, locations encountered the following strata at formation level:

- 8 locations suggest the enabling works removed the Made Ground down to the top of the Chester Sandstone Formation.
- 16 locations suggest that Made Ground remained in-situ following completion of the enabling works.
- 2 locations suggest that Alluvium remained in-situ following completion of the enabling works.
- 2 location recorded sandstone at a higher elevation then the survey suggesting either an error in the excavation level survey or a potential below ground obstruction (BH211 or BH216).

Levels for the top of the Chester Sandstone Formation have been plotted as contours based on the Civic Earth and RoC Investigations^{2,3} for Plots M and N, to give an indication of how the surface of the sandstone varies across the site. Plate 9 and Plate 10 shows these contour plots for Plots M and N, respectively. It is noted that the contours between the borehole locations are estimated based on the contouring method.

Plate 9: Top of Sandstone Level Contours for Plot M

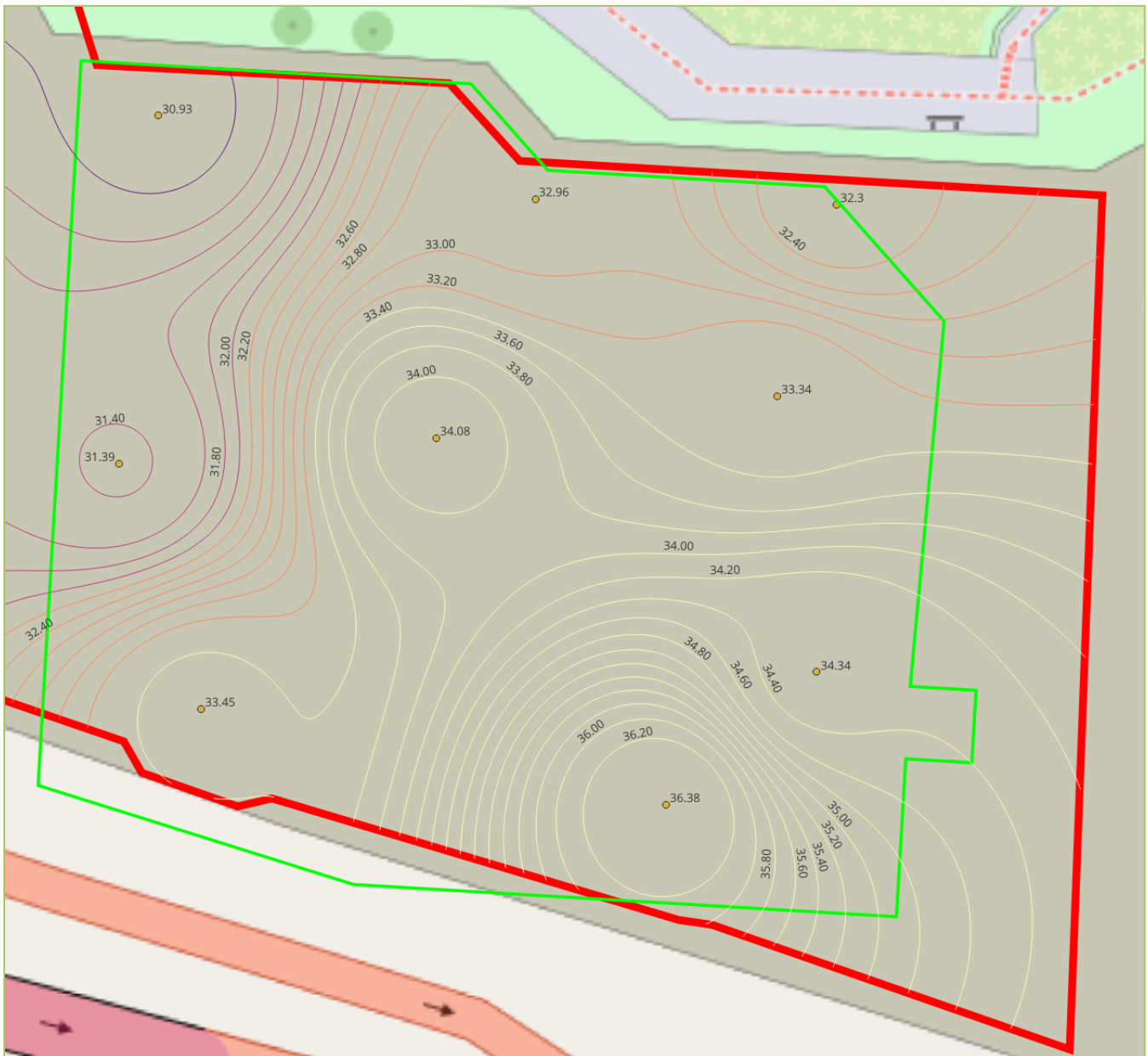


Plate 10: Top of Sandstone Level Contours for Plot N



Contours for Plot M suggest that the top of the Chester Sandstone Formation slopes gently down to the north and west across the plot before steeply dropping in the northwest and west of the plot, whilst contours plotted for Plot N suggest that the top of the Chester Sandstone Formation slopes to the north west. Contours within Plot N also suggest that a small headland is present within the central western part with a 2m elevation change when compared to the central eastern area. This variable level could be as a result of ancient natural weather process associated with the nearby surface water feature, or potentially as a result of historical excavation of basement. It is noted that the recorded base of excavation was approximately 0.9m to 1.6m lower than the level that Sandstone was recorded at this location, suggesting that there was a survey error during the enabling works, or that there was an obstruction that was similar to Sandstone. However, borehole BH216 extended approximately 2m into the sandstone, suggesting that this was natural ground.

Due to the current attenuation pond present across the footprint of Plot O, no exploratory holes were undertaken within this plot as part of the Civic Earth investigation, however based on the RoC investigation³ completed within Plot O, it is anticipated that the top of the sandstone is located between approximately +27.8mOD and +28.2mOD.

It is recommended that once the attenuation pond is backfilled, further investigation is undertaken to confirm the depth of the sandstone and the nature of the overlying material to provide further information to support the design.

Groundwater was encountered within the Possible Engineered Fill, suggesting that perched water is present within

layers of granular material within the Possible Engineered Fill, restrained by layers of cohesive material resulting in a varied level across the plots.

7. Contamination Assessment

7.1 Soil Contamination

A total of 20 samples were submitted for chemical analysis (19 from the Engineered Fill (Possible) and 1 from Made Ground) and the results have been compared against the Soil Reuse Chemical Validation Criteria for site won material reuse beneath areas of building / hardstanding in the ROC Remediation Strategy⁴.

Generally, the samples tested passed the reuse criteria; however, one sample of the Engineered Fill (Possible) from borehole BH204 recorded the following minor exceedances:

- Benzo(b)fluoranthene (21mg/kg against a threshold of 13mg/kg);
- benzo(a)pyrene (20mg/kg against a threshold of 10mg/kg); and
- Dibenz(a,h)anthracene (2.5mg/kg against a threshold of 1.1mg/kg)

This sample is located within the centre of Plot M and therefore, if the material was to remain in-situ, it would be beneath hardstanding removing the main pathway to future end-users. The risks to controlled waters will also be mitigated due to the infiltration from surface water being reduced as a result of the building and hardstanding construction above the material location.

If the material was to be excavated, it does not meet the requirements set out with the ROC Remediation Strategy⁴ and will therefore require off site disposal or further risk assessment/remediation before reuse on site. The hotspot will need to be delineated and segregated from other arising before off site disposal.

Asbestos in the form of chrysotile and amosite loose fibres and loose fibrous debris was also recorded in six of the twenty samples. Quantification testing results ranged between <0.001% and 0.011% by weight which are below the ROC acceptable limits for site won material reuse. However, caution should be given to site works with asbestos containing material being handled/removed in accordance with current regulations and guidance^{19,20}.

It was understood that arsenic impacted material was placed under Plot M with Environment Agency agreement. It is noted that the samples collected from within Plot M did not record exceedances of the arsenic screening criteria, but its presence cannot be ruled out.

7.2 Leachate Testing

As part of the investigation for infiltration potential within the proposed rain garden, 2 samples of the Possible Engineered Fill from borehole BH213 were submitted for leachate testing and recorded the following exceedances when compared against the freshwater Environmental Quality Standards (EQS) and UK Drinking Water Value (DWV). The results indicate a number of exceedances were noted:

- Chromium (VI) exceeding the EQS (16µg/l and 19 µg/l against a threshold of 3.4µg/l);
- Chromium (III) exceeding the EQS (13µg/l and 16µg/l against a threshold of 4.7µg/l);
- Copper exceeding the EQS (75µg/l and 81µg/l against a threshold of 1µg/l);
- Nickel exceeding the EQS (4.2µg/l and 5.3µg/l against a threshold of 4µg/l);
- Total Phenols exceeding the EQS (20µg/l against a threshold of 7.7);

¹⁹ Control of Asbestos Regulations 2012

²⁰ HSE (2012). *Managing and Working with Asbestos - Control of Asbestos Regulations 2012*, HSE 2013.

- Total Petroleum Hydrocarbons (TPH) exceeding the DWV (126µg/l against a threshold of 10µg/l);
- Anthracene exceeding the EQS (0.42µg/l against a threshold of 0.1µg/l);
- Fluoranthene exceeding the EQS (0.24µg/l against a threshold of 0.1µg/l); and
- Naphthalene exceeding the EQS (2.9µg/l against a threshold of 2.0µg/l).

7.3 Ground Gas

The first round of ground gas monitoring indicates Characteristic Situation 1 in line with previous RoC recommendations. Following the completion of the final two rounds, the assessment will be updated in the final report.

7.4 Preliminary Waste Characterisation

A preliminary waste characterisation assessment in line with WM3 technical guidance has been carried out on the 20 soil samples submitted for chemical analysis which indicated whether the material is hazardous or non-hazardous.

If the material is classified as non-hazardous, there is the option of sending the material to a non-hazardous waste facility or an inert facility (subject to the material meeting the inert waste acceptance levels based on Waste Characterisation Acceptance (WAC) analysis). If the material is classified as hazardous, WAC analysis will be required to demonstrate that the concentrations meet the levels for a hazardous waste facility or stable non-reactive hazardous (SNRH) waste facility without a requirement for prior treatment.

The preliminary waste assessment has been carried out using the HazWaste Online Toolkit and the waste classification reports are included in Appendix F. The results of the assessment indicate that the material would be characterised as non-hazardous material. WAC tests undertaken on 7 samples from the Possible Engineered Fill, indicate that the material can be classed as inert. However, due to the presence of asbestos fibres recorded, at not-hazardous levels within 6 of the Possible Engineered Fill samples, at least some of this material does not meet the criteria for inert waste and would require disposal at a non-hazardous facility that can accept asbestos containing material. Delineation testing should be undertaken around the positions at which asbestos was found to determine the extent of the impact soils. The material can then be segregated and may be disposable to a non-hazardous waste facility that is licensed to accept low level asbestos waste, whilst not impacted Possible Engineered Fill (Possible) may be classed as inert.

Natural uncontaminated soils do not require WAC testing as they are deemed to be 'inert' by default, if they can be segregated during the excavation works.

8. Geotechnical Recommendations

8.1 Introduction

Geotechnical recommendations for the proposed redevelopment of the site are outlined in the following section based on the information obtained during the supplementary Phase 2 site investigation and proposed development scheme,

8.2 Geotechnical Design Parameters

Geotechnical design parameters are outline in Table 12. The parameters provided are moderately conservative, serviceability limit state and considered appropriate for foundation (shallow/deep), retaining walls, (gravity/embedded), earthworks (settlement/consolidation) and infrastructure (roads/aprons).

Table 12: Geotechnical Design Parameters

Stratum	Bulk Unit Weight γ_b (kN/m ³)	Undrained Strength c_u (kPa) [c']	Shear Friction ϕ (°)	Angle	Young's Modulus, E_u (MPa) [E']
Made ground including Possible Engineered Fill (Granular)	18	-	30 ^a		[10]
Made ground including Possible Engineered Fill (Cohesive)	17	30 [0]	21 ^b		12 ^c [9.6] ^d
Alluvium (Granular)	18	-	34 ^a		[20]

Notes:

- Peck, R.B., Hanson, W.E., and Thornburn, T.H., Foundation Engineering, 2nd Edition, John Wiley, New York, 1967, p.310.
- BS 8002:2015 Code of practice for Earth retaining structures, British Standards institution.
- Based on 400 Cu – Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200.
- Based on 0.8Eu – Burland, Standing J.R., and Jardine F.M. (eds) (2001), Building response to tunnelling, case studies from construction of the Jubilee Line Extension London, CIRIA Special Publication 200

8.3 Foundations

The site investigation has identified that the proposed formation levels sit within a combination of Engineered Fill (Possible), Made Ground, Alluvium and Chester Sandstone Formation depending on the position on site and individual plots. Therefore, given the variability in Engineered Fill (Possible), Made Ground and Alluvium, and the anticipated loads, it is recommended that foundations are founded in the Chester Sandstone Formation in line with the RoC reports, and not within the overlying deposits due to variable bearing capacity and potential for differential settlement.

It is noted that static pile testing was conducted within Plot M in January and February 2023 to provide information to reduce the factors of safety on the pile design, the findings of which can be used to inform the pile design, along with the previous recommendations of the RoC reports.

Whilst the objective of the enabling works was to remove underground obstructions it is noted that a former abstraction well was decommissioned by capping with concrete within Plot M which needs to be considered with respect to foundation design.

It is recommended that further investigation is undertaken within Plot O once the attenuation basin has been emptied to confirm the elevation of the sandstone and overlying ground conditions.

8.4 Excavations

Based on the ground conditions encountered, excavations required during the development should not pose difficulties for conventional excavators or earth moving equipment for the identified strata including some excavation in the upper sandstone horizons. Excavations have the potential to become unstable if water is introduced into the excavation. Water control, if required, may be achieved within shallow excavations by adopting a sump pumping system around the perimeter of the excavation as well as appropriate temporary supports such as trench boxes/trench sheets. This should be confirmed by the contractor and temporary works designer on initial excavation.

It is understood that the main contractor for Plots O and N is currently evaluating potential requirements and options for managing potential groundwater and surface ingress into open excavations.

Excavations should be suitably shored or otherwise supported or battered and should be inspected regularly by a competent person. No operatives should enter unshored or otherwise unprotected excavations identified as unstable by a competent person, however shallow they are, in accordance with the guidelines presented in CIRIA Report 97²¹. Dewatering will likely be required when excavation works are in close proximity to perched groundwater level.

8.5 Floor Slabs and Pavements

Based on the proposed formation levels, it is assumed that roads and pavements will be founded onto Engineered Fill (Possible), Made Ground, Alluvium or Chester Sandstone Formation.

During the enabling works, in-situ CBR testing was undertaken at the base of the excavation recording a >5% CBR across the site. However, due to the variability of the Engineered Fill (Possible), Made Ground and Alluvium and the time since the enabling works, it is recommended that a conservative <2.5% is assumed. This could potentially increase following in-situ testing of formation level soils. It is recommended that the formation level should be compacted and soft spots (<2.5% CBR) removed. All pavements should be designed and compacted and verified in accordance with MCHW Series 600. A specialist testing and construction contractor should be engaged for any lime/cement stabilisation works, and it is anticipated that a stabilisation trial would be undertaken prior to implementation.

In areas where land raise is proposed, the build-up of capping/blinding layers beneath pavements/slabs will be dependent on the fill used in the land raise.

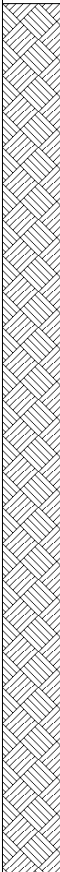
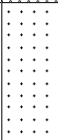
Floor slab design will need to take account of the potential variability in ground conditions at the formation level, and suspended slabs will need to be utilised where there is insufficient bearing capacity or potential for an unacceptable level of differential settlement.

8.6 Rain Gardens

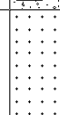
Due to the low infiltration rate of the Engineered Fill (Possible) and the leachate exceedances recorded, it's unlikely that infiltration will be feasible or permitted by the EA.

²¹ CIRIA (1992). *Trenching Practice (Second Edition)*. Construction Industry Research and Information Association Report 97.

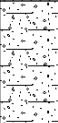
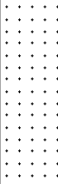
Appendix A
Exploratory Hole Records

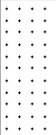
 www.civicearth.com		Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I							
		Project Number: 51001/01		Logged By: HG Checked By: KP		Method and Plant Used				Groundwater			
Location ID: BH201		Location Type: Cable percussion (shell and auger)				0.00	3.45	CP	Dando 2000	0.40	-	-	
		Coords: 385085.85E/397519.00N		Level: 35.86mAOD									
Status: FINAL		Scale: 1:30		Final Depth: 3.45									
Sheet 1 of 1		Date Start: 06/11/2023		Date End: 06/11/2023									
Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description				
		Sample Depth (m)	Type/Ref	Tests/Results									
	0.30 0.30 - 0.40	ES 1 B							Soft to firm dark grey mottled black, orange brown and blue grey sandy gravelly clay. Gravel is subrounded to angular fine to coarse brick, flint, concrete and sandstone. Sand is fine to medium. Occasional cobbles of brick and concrete and rare metal fragments noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]				
	0.70 0.70 - 0.80												
	1.20 1.20 - 1.65	B D											SPT(S) 1.20m N=18 (3,3/4,4,5,5)
	2.00 2.00 - 2.45	B D											SPT(S) 2.00m N=9 (1,1/2,2,3,2)
	2.50 - 2.95	D	SPT(S) 2.50m N=34 (2,3/5,9,10,10)						Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]				
3.00 - 3.45	D	SPT(S) 3.00m 50 (25 for 10mm/50 for 20mm)	32.96	2.90									
						32.41	3.45		EOH at 3.45m - Achieved target depth				
	4.0								EOH at 3.45m - Achieved target depth				
	5.0								EOH at 3.45m - Achieved target depth				
	6.0								EOH at 3.45m - Achieved target depth				
Notes:						Hole Diameter		Casing		Hammer Information			
1. Groundwater encountered at 0.4mbgl. 2. Backfilled with arisings on completion. 3. ES - Environmental Sample, B - Bulk Sample, D - Disturbed Sample, SPT - Standard Penetration Test. 4. Sandstone encountered at similar level to estimated base of enabling works excavation.						Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.		
						3.45	150	1.50	150	55%	BBL04		
						Install Response Zones							
						Ref	From (m)	To (m)					

Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I						
Project Number: 51001/01		Logged By: HG		Method and Plant Used			Groundwater			
		Checked By: KP								
				From (m)	To (m)	Type	Plant Used	Strike (m)	Time (min)	Rose To
		Location Type: Cable percussion (shell and auger)		0.00	3.45	CP	Dando 2000			
		Coords: 385064.44E/397486.29N								
Scale: 1:30										
Date Start: 08/11/2023										
		Level: 36.45mAOD								

Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description
		Sample Depth (m)	Type/Ref	Tests/Results					
		0.30 - 0.40	B	SPT(C) 1.20m N=15 (2,2/3,4,4,4)					Soft to firm grey to grey brown mottled blue grey and red brown sandy very gravelly clay. Gravel is rounded to angular fine to coarse of flint, brick, concrete and sandstone. Occasional cobbles of brick and concrete and rare wood fragments noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]
		0.70 0.70 - 0.80	ES 1 B						
	1.0	1.20 1.20 - 1.65	B D						
	2.0	2.00 2.00 - 2.45	B D	SPT(C) 2.00m N=32 (5,5/6,7,9,10)					
		2.50 2.50 - 2.95	B D	SPT(C) 2.50m 50 (8,14/50 for 205mm)	33.95	2.50		Very dense red brown clayey gravelly SAND. Sand is fine to medium. Gravel is subangular fine to coarse of sandstone. [WEATHERED CHESTER SANDSTONE FORMATION]	
	3.0	3.00 - 3.45	D	SPT(C) 3.00m 50 (25 for 30mm/50 for 45mm)	33.45	3.00		Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]	
					33.00	3.45		EOH at 3.45m - Achieved target depth	
	4.0								
	5.0								
	6.0								

Notes:	Hole Diameter		Casing		Hammer Information		
	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.	
	3.45	150	1.50	150	55%	BBL04	
					Install Response Zones		
					Ref	From (m)	To (m)

 Civic Earth www.civicearth.com		Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I						
		Project Number: 51001/01		Logged By: HG Checked By: KP		Method and Plant Used				Groundwater		
Location ID: BH203		Location Type: Cable percussion (shell and auger)				0.00	2.45	CP	Dando 2000			
		Coords: 385103.90E/397488.67N		Level: 36.04mAOD								
Status: FINAL		Scale: 1:30		Final Depth: 2.45								
Sheet 1 of 1		Date Start: 10/11/2023		Date End: 10/11/2023								
	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description			
		Sample Depth (m)	Type/Ref	Tests/Results								
	0.30 0.30 - 0.40	ES 1 B							Medium dense dark grey to dark brown clayey gravelly sand. Sand is fine to medium. Gravel is subangular to angular fine to coarse of brick, flint, concrete and sandstone. Occasional cobbles of brick, flint and quartz noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]			
	0.70 - 0.80	B										
	1.0											
	1.20 - 1.65 1.20 - 1.65	B D		SPT(C) 1.20m 50 (25 for 5mm/50 for 10mm)		34.84	1.20		Very Dense brown gravelly clayey SAND. Sand is fine to medium. Gravel is subrounded to angular fine to coarse of flint, brick and sandstone. [WEATHERED CHESTER SANDSTONE FORMATION]			
	2.0											
	2.00 - 2.45	D		SPT(C) 2.00m 50 (25 for 10mm/50 for 15mm)		33.59	2.45		Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]			
									EOH at 2.45m - Achieved target depth			
	3.0											
	4.0											
	5.0											
	6.0											
Notes: 1. No groundwater encountered. 2. Backfilled with arisings on completion. 3. ES - Environmental Sample. B - Bulk Sample. D - Disturbed Sample. SPT - Standard Penetration Test. 4. Densities above 1.2m based on engineer observations. 5. Enabling works cut level is indicated to be above current ground level, suggesting there has been further cut undertaken post-enabling works.						Hole Diameter		Casing		Hammer Information		
						Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.	
						2.45	150	1.50	150	55%	BBL04	
						Install Response Zones						
						Ref	From (m)	To (m)				

 Civic Earth www.civicearth.com		Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I						
		Project Number: 51001/01		Logged By: HG Checked By: KP		Method and Plant Used				Groundwater		
Location ID: BH204		Location Type: Cable percussion (shell and auger)				From (m) 0.00	To (m) 2.41	Type CP	Plant Used Dando 2000	Strike (m)	Time (min)	Rose To
		Coords: 385079.49E/397503.67N		Level: 35.98mAOD								
Status: FINAL		Scale: 1:30		Final Depth: 2.45								
Sheet 1 of 1		Date Start: 10/11/2023		Date End: 10/11/2023								
Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description			
		Sample Depth (m)	Type/Ref	Tests/Results								
	0.30 0.30 - 0.40		ES 1 B						Medium dense to very dense grey to dark grey gravelly very clayey sand. Sand is fine to coarse. Gravel is subrounded to angular brick, flint, concrete, mudstone and sandstone. Occasional cobbles of brick and concrete noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]			
	0.70 - 0.80		B									
	1.20 - 1.65 1.20 - 1.65		B D	SPT(C) 1.20m 50 (5,9/50 for 170mm)								
	2.00 - 2.45		D	SPT(C) 2.00m 50 (25 for 10mm/50 for 20mm)		34.08	1.90		Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]			
						33.53	2.45		EOH at 2.45m - Achieved target depth			
	3.0											
	4.0											
	5.0											
	6.0											
Notes:						Hole Diameter		Casing		Hammer Information		
1. No groundwater encountered. 2. Backfilled with arisings on completion. 3. ES - Environmental Sample. B - Bulk Sample. D - Disturbed Sample. SPT - Standard Penetration Test. 4. Densities above 1.2m based on engineer observations. 5. Sandstone encountered at similar level to estimated base of enabling works excavation.						Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.	
						2.45	150	1.50	150	55%	BBL04	
						Install Response Zones						
						Ref	From (m)	To (m)				

Civic Earth www.civicearth.com		Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I							
		Project Number: 51001/01		Logged By: HG Checked By: KP		Method and Plant Used				Groundwater			
Location ID: BH205		Location Type: Cable percussion (shell and auger)				From (m) 0.00	To (m) 2.95	Type CP	Plant Used Dando 2000	Strike (m)	Time (min)	Rose To	
		Coords: 385101.38E/397506.38N		Level: 35.84mAOD									
Status: FINAL		Scale: 1:30		Final Depth: 2.95									
Sheet 1 of 1		Date Start: 10/11/2023		Date End: 10/11/2023									
Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description				
		Sample Depth (m)	Type/Ref	Tests/Results									
		0.30 - 0.40	B						Medium dense dark grey clayey gravelly sand. Sand is fine to medium. Gravel is subangular to angular fine to coarse of flint, brick, concrete and sandstone. Occasional cobbles of brick and concrete and pockets of sandy gravelly clay noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]				
		0.70 0.70 - 0.80	ES 1 B										
	1.0	1.20 - 1.65 1.20 - 1.65	B D	SPT(C) 1.20m N=25 (6,5/4,6,7,8)									
	2.0	2.00 - 2.45 2.00 - 2.45	B D	SPT(C) 2.00m N=16 (1,2/2,3,4,7)									
		2.50 - 2.95	D	SPT(C) 2.50m 50 (25 for 80mm/50 for 25mm)									
					33.44	2.40			Yellow gravelly SAND. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of sandstone. [WEATHERED CHESTER SANDSTONE FORMATION] Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]				
					33.34	2.50							
					32.89	2.95							
	3.0								EOH at 2.95m - Achieved target depth				
	4.0												
	5.0												
	6.0												
Notes: 1. No groundwater encountered. 2. Backfilled with arisings on completion. 3. ES - Environmental Sample. B - Bulk Sample. D - Disturbed Sample. SPT - Standard Penetration Test. 4. Densities above 1.2m based on engineer observations. 5. Sandstone encountered at similar level to estimated base of enabling works excavation.						Hole Diameter		Casing		Hammer Information			
						Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.		
						2.95	150	1.50	150	55%	BBL04		
						Install Response Zones							
						Ref	From (m)	To (m)					

 www.civicearth.com		Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I							
		Project Number: 51001/01		Logged By: HG Checked By: KP		Method and Plant Used			Groundwater				
Location ID: BH206		Location Type: Cable percussion (shell and auger)				0.00	6.45	CP	Dando 2000	5.20	20	4.80	
		Coords: 385003.00E/397522.00N		Level: 34.30mAOD									
Status: FINAL		Scale: 1:30		Final Depth: 6.45									
		Date Start: 13/11/2023		Date End: 13/11/2023									
Sheet 1 of 2													
	Depth (m)	Sample Depth (m)	Type/Ref	Tests/Results	Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description				
		0.30 - 0.40	B						Loose to very dense grey gravelly clayey sand. Sand is fine to medium. Gravel is rounded to angular fine to coarse of flint, brick and concrete. Occasional cobbles of brick noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]				
		0.70 - 0.80	B										
		1.20 - 1.65 1.20 - 1.65	B D	SPT(S) 1.20m N=60 (7,9/60 for 255mm)									
		2.00 - 2.45 2.00 - 2.45	B D	SPT(S) 2.00m N=13 (2,2/3,3,3,4)									
		2.50 - 2.95	D	SPT(S) 2.50m N=6 (1,1/1,1,2,2)						Soft dark grey mottled black gravelly sandy clay. Sand is fine to medium. Gravel is subangular to angular fine to coarse of flint, brick and concrete. [MADE GROUND]			
		3.00 3.00 - 3.45 3.00 - 3.45	ES 1 B D	SPT(S) 3.00m N=8 (1,2/1,2,2,3)	31.30	3.00							
		3.50 - 3.95	D	SPT(S) 3.50m N=7 (1,2/1,2,2,2)									
		4.00 - 4.45 4.00 - 4.45	B D	SPT(S) 4.00m N=3 (1,1/0,1,1,1)									
		4.50 - 4.95	D	SPT(S) 4.50m N=9 (4,4/3,2,2,2)						3.80m bgl - Estimated base of Enabling Works excavation based on E3P Validation Report.			
		5.00 - 5.45 5.00 - 5.45	B D	SPT(S) 5.00m N=11 (10,9/5,4,1,1)									
		5.50 - 5.95	D	SPT(S) 5.50m N=16 (3,4/1,0,0,15)									
		6.00 - 6.45	D	SPT(S) 6.00m 50 (25 for 30mm/50 for 45mm)	28.30	6.00							

Notes:						Hole Diameter		Casing		Hammer Information	
1. Groundwater encountered at 5.2mbgl. 2. Install details: 0.0m to 4.0m 50mm plain pipe with bentonite seal, 4.0m to 5.7m 50mm slotted pipe with gravel filter, 5.7m to 6.45m hole collapsed. Fitted with bung, gas tap and raised cover. 3. ES - Environmental Sample. B - Bulk Sample. D - Disturbed Sample. SPT - Standard Penetration Test. 4. Made Ground recorded below the estimated Enabling Contractor's base of excavation. Visual variation in composition to overlying material observed suggesting material below estimated base of Enabling Contractor's excavation is residual in-situ original Made Ground.						Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.
						6.45	150	3.00	150	55%	BBL04
						Install Response Zones					
						Ref	From (m)	To (m)			
Pipe1	4.00	5.70									

Civic Earth

www.civicearth.com

Project Title:

Phase 1A, Mayfield, Manchester

Client:

LandsecU+I

Project Number:

51001/01

Logged By:

HG

Checked By:

KP

Method and Plant Used

Groundwater

From (m)

To (m)

Type

Plant Used

Strike (m)

Time (min)

Rose To

0.00

6.45

CP

Dando 2000

5.20

20

4.80

Location ID:

Location Type: Cable percussion (shell and auger)

Coords: 385003.00E/397522.00N

Level: 34.30mAOD

Status:

Scale: 1:30

Final Depth: 6.45

Sheet 2 of 2

Date Start: 13/11/2023

Date End: 13/11/2023

Inst/Backfill

Depth (m)

Sample Depth (m)

Type/Ref

Tests/Results

Water Level (m)

Level (mAOD)

Strata Depth (m)

Legend / Cover

Strata Description

7.0

Very weak red brown SANDSTONE recovered as very dense sand.
[CHESTER SANDSTONE FORMATION]

27.85

6.45

EOH at 6.45m - Achieved target depth

8.0

9.0

10.0

11.0

12.0

Notes:

Hole Diameter

Casing

Hammer Information

1. Groundwater encountered at 5.2mbgl.

2. Install details: 0.0m to 4.0m 50mm plain pipe with bentonite seal, 4.0m to 5.7m 50mm slotted pipe with gravel filter, 5.7m to 6.45m hole collapsed. Fitted with bung, gas tap and raised cover.

3. ES - Environmental Sample. B - Bulk Sample. D - Disturbed Sample. SPT - Standard Penetration Test.

4. Made Ground recorded below the estimated Enabling Contractor's base of excavation. Visual variation in composition to overlying material observed suggesting material below estimated base of Enabling Contractor's excavation is residual in-situ original Made Ground.

Depth (m)

Dia (mm)

Depth (m)

Dia (mm)

Energy Ratio

Serial No.

6.45

150

3.00

150

55%

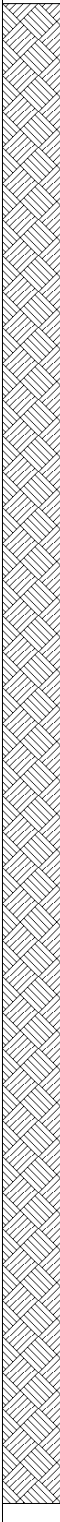
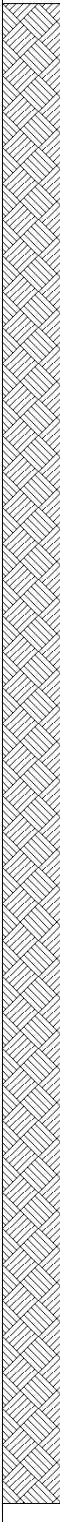
BBL04

Install Response Zones

Ref

From (m)

To (m)

Civic Earth www.civicearth.com		Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I									
		Project Number: 51001/01		Logged By: HG Checked By: KP		Method and Plant Used			Groundwater						
Location ID: BH207		Location Type: Cable percussion (shell and auger)				0.00	5.95	CP	Dando 2000						
Status: FINAL		Coords: 385013.15E/397536.50N		Level: 34.55mAOD											
Sheet 1 of 1		Scale: 1:30		Final Depth: 5.95											
		Date Start: 07/11/2023		Date End: 07/11/2023											
Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description						
		Sample Depth (m)	Type/Ref	Tests/Results											
									Soft to firm dark brown to dark grey mottled black gravelly very sandy clay. Sand is fine to medium. Gravel is subangular to angular fine to coarse of flint, brick, concrete and sandstone. Occasional cobbles of brick noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]						
	0.30 - 0.40	B													
	0.70 - 0.80	B													
	1.0														
	1.20 1.20 - 1.65 1.20 - 1.65	ES 1 B D	SPT(S) 1.20m N=30 (5,8/9,11,6,4)												
	2.0	2.00 - 2.45 2.00 - 2.45	B D	SPT(S) 2.00m N=12 (2,2/3,3,3,3)											
	2.50 - 2.95	D	SPT(S) 2.50m N=12 (1,1/2,3,4,3)	32.15	2.40										
	3.0	3.00 3.00 - 3.45 3.00 - 3.45	ES 2 B D	SPT(S) 3.00m N=11 (2,5/2,2,3,4)											
	3.50 - 3.95	D	SPT(S) 3.50m N=8 (1,1/2,2,2,2)												
	4.0	4.00 - 4.45 4.00 - 4.45	B D	SPT(S) 4.00m N=17 (2,3/4,4,4,5)											
	4.50 - 4.95	D	SPT(S) 4.50m N=29 (3,5/6,6,8,9)				Soft to firm dark grey mottled black gravelly sandy clay. Sand is fine to medium. Gravel is subangular to angular fine to coarse of flint, brick and concrete. [MADE GROUND - POSSIBLE ENGINEERED FILL]								
	5.0	5.00 - 5.45 5.00 - 5.45	B D	SPT(S) 5.00m N=44 (5,6/10,11,11,12)											
	5.50 - 5.95	D	SPT(S) 5.50m 50 (21 for 50mm/50 for 45mm)	29.05	5.50										
												Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]			
	6.0														
									EOH at 5.95m - Achieved target depth						
Notes: 1. No groundwater encountered. 2. Backfilled with arisings on completion. 3. ES - Environmental Sample, B - Bulk Sample, D - Disturbed Sample, SPT - Standard Penetration Test. 4. Made Ground recorded below the estimated Enabling Contractor's base of excavation; no visual variation in composition to overlying material.						Hole Diameter		Casing		Hammer Information					
						Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.				
						5.95	150	3.00	150	55%	BBL04				
						Install Response Zones									
						Ref	From (m)	To (m)							

 Civic Earth www.civicearth.com		Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I							
Location ID: BH208		Project Number: 51001/01		Logged By: HG Checked By: KP		Method and Plant Used				Groundwater			
						From (m)	To (m)	Type	Plant Used	Strike (m)	Time (min)	Rose To	
Status: FINAL		Location Type: Cable percussion (shell and auger)		Coords: 385040.00E/397515.00N		Level: 34.50mAOD							
Sheet 1 of 1		Scale: 1:30		Final Depth: 2.45									
		Date Start: 10/11/2023		Date End: 10/11/2023									
Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description				
		Sample Depth (m)	Type/Ref	Tests/Results									
	0.30 - 0.40	B							Medium dense grey gravelly very clayey sand. Sand is fine to coarse. Gravel is rounded to angular fine to coarse of flint, brick, concrete and sandstone. [MADE GROUND - POSSIBLE ENGINEERED FILL]				
	0.70 - 0.80	B											
	1.0								1.50m bgl - Estimated base of Enabling Works excavation based on E3P Validation Report.				
	1.20 1.20 - 1.65 1.20 - 1.65	ES 1 B D	SPT(C) 1.20m N=25 (7,6/6,6,7,6)										
	2.0	2.00 - 2.45	D	SPT(C) 2.00m N=50 (4,7/50 for 265mm)		32.50	2.00		Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]				
						32.05	2.45						
									EOH at 2.45m - Achieved target depth				
	3.0												
	4.0												
	5.0												
	6.0												
Notes:						Hole Diameter		Casing		Hammer Information			
1. No groundwater encountered. 2. Backfilled with arisings on completion. 3. ES - Environmental Sample, B - Bulk Sample, D - Disturbed Sample, SPT - Standard Penetration Test. 4. Made Ground recorded below the estimated Enabling Contractor's base of excavation; no visual variation in composition to overlying material.						Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.		
						2.45	150	1.50	150	55%	BBL04		
						Install Response Zones							
						Ref	From (m)	To (m)					

Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I						
Project Number: 51001/01		Logged By: HG		Method and Plant Used				Groundwater		
		Checked By: KP		From (m)	To (m)	Type	Plant Used	Strike (m)	Time (min)	Rose To
				0.00	5.45	CP	Dando 2000	2.50	20	2.35
		Location Type: Cable percussion (shell and auger)								
		Coords: 385027.07E/397533.21N		Level: 34.52mAOD						
Scale: 1:30		Final Depth: 5.45								
Date Start: 06/11/2023		Date End: 06/11/2023								

Inst/ Backfill	Depth (m)	Samples & Tests		Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description
		Sample Depth (m)	Type/Ref					
	0.30 0.30 - 0.40	ES 1 B						Soft to firm dark brown to dark grey mottled black gravelly very sandy clay. Sand is fine to medium. Gravel is subangular to angular fine to coarse of flint, brick, concrete and sandstone. Occasional cobbles of brick noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]
	0.70 - 0.80	B						
	1.20 - 1.65 1.20 - 1.65	B D	SPT(S) 1.20m N=16 (3,2/3,4,4,5)					
	2.00 - 2.45 2.00 - 2.45	B D	SPT(S) 2.00m N=25 (4,5/6,6,6,7)					
	2.50 - 2.95	D	SPT(S) 2.50m N=16 (2,3/3,4,4,5)		32.02	2.50		2.20m bgl - Estimated base of Enabling Works excavation based on E3P Validation Report.
	3.00 3.00 - 3.45 3.00 - 3.45	ES 2 B D	SPT(S) 3.00m N=27 (4,5/6,6,7,8)					Medium dense to dense grey brown mottled orange brown gravelly clayey sand. Sand is fine to medium. Gravel is subangular to angular fine to coarse of brick, flint, concrete and sandstone. [MADE GROUND - POSSIBLE ENGINEERED FILL]
	3.50 - 3.95	D	SPT(S) 3.50m N=43 (5,9/10,10,11,12)					
	4.00 - 4.45 4.00 - 4.45	B D	SPT(S) 4.00m N=38 (7,8/8,9,10,11)		30.52	4.00		Dense to very dense grey brown to orange brown gravelly very clayey sand. Sand is fine to medium. Gravel is subrounded to subangular fine to coarse of flint and sandstone. [ALLUVIUM]
	4.50 - 4.95	D	SPT(S) 4.50m 50 (9,13/50 for 135mm)					
	5.00 - 5.45	D	SPT(S) 5.00m 50 (25 for 10mm/50 for 20mm)		29.52	5.00		Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]
				29.07	5.45			EOH at 5.45m - Achieved target depth

Notes:

1. Groundwater encountered at 2.5mbgl.
2. Backfilled with arisings on completion.
3. ES - Environmental Sample. B - Bulk Sample. D - Disturbed Sample. SPT - Standard Penetration Test.
4. Made Ground recorded below the estimated Enabling Contractor's base of excavation. Visual variation in composition to overlying material observed suggesting material below estimated base of Enabling Contractor's excavation is residual in-situ original Made Ground.

Hole Diameter		Casing		Hammer Information		
Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.	
5.45	150	3.00	150	55%	BBL04	
				Install Response Zones		
				Ref	From (m)	To (m)

Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I						
Project Number: 51001/01		Logged By: HG		Method and Plant Used				Groundwater		
		Checked By: KP		From (m)	To (m)	Type	Plant Used	Strike (m)	Time (min)	Rose To
				0.00	3.95	CP	Dando 2000	0.60	-	-
		Location Type: Cable percussion (shell and auger)								
		Coords: 385043.59E/397530.53N								
Level: 34.57mAOD										
Scale: 1:30		Final Depth: 3.95								
Date Start: 06/11/2023		Date End: 06/11/2023								

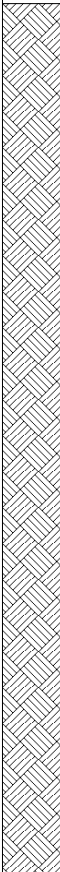
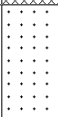
Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description
		Sample Depth (m)	Type/Ref	Tests/Results					
		0.30 - 0.40	B						Soft to firm dark brown to dark grey mottled black gravelly very sandy clay. Sand is fine to medium. Gravel is subangular to angular fine to coarse of flint, brick, concrete and sandstone. Occasional cobbles of brick noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]
		0.70 0.70 - 0.80	ES 1 B						
	1.0	1.20 - 1.65 1.20 - 1.65	B D	SPT(S) 1.20m N=10 (2,2/2,3,3,2)					
									1.40m bgl - Estimated base of Enabling Works excavation based on E3P Validation Report.
	2.0	2.00 2.00 - 2.45 2.00 - 2.45	ES 2 B D	SPT(S) 2.00m N=15 (2,2/3,3,4,5)	32.57	2.00			Medium dense dark brown gravelly very clayey sand. Sand is fine to coarse. Gravel is subrounded to angular of brick, flint and sandstone. Rare cobbles of flint noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]
		2.50 - 2.95	D	SPT(S) 2.50m N=10 (1,2/2,2,3,3)	32.07	2.50			Medium dense dark orange brown gravelly SAND. Sand is fine to medium. Gravel is subrounded to subangular fine to coarse of sandstone. [ALLUVIUM]
	3.0	3.00 - 3.45 3.00 - 3.45	B D	SPT(S) 3.00m N=15 (2,3/3,4,4,4)					
		3.50 - 3.95	D	SPT(S) 3.50m 50 (25 for 110mm/50 for 115mm)	31.07	3.50			Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]
					30.62	3.95			
		4.0							EOH at 3.95m - Achieved target depth
	5.0								
	6.0								

Notes:

1. Groundwater encountered at 0.6mbgl.
2. Backfilled with arisings on completion.
3. ES - Environmental Sample. B - Bulk Sample. D - Disturbed Sample. SPT - Standard Penetration Test.
4. Made Ground recorded below the estimated Enabling Contractor's base of excavation. Visual variation in composition to overlying material observed suggesting material below estimated base of Enabling Contractor's excavation is residual in-situ original Made Ground.

Hole Diameter		Casing		Hammer Information		
Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.	
3.95	150	3.00	150	55%	BBL04	
				Install Response Zones		
				Ref	From (m)	To (m)

 www.civicearth.com		Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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 Civic Earth www.civicearth.com		Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I							
		Project Number: 51001/01		Logged By: HG Checked By: KP		Method and Plant Used				Groundwater			
Location ID: BH212		Location Type: Cable percussion (shell and auger)				0.00	3.45	CP	Dando 2000				
		Coords: 385009.86E/397514.64N		Level: 34.56mAOD									
Status: FINAL		Scale: 1:30		Final Depth: 3.45									
Sheet 1 of 1		Date Start: 07/11/2023		Date End: 07/11/2023									
Inst/ Backfill 	Depth (m) 0.30 - 0.40 0.70 0.70 - 0.80 1.0 1.20 - 1.65 1.20 - 1.65 2.0 2.50 - 2.95 3.0 4.0 5.0 6.0	Sample Depth (m) 2.00 2.00 - 2.45 2.00 - 2.45 3.00 - 3.45 3.00 - 3.45	Type/Ref B ES 1 B B D D B D	Tests/Results SPT(S) 1.20m N=11 (2,1/2,2,3,4) SPT(S) 2.00m N=10 (2,3/2,2,3,3) SPT(S) 2.50m N=25 (1,2/4,5,7,9) SPT(S) 3.00m 50 (25 for 10mm/50 for 25mm)	Water Level (m)	Level (mAOD) 33.36 31.56 31.11	Strata Depth (m) 1.20 3.00 3.45	Legend / Cover  	Strata Description Soft to firm brown to grey brown gravelly very sandy clay. Sand is fine to medium. Gravel is subangular to angular fine to coarse of flint, brick and concrete. Rare cobbles of brick noted. [MADE GROUND - POSSIBLE ENGINEERED FILL] Soft to firm grey mottled green grey, red brown and black sandy gravelly clay. Gravel is subangular to angular fine to coarse of flint, brick, concrete and sandstone. Rare cobbles of brick and concrete noted. [MADE GROUND - POSSIBLE ENGINEERED FILL] Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION] EOH at 3.45m - Achieved target depth				

Notes:

1. No groundwater encountered.

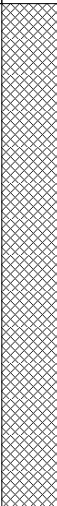
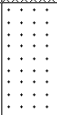
2. Backfilled with arisings on completion.

3. ES - Environmental Sample. B - Bulk Sample. D - Disturbed Sample. SPT - Standard Penetration Test.

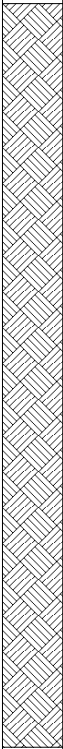
4. Sandstone encountered at similar level to estimated base of enabling works excavation.

Hole Diameter		Casing		Hammer Information		
Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.	
3.45	150	1.50	150	55%	BBL04	
				Install Response Zones		
		Ref	From (m)	To (m)		

Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I					
Project Number: 51001/01	Logged By: HG		Method and Plant Used				Groundwater		
	Checked By: KP		From (m)	To (m)	Type	Plant Used	Strike (m)	Time (min)	Rose To
	Location Type: Cable percussion (shell and auger)		0.00	2.45	CP	Dando 2000			
	Coords: 384992.76E/397508.35N								
	Scale: 1:30								
Date Start: 13/11/2023									
Level: 34.46mAOD		Final Depth: 2.45		Date End: 13/11/2023					

Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description
		Sample Depth (m)	Type/Ref	Tests/Results					
		0.30 - 0.40	B	SPT(S) 1.20m N=4 (1,1/1,1,1,1)					Loose grey mottled dark grey clayey very gravelly sand. Sand is fine to coarse. Gravel is subrounded to angular fine to coarse of flint, brick, concrete and sandstone. Occasional cobbles of brick and concrete noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]
	1.0	0.70 0.70 - 0.80	ES 1 B						
		1.20 - 1.65 1.20 - 1.65	B D						
	2.0	2.00 - 2.45 2.00 - 2.45	B D		SPT(S) 2.00m 50 (25 for 110mm/50 for 90mm)	32.46	2.00		
									Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]
									EOH at 2.45m - Achieved target depth
	3.0								
	4.0								
	5.0								
	6.0								

Notes:	Hole Diameter		Casing		Hammer Information		
	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.	
	2.45	150	1.50	150	55%	BBL04	
					Install Response Zones		
					Ref	From (m)	To (m)

Civic Earth www.civicearth.com		Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I						
		Project Number: 51001/01		Logged By: HG Checked By: KP		Method and Plant Used			Groundwater			
Location ID: BH214		Location Type: Cable percussion (shell and auger)				From (m) 0.00	To (m) 2.95	Type CP	Plant Used Dando 2000	Strike (m)	Time (min)	Rose To
		Coords: 385031.31E/397499.04N		Level: 34.53mAOD								
Status: FINAL		Scale: 1:30		Final Depth: 2.95								
Sheet 1 of 1		Date Start: 08/11/2023		Date End: 08/11/2023								
Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description			
		Sample Depth (m)	Type/Ref	Tests/Results								
		0.30 - 0.40	B						Medium dense dark grey to grey brown very clayey very gravelly sand. Sand is fine to coarse. Gravel is subangular to angular fine to medium of flint, brick, sandstone and concrete. Occasional cobbles of brick and concrete noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]			
		0.70 - 0.80	B									
	1.0					33.44	1.10		Medium dense to dense grey brown clayey very gravelly sand. Sand is fine to medium. Gravel is subrounded to angular fine to coarse of flint and sandstone. [ALLUVIUM]			
		1.20 - 1.65 1.20 - 1.65	B D	SPT(S) 1.20m N=10 (2,2/3,3,2,2)								
	2.0	2.00 2.00 - 2.45 2.00 - 2.45	ES 1 B D	SPT(S) 2.00m N=38 (9,13/16,8,7,7)								
	2.50 - 2.95	D	SPT(S) 2.50m N=50 (25 for 135mm/50 for 235mm)		32.03	2.50		Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]				
					31.58	2.95						
	3.0								EOH at 2.95m - Achieved target depth			
	4.0											
	5.0											

Project Title: Phase 1A, Mayfield, Manchester				Client: LandsecU+I					
Project Number: 51001/01	Logged By: HG		Method and Plant Used				Groundwater		
	Checked By: KP		From (m)	To (m)	Type	Plant Used	Strike (m)	Time (min)	Rose To
	Location Type: Cable percussion (shell and auger)		0.00	2.45	CP	Dando 2000			
	Coords: 385006.37E/397501.03N								
	Scale: 1:30								
Date Start: 08/11/2023									
Level: 34.55mAOD		Final Depth: 2.45		Date End: 08/11/2023					

Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description
		Sample Depth (m)	Type/Ref	Tests/Results					
		0.30 - 0.40	B						Soft to firm light grey brown sandy very gravelly clay. Gravel is subrounded to angular fine to coarse of flint, brick and concrete. Sand is fine to medium. Occasional cobbles of brick and concrete noted. [MADE GROUND - POSSIBLE ENGINEERED FILL]
		0.70 - 0.80	B						
	1.0	1.20 1.20 - 1.65	ES 1 D	SPT(S) 1.20m N=21 (2,3/3,5,6,7)		33.65	0.90		Medium dense light brown clayey very gravelly sand. Sand is fine to medium. Gravel is rounded to subangular fine to coarse of flint and sandstone. Rare cobbles of flint and sandstone noted. [MADE GROUND - POSSIBLE ENGINEERED FILL] <i>1.10m bgl - Estimated base of Enabling Works excavation based on E3P Validation Report.</i>
		1.70 - 2.15	D	SPT(S) 1.70m 50 (25 for 20mm/50 for 45mm)		32.85	1.70		
	2.0	2.00 - 2.45	D	SPT(S) 2.00m 50 (25 for 5mm/50 for 20mm)		32.10	2.45		Very weak red brown SANDSTONE recovered as very dense sand. [CHESTER SANDSTONE FORMATION]
									EOH at 2.45m - Achieved target depth
	3.0								
	4.0								
	5.0								
	6.0								

Notes:	Hole Diameter		Casing		Hammer Information	
	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Energy Ratio	Serial No.
	2.45	150	1.50	150	55%	BBL04
	Install Response Zones					
					Ref	From (m) To (m)
1. No groundwater encountered. 2. Backfilled with arisings on completion. 3. ES - Environmental Sample, B - Bulk Sample, D - Disturbed Sample, SPT - Standard Penetration Test. 4. Made Ground recorded below the estimated Enabling Contractor's base of excavation. Visual variation in composition to overlying material observed suggesting material below estimated base of Enabling Contractor's excavation is residual in-situ original Made Ground.						

Civic Earth

www.civicearth.com

Project Title:

Phase 1A, Mayfield, Manchester

Client

LandsecU+I

Project Number:

51001/01

Logged By:

Fay McDermott

Checked By:

Method and Plant Used

Groundwater

From (m)

To (m)

Type

Plant Used

Strike (m)

Time (min)

Rose To

Location ID:

BH216

Location Type:

Rotary open hole

Coords:

385013.88E/397526.93N

Level:

34.55mAOD

Status:

DRAFT

Scale:

1:50

Final Depth:

5.50

Sheet 1 of 1

Date Start:

22/01/2024

Date End:

22/01/2024

Inst/
Backfill

Depth
(m)

Sample Depth
(m)

Type/Ref

Tests/Results

Water
Level (m)

Level
(mAOD)

Strata
Depth
(m)

Legend /
Cover

Strata Description

1.0

2.0

3.0

4.0

5.0

6.0

7.0

8.0

9.0

10.0

33.35

31.15

29.05

1.20

3.40

5.50

Possible dark grey sandy clayey gravel. Gravel is angular fine to coarse brick, flint and concrete. Sand is fine to coarse.
[MADE GROUND - POSSIBLE ENGINEERED FILL]

Possible grey sandy very gravelly clay. Gravel is angular fine to coarse of brick, concrete and sandstone. Sand is fine to coarse.
[MADE GROUND - POSSIBLE ENGINEERED FILL]

Possible red brown SANDSTONE. Recovered as fine to coarse sand.
[CHESTER SANDSTONE FORMATION]

EOH at 5.50m - Achieved target depth

Notes:

1. No groundwater encountered.

2. Backfilled with arisings on completion.

3. Due to the drilling method, descriptions based on logging of chippings brought up during drilling .

Hole Diameter

Casing

Hammer Information

Depth (m)

Dia (mm)

Depth (m)

Dia (mm)

Energy Ratio

Serial No.

5.50

85

%

Install Response Zones

Ref

From (m)

To (m)

Civic Earth

www.civicearth.com

Project Title:

Phase 1A, Mayfield, Manchester

Client

LandsecU+I

Project Number:

51001/01

Logged By:

Fay McDermott

Checked By:

Method and Plant Used

Groundwater

From (m)

To (m)

Type

Plant Used

Strike (m)

Time (min)

Rose To

0.00

6.60

RO

comacchio 205

Location ID:

BH217

Location Type:

Rotary open hole

Coords:

385034.68E/397517.21N

Level:

34.40mAOD

Status:

DRAFT

Scale:

1:50

Final Depth:

6.60

Sheet 1 of 1

Date Start:

22/01/2024

Date End:

22/01/2024

Inst/ Backfill	Depth (m)	Samples & Tests			Water Level (m)	Level (mAOD)	Strata Depth (m)	Legend / Cover	Strata Description
		Sample Depth (m)	Type/Ref	Tests/Results					
									Possible dark grey sandy clayey gravel. Gravel is angular fine to coarse of brick, flint and concrete. Sand is fine to coarse. [MADE GROUND - POSSIBLE ENGINEERED FILL]
	1.0					33.01	1.40		Possible light brown gravelly sand. Sand is fine to coarse . Gravel is angular fine to coarse of flint, brick and concrete. [MADE GROUND - POSSIBLE ENGINEERED FILL]
	2.0								
	3.0								
	4.0					29.80	4.60		Possible red brown SANDSTONE. Recovered as fine to coarse sand. [CHESTER SANDSTONE FORMATION]
	5.0								
	6.0								
	7.0					27.80	6.60		EOH at 6.60m - Achieved target depth
	8.0								
	9.0								
	10.0								

Notes:

1. No groundwater encountered.

2. Backfilled with arisings on completion.

3. Due to the drilling method, descriptions based on logging of chippings brought up during drilling .

Hole Diameter

Casing

Hammer Information

Depth (m)

Dia (mm)

Depth (m)

Dia (mm)

Energy Ratio

Serial No.

6.60

85

%

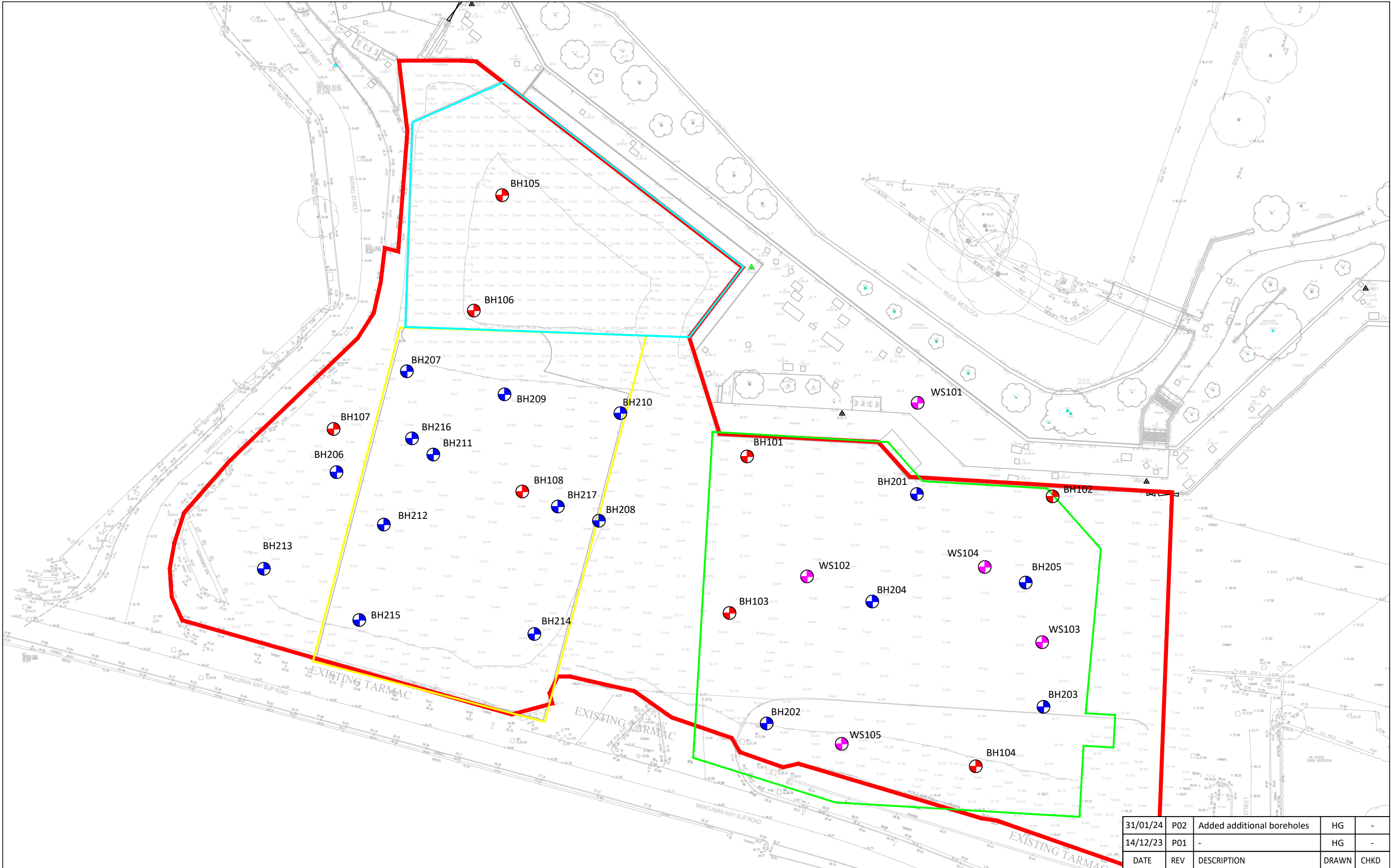
Install Response Zones

Ref

From (m)

To (m)

Appendix B
Exploratory Hole Location Plan



Key Civic Earth Borehole Historical Borehole (RoC 2019 & 2020) Historical Window Sample (RoC 2019) © CIVIC EARTH LIMITED	Civic Earth MANCHESTER / LONDON / LEEDS / GLASGOW www.civicearth.com	PROJECT	DRAWING STATUS				STATUS CODE		
		Phase 1A, Mayfield Manchester	FINAL				-		
		TITLE	CE PROJECT No.	SCALE @ A3	DATE CREATED	DRAWN	CHECKED	REV	
			51001	NTS	31/01/24	HG	--		
			DRAWING No.						
Exploratory Hole Location Plan	51001-CE-XX-XX-D-G-0002					P02			

Appendix C
Monitoring and Infiltration Records

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Civic Earth
Site: Baring Industrial Estate
Date: 14/12/2023

Quote No:
Visit No: 1 of 1
Operator: RYAN CHAU **Project Manager:** Dan Stodgell



	GAS CONCENTRATIONS												VOLATILES		FLOW DATA			WELL AND WATER DATA		Comments	
Monitoring Point	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)		Depth of well (m)
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady					
BH206	0.0	0.0	0.0	0.0	4.2	4.2	0	0	0	0	3.8	3.8			0.2	0.2	-0.74	30	5.10	5.71	
Max	0.0	0.0	0.0	0.0	4.2	4.2	0	0	0	0	3.8	3.8	NR	ND	0.2	0.2	-1	30	5.10	5.71	
Min	0.0	0.0	0.0	0.0	4.2	4.2	0	0	0	0	3.8	3.8	NR	0.0	0.2	0.2	-0.7	30	5.10	5.71	

ND - Not detected
 NR - Not recorded
 NA - Non applicable

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground: ☐ Dry ☒ Moist ☐ Wet ☐ Snow ☐ Frozen
 Wind: ☐ Calm ☒ Light ☐ Moderate ☐ Strong
 Cloud cover: ☐ None ☒ Slight ☐ Cloudy ☐ Overcast
 Precipitation: ☒ None ☐ Slight ☐ Moderate ☐ Heavy
 Time monitoring performed: 13:03 Start 13:39 End
 Barometric pressure (mbar): 1014 Start 1016 End
 Pressure trend (Daily): ☐ Falling ☒ Steady ☐ Rising
 Source: ☐ Met Office
 Air Temperature (Deg. C): ☐ 7 Before ☐ 7 After

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GA5000 - G505448
 Gas Range: CH₄ 0 - 100% CO₂ 0 - 100% O₂ 0 - 25%
 Gas Flow range: +100/-50 l/hour
 Differential Pressure: (+/-) 1000 Pa
 Date of last calibration: 26/09/2023
 Date of next calibration: 26/03/2024

Ambient air check: CH₄ CO₂ O₂

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Civic Earth
Site: Baring Industrial Estate
Date: 19/12/2023

Quote No:
Visit No: 2 of 3
Operator: Charlotte Wilson **Project Manager:** Dan Stodgell



	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				WELL AND WATER DATA		Comments
Monitoring Point	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m)	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady					
BH206	ND	ND	ND	ND	3.8	3.8	1	1	ND	ND	4.9	4.9	NR	NR	0.2	0.2	-0.21	30	5.25	5.70	
Max	ND	ND	ND	ND	3.8	3.8	1	1	ND	ND	4.9	4.9	NR	NR	0.2	0.2	0	30	5.25	5.70	
Min	ND	ND	ND	ND	3.8	3.8	1	1	ND	ND	4.9	4.9	NR	NR	0.2	0.2	-0.2	30	5.25	5.70	

ND - Not detected

NR - Not recorded

NA - Non applicable

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground: ☐ Dry ☐ Moist ☒ Wet ☐ Snow ☐ Frozen
 Wind: ☐ Calm ☐ Light ☒ Moderate ☐ Strong
 Cloud cover: ☐ None ☐ Slight ☐ Cloudy ☒ Overcast
 Precipitation: ☒ None ☐ Slight ☐ Moderate ☐ Heavy
 Time monitoring performed: 08:46 Start 09:10 End
 Barometric pressure (mbar): 1018 Start 1018 End
 Pressure trend (Daily): ☐ Falling ☐ Steady ☒ Rising
 Source: world weather online
 Air Temperature (Deg. C): 9 Before 9 After

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GA507573
 Gas Range: CH₄ 0 - 100% CO₂ 0 - 100% O₂ 0 - 25%
 Gas Flow range: +100/-50 l/hour
 Differential Pressure: (+/-) 1000 Pa
 Date of last calibration: 19/12/2023
 Date of next calibration: 25/04/2023

Ambient air check: CH₄ 20.9 CO₂ 0.1 O₂ 0.0

JOB DETAILS:

Client: Civic Earth
Site: Baring Industrial Estate
Date: 28/12/2023

Quote No:
Visit No: 3 of 3
Operator: Charlotte Wilson
Project Manager: Dan Stodgell



Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA			WELL AND WATER DATA		Comments	
	Methane (%v/v)		%LEL	Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)	Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m)			
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady					
BH206	ND	ND	ND	ND	0.6	0.6	1	1	ND	ND	19.4	19.4	NR	NR	0.3	0.3	-0.12	30	5.00	5.69	
Max	ND	ND	ND	ND	0.6	0.6	1	1	ND	ND	19.4	19.4	NR	ND	0.3	0.3	0	30	5.00	5.69	
Min	ND	ND	ND	ND	0.6	0.6	1	1	ND	ND	19.4	19.4	NR	0.0	0.3	0.3	-0.1	30	5.00	5.69	

ND - Not detected
 NR - Not recorded
 NA - Non applicable

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground: ☐ Dry ☐ Moist ☒ Wet ☐ Snow ☐ Frozen
 Wind: ☐ Calm ☒ Light ☐ Moderate ☐ Strong
 Cloud cover: ☐ None ☐ Slight ☐ Cloudy ☒ Overcast
 Precipitation: ☒ None ☐ Slight ☐ Moderate ☐ Heavy
 Time monitoring performed: 09:15 Start 10:05 End
 Barometric pressure (mbar): 1018 Start 1018 End
 Pressure trend (Daily): ☐ Rising
 Source: ☐ Met Office ☐ Falling ☒ Steady
 Air Temperature (Deg. C): ☐ 9 Before ☐ 9 After

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GA507573
 Gas Range: **CH₄** 0 - 100% **CO₂** 0 - 100% **O₂** 0 - 25%
 Gas Flow range: +100/-50 l/hour
 Differential Pressure: (+/-) 1000 Pa
 Date of last calibration: 19/12/2023
 Date of next calibration: 25/04/2023

Ambient air check: **CH₄** **CO₂** **O₂**

Test Location: BH213	Test No: 1	Engineer: HG	Date: 13/11/2023
----------------------	------------	--------------	------------------

Water Level During Test

Time (minutes)	Depth (mbgl)	Head, H (m)	Head Ratio, H/Ho
0.0	0.05	0.59	1.00
0.5	0.09	0.55	0.93
1.0	0.10	0.54	0.92
3.0	0.13	0.51	0.86
6.0	0.15	0.49	0.83
8.0	0.16	0.48	0.81
10.0	0.17	0.47	0.80
15.0	0.19	0.45	0.76
20.0	0.21	0.43	0.73
30.0	0.26	0.38	0.64
40.0	0.29	0.35	0.59
50.0	0.31	0.33	0.56
60.0	0.34	0.30	0.51
72.0	0.37	0.27	0.46
80.0	0.39	0.25	0.42
95.0	0.41	0.23	0.39
105.0	0.43	0.21	0.36
120.0	0.44	0.20	0.34
135.0	0.45	0.19	0.32
150.0	0.47	0.17	0.29
165.0	0.49	0.15	0.25
180.0	0.51	0.13	0.22

Monitoring Details

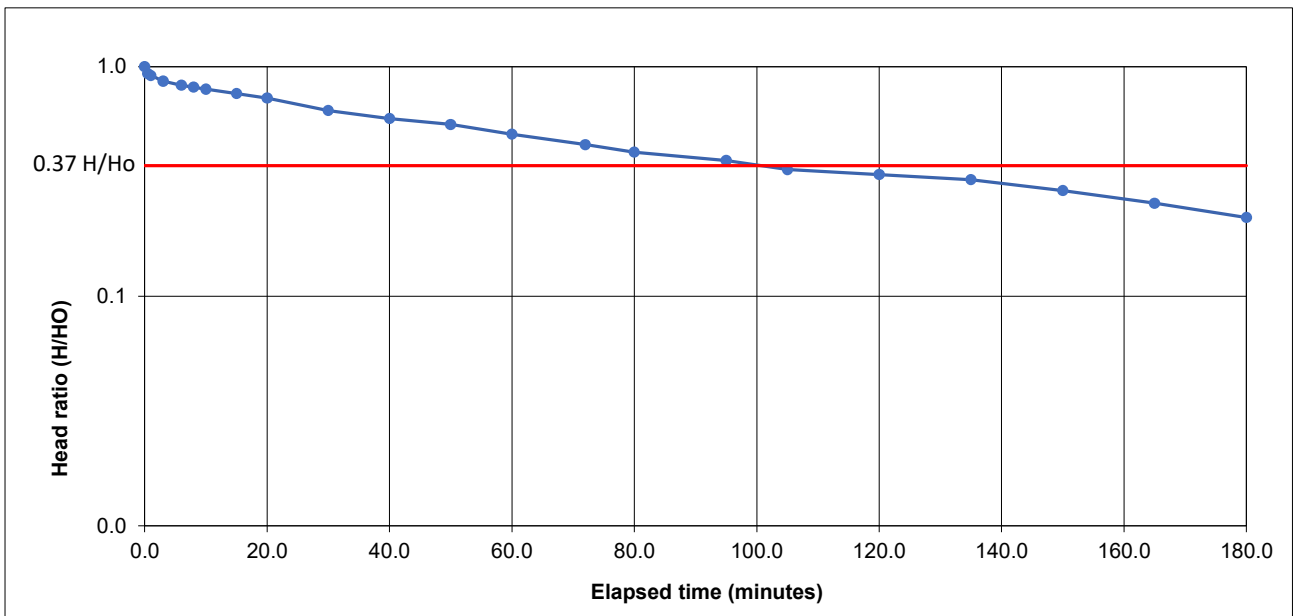
Initial groundwater depth	0.64 mbgl
Well depth	0.64 mbgl
Well pipe diameter	0.15 m
Length tested	0.64 m

Permeability Equation

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

F = Intake factor	1.86
H ₁ = Variable head measured at t ₁	0.59 m
H ₂ = Variable head measured at t ₂	0.38 m
t ₁ = Time at commencement of test	0.00 minutes
t ₂ = Time at end of test	30.00 minutes
A = Cross section area	0.018 m ²

Permeability (k)	2.32E-06 m/s
	0.200215083 m/day



Notes: Hvorslev. (1951). Time lag and soil permeability in ground water observations

Client LandecU + I	Project Phase 1A, Mayfield, Manchester	Job No. 51001/01
	Title BH213 Falling Head Test	

Appendix D
Chemical Laboratory Analysis Results

Hal Godwin
Civic Earth Limited
Reeds Wharf
33 Mill Street
London
SE1 2AX

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

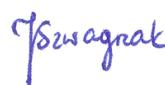
e: Hal.Godwin@civicearth.com

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 23-67740-2

Replaces Analytical Report Number: 23-67740, issue no. 1
Additional analysis undertaken.
Asbestos Quantification added as per client request

Project / Site name:	Mayfields, Manchester	Samples received on:	08/11/2023
Your job number:	51001	Samples instructed on/ Analysis started on:	08/11/2023
Your order number:	PO-0014	Analysis completed by:	27/11/2023
Report Issue Number:	2	Report issued on:	28/11/2023
Samples Analysed:	8 soil samples		



Signed:

Joanna Szwagrak
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-67740
Project / Site name: Mayfields, Manchester
Your Order No: PO-0014

Lab Sample Number				2872579	2872580	2872581	2872582	2872583
Sample Reference				BH201	BH201	BH210	BH210	BH209
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.70	0.70	2.00	0.30
Date Sampled				08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	25	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	13	13	14	16	18
Total mass of sample received	kg	0.001	NONE	0.9	1	1.1	0.9	0.8

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	< 0.001	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	< 0.001	-	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	PDO	PDO	PDO	PDO	PDO

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10.3	8.1	10.2	8.3	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	1600	1900	2000	600	1500
Organic Matter (automated)	%	0.1	MCERTS	1.7	2.2	1.9	3.1	2.2

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
----------------------------	-------	---	--------	-------	-------	-------	-------	-------

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.35	0.38	0.45	0.12	0.79
Acenaphthylene	mg/kg	0.05	MCERTS	0.08	0.09	0.12	< 0.05	0.09
Acenaphthene	mg/kg	0.05	MCERTS	0.48	0.48	0.44	0.08	0.83
Fluorene	mg/kg	0.05	MCERTS	0.34	0.4	0.42	0.07	0.65
Phenanthrene	mg/kg	0.05	MCERTS	3.2	2.9	3.1	0.49	4.4
Anthracene	mg/kg	0.05	MCERTS	0.83	0.72	0.68	0.12	1
Fluoranthene	mg/kg	0.05	MCERTS	5.8	4.2	4	0.66	5
Pyrene	mg/kg	0.05	MCERTS	5.4	3.8	3.7	0.65	4.8
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.6	1.8	1.9	0.26	2.2
Chrysene	mg/kg	0.05	MCERTS	2.7	1.8	1.7	0.3	2.3
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3	2.4	2.3	0.36	2.8
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1.5	0.77	0.89	0.13	0.89
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.6	1.9	2.1	0.29	2.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.2	0.96	1	0.14	1
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.38	0.27	0.26	< 0.05	0.31
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.4	1.1	1.1	0.17	1.2
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	32	23.8	24.1	3.84	30.4
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Analytical Report Number: 23-67740
Project / Site name: Mayfields, Manchester
Your Order No: PO-0014

Lab Sample Number	2872579	2872580	2872581	2872582	2872583
Sample Reference	BH201	BH201	BH210	BH210	BH209
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.30	0.70	0.70	2.00	0.30
Date Sampled	08/11/2023	08/11/2023	08/11/2023	08/11/2023	08/11/2023
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	5.7	4.2	3.8	3.5	4.6
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	36	31	74	27	85
Barium (aqua regia extractable)	mg/kg	1	MCERTS	190	200	170	73	210
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.81	0.76	0.86	1.1	1
Boron (water soluble)	mg/kg	0.2	MCERTS	0.6	1.2	0.5	1.1	0.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (III)	mg/kg	1	NONE	18	17	16	10	21
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	17	16	10	21
Copper (aqua regia extractable)	mg/kg	1	MCERTS	60	110	63	82	75
Lead (aqua regia extractable)	mg/kg	1	MCERTS	190	210	220	730	240
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.6	0.7	0.9	0.3	0.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	16	15	18	21
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	1.2	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	22	20	20	19	25
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	140	120	130	49	140

Monoaromatics & Oxygenates

Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	1.5	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	20	10	11	< 2.0	8.4
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	65	37	34	< 8.0	30
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	230	120	220	8.5	84
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	NONE	320	170	260	< 10	120

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	16	10	< 10	< 10	16
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	64	45	42	< 10	55
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	NONE	81	55	51	< 10	72

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-67740
Project / Site name: Mayfields, Manchester
Your Order No: PO-0014

Lab Sample Number				2872584	2872585	2872586
Sample Reference				BH209	BH207	BH207
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				3.00	1.20	3.00
Date Sampled				08/11/2023	08/11/2023	08/11/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Stone Content	%	0.1	NONE	4.7	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	13	16	16
Total mass of sample received	kg	0.001	NONE	0.7	0.8	0.9

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	PDO	PDO	PDO

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.9	9	8.3
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	640	2000	2600
Organic Matter (automated)	%	0.1	MCERTS	1.7	2.3	3.4

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.14	0.48	0.89
Acenaphthylene	mg/kg	0.05	MCERTS	0.05	0.1	0.11
Acenaphthene	mg/kg	0.05	MCERTS	0.12	0.58	1.4
Fluorene	mg/kg	0.05	MCERTS	0.09	0.41	1.1
Phenanthrene	mg/kg	0.05	MCERTS	1.1	4.1	8.6
Anthracene	mg/kg	0.05	MCERTS	0.27	0.87	1.9
Fluoranthene	mg/kg	0.05	MCERTS	1.2	6.6	10
Pyrene	mg/kg	0.05	MCERTS	1.1	6	9.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.48	2.9	4.2
Chrysene	mg/kg	0.05	MCERTS	0.57	3	4.1
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.62	3.2	4.5
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.21	1.5	1.9
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.54	3	4.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.24	1.6	2.4
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.24	0.34
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.28	1.9	2.5
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	1.2

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	7.03	36.3	59.3
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Analytical Report Number: 23-67740
Project / Site name: Mayfields, Manchester
Your Order No: PO-0014

Lab Sample Number				2872584	2872585	2872586
Sample Reference				BH209	BH207	BH207
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				3.00	1.20	3.00
Date Sampled				08/11/2023	08/11/2023	08/11/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Heavy Metals / Metalloids						
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	< 1.0	5.8	6.6
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	33	96	51
Barium (aqua regia extractable)	mg/kg	1	MCERTS	61	210	230
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.48	1.1	0.94
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	0.6	1.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	1.1
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (III)	mg/kg	1	NONE	11	21	21
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	12	22	21
Copper (aqua regia extractable)	mg/kg	1	MCERTS	31	100	87
Lead (aqua regia extractable)	mg/kg	1	MCERTS	64	290	270
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	1.1	2.9
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	10	20	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	14	26	22
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	57	170	220

Monoaromatics & Oxygenates

Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	5.7	13
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	26	50
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	68	170
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	NONE	< 10	100	230

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	10	19
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	41	74
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	NONE	< 10	51	94

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-67740
Project / Site name: Mayfields, Manchester
Your Order No: PO-0014

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2872579	BH201	0.30	123	Loose Fibres	Chrysotile	< 0.001	< 0.001

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number : 23-67740

Project / Site name: Mayfields, Manchester

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2872579	BH201	None Supplied	0.3	Brown clay and sand with gravel.
2872580	BH201	None Supplied	0.7	Brown clay and sand with gravel and stones.
2872581	BH210	None Supplied	0.7	Brown clay and sand with gravel.
2872582	BH210	None Supplied	2	Brown sandy clay with gravel.
2872583	BH209	None Supplied	0.3	Brown clay and sand with gravel and vegetation.
2872584	BH209	None Supplied	3	Brown sandy clay with stones.
2872585	BH207	None Supplied	1.2	Brown clay and sand with gravel and brick.
2872586	BH207	None Supplied	3	Brown clay and sand with gravel.

Analytical Report Number : 23-67740

Project / Site name: Mayfields, Manchester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID. Refer to CoA for band specific accreditation.	In-house method with silica gel split/clean up.	L088/76-PL	D	MCERTS
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

Analytical Report Number : 23-67740
Project / Site name: Mayfields, Manchester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
-	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 23-68794

Replaces Analytical Report Number: 23-68794, issue no. 1
Additional analysis undertaken.
Quantifications added to positive samples as per client's request.

Project / Site name:	Mayfields Manchester	Samples received on:	10/11/2023
Your job number:	51001	Samples instructed on/ Analysis started on:	15/11/2023
Your order number:	PO-0014	Analysis completed by:	29/11/2023
Report Issue Number:	2	Report issued on:	29/11/2023
Samples Analysed:	9 soil samples		

Signed:

Izabela Wójcik

Izabela Wójcik
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-68794
Project / Site name: Mayfields Manchester
Your Order No: PO-0014

Lab Sample Number	2878457	2878458	2878459	2878460	2878461
Sample Reference	BH211	BH212	BH212	BH215	BH214
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.20	0.70	2.00	1.20	2.00
Date Sampled	09/10/2023	09/10/2023	09/10/2023	09/10/2023	09/10/2023
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	15	9.9
Total mass of sample received	kg	0.001	NONE	0.8	0.8

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	0.003	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	0.003	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	WEM	WEM	WEM	WEM	WEM

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.8	10.7	10	8.4	9.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	1600	1900	2000	190	600
Organic Matter (automated)	%	0.1	MCERTS	2.3	1.8	1.7	0.7	1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	1	0.81	0.38	< 0.05	0.08
Acenaphthylene	mg/kg	0.05	MCERTS	0.28	0.15	0.06	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.81	0.66	0.38	< 0.05	0.15
Fluorene	mg/kg	0.05	MCERTS	1	0.68	0.36	< 0.05	0.09
Phenanthrene	mg/kg	0.05	MCERTS	6.4	5.6	2.6	0.1	0.76
Anthracene	mg/kg	0.05	MCERTS	1.5	1.3	0.55	< 0.05	0.14
Fluoranthene	mg/kg	0.05	MCERTS	7.3	6.9	3.2	0.11	0.9
Pyrene	mg/kg	0.05	MCERTS	7	6.6	3	0.11	0.82
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.4	3.3	1.5	< 0.05	0.42
Chrysene	mg/kg	0.05	MCERTS	3	2.9	1.4	< 0.05	0.39
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3.3	3.3	1.5	< 0.05	0.41
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1.5	1.4	0.77	< 0.05	0.2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.2	2.8	1.3	< 0.05	0.36
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.4	1.2	0.64	< 0.05	0.18
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.44	0.35	0.17	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.9	1.6	0.76	< 0.05	0.25
Coronene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	43.4	39.5	18.5	< 0.85	5.15
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Analytical Report Number: 23-68794
 Project / Site name: Mayfields Manchester
 Your Order No: PO-0014

Lab Sample Number	2878457	2878458	2878459	2878460	2878461
Sample Reference	BH211	BH212	BH212	BH215	BH214
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.20	0.70	2.00	1.20	2.00
Date Sampled	09/10/2023	09/10/2023	09/10/2023	09/10/2023	09/10/2023
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	4.5	3.8	4.1	< 1.0	1.7
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	63	45	72	7.2	7.6
Barium (aqua regia extractable)	mg/kg	1	MCERTS	210	150	190	28	52
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1	0.72	0.96	0.83	0.35
Boron (water soluble)	mg/kg	0.2	MCERTS	1.2	2	1.2	< 0.2	0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (III)	mg/kg	1	NONE	21	17	20	19	12
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	21	17	20	20	13
Copper (aqua regia extractable)	mg/kg	1	MCERTS	94	52	67	14	16
Lead (aqua regia extractable)	mg/kg	1	MCERTS	280	130	210	11	33
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1	0.5	0.5	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19	14	18	23	10
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	24	22	22	26	15
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	150	100	140	49	46

Monoaromatics & Oxygenates

Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	20	20	13	< 8.0	18
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	NONE	26	28	14	< 10	18

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	4.6	3.6	2.1	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	21	35	17	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	54	91	35	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	NONE	80	130	54	< 10	10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-68794
Project / Site name: Mayfields Manchester
Your Order No: PO-0014

Lab Sample Number				2878462	2878463	2878464	2878465
Sample Reference				BH202	BH203	BH205	BH204
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.70	0.30	0.70	0.30
Date Sampled				09/10/2023	09/10/2023	09/10/2023	09/10/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	10	11	13	14
Total mass of sample received	kg	0.001	NONE	0.8	0.9	0.8	0.9

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile & Amosite	Amosite	Amosite
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Detected	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	0.006	0.011	0.002
Asbestos Quantification Total	%	0.001	ISO 17025	-	0.006	0.011	0.002
Asbestos Analyst ID	N/A	N/A	N/A	WEM	WEM	WEM	WEM

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.3	10.4	10.3	9.8
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	570	2300	3300	2200
Organic Matter (automated)	%	0.1	MCERTS	0.8	1.7	2.3	2.3

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.45	0.38	2.3
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.05	0.08	0.2
Acenaphthene	mg/kg	0.05	MCERTS	0.08	0.92	0.75	8.1
Fluorene	mg/kg	0.05	MCERTS	0.06	0.59	0.52	7.7
Phenanthrene	mg/kg	0.05	MCERTS	0.63	6	4.7	46
Anthracene	mg/kg	0.05	MCERTS	0.13	1.3	1.1	12
Fluoranthene	mg/kg	0.05	MCERTS	0.87	8.2	7.7	54
Pyrene	mg/kg	0.05	MCERTS	0.81	7.3	7.2	43
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.4	3.4	3.7	24
Chrysene	mg/kg	0.05	MCERTS	0.45	3.6	3.7	19
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.42	3.8	4.3	21
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.19	1.6	1.6	9.3
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.35	3.5	3.9	20
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.18	1.6	1.8	8.6
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.49	0.53	2.5
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.23	1.9	2	8.7
Coronene	mg/kg	0.05	NONE	< 0.05	0.88	1.3	4.2

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	4.8	45.4	45.2	291
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Analytical Report Number: 23-68794
 Project / Site name: Mayfields Manchester
 Your Order No: PO-0014

Lab Sample Number				2878462	2878463	2878464	2878465
Sample Reference				BH202	BH203	BH205	BH204
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.70	0.30	0.70	0.30
Date Sampled				09/10/2023	09/10/2023	09/10/2023	09/10/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status				
Heavy Metals / Metalloids							
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	< 1.0	3.9	8.3	4.4
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	30	42	32
Barium (aqua regia extractable)	mg/kg	1	MCERTS	100	170	200	160
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.49	0.82	0.82	0.9
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	0.8	1.2	0.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (III)	mg/kg	1	NONE	15	18	18	17
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	15	18	18	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	41	40	62	49
Lead (aqua regia extractable)	mg/kg	1	MCERTS	29	100	210	140
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.4	0.6	0.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	15	16	15
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	19	24	24	22
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	46	120	150	130

Monoaromatics & Oxygenates

Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	< 0.020	< 0.020
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	2.4
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	2.4	< 2.0	14
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	22	12	17
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	140	110	60
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	NONE	< 10	170	130	94

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	< 0.010	< 0.010
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	< 0.050	< 0.050
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	2.3
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	7	4.6	33
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	47	35	140
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	120	97	170
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	NONE	< 10	180	140	340

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-68794
Project / Site name: Mayfields Manchester
Your Order No: PO-0014

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2878458	BH212	0.70	136	Loose Fibrous Debris	Chrysotile	0.003	0.003
2878463	BH203	0.30	133	Loose Fibrous Debris	Chrysotile & Amosite	0.006	0.006
2878464	BH205	0.70	127	Loose Fibrous Debris	Amosite	0.011	0.011
2878465	BH204	0.30	126	Loose Fibrous Debris	Amosite	0.002	0.002

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number : 23-68794

Project / Site name: Mayfields Manchester

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2878457	BH211	None Supplied	1.2	Brown sand with gravel.
2878458	BH212	None Supplied	0.7	Brown sand with gravel and brick.
2878459	BH212	None Supplied	2	Brown sand with gravel and brick.
2878460	BH215	None Supplied	1.2	Brown sand with stones.
2878461	BH214	None Supplied	2	Brown sand.
2878462	BH202	None Supplied	0.7	Brown sand.
2878463	BH203	None Supplied	0.3	Brown sand with gravel and brick.
2878464	BH205	None Supplied	0.7	Brown sand with gravel.
2878465	BH204	None Supplied	0.3	Brown sand with gravel and brick.

Analytical Report Number : 23-68794

Project / Site name: Mayfields Manchester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 °C)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Total sulphate (as SO ₄ in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260. Refer to CoA for analyte specific accreditation	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID. Refer to CoA for band specific accreditation.	In-house method with silica gel split/clean up.	L088/76-PL	D	MCERTS
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.