

8 Appendices

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Appendix A.4 – Surface Water Management Calculations

Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	4.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Existing	0.053	4.00	10.000	1000	0.000	0.000	1.000
Existing 1	0.000		10.000	1000	0.000	10.000	2.000

Links

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)
Existing	Existing	Existing 1	10.000	0.600	9.000	8.000	1.000	10.0	1000	4.02	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
Existing	10.602	8327.0	9.6	0.000	1.000	0.053	0.0	25	1.858

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
Existing	10.000	10.0	1000	Circular	10.000	9.000	0.000	10.000	8.000	1.000

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
Existing	Existing	1000	Manhole	Adoptable	Existing 1	1000	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Existing	0.000	0.000	10.000	1.000	1000				
						0	Existing	9.000	1000
Existing 1	0.000	10.000	10.000	2.000	1000		1	Existing	8.000
						1	Existing	8.000	1000

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m ³ /ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440	10080
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	0	0	0

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	0	0	0
100	40	0	0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.028	0.028	10.6	0.0515	0.0000	OK
15 minute summer	Existing 1	10	8.027	0.027	10.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	10.6	1.889	0.001	0.0561	4.1

Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.040	0.040	22.4	0.0730	0.0000	OK
15 minute summer	Existing 1	10	8.037	0.037	22.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	22.4	2.344	0.003	0.0956	8.7

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.046	0.046	30.2	0.0840	0.0000	OK
15 minute summer	Existing 1	10	8.043	0.043	30.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	30.2	2.535	0.004	0.1192	11.8

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.052	0.052	39.3	0.0952	0.0000	OK
15 minute summer	Existing 1	10	8.049	0.049	39.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	39.4	2.714	0.005	0.1451	15.3

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	9	9.061	0.061	55.1	0.1129	0.0000	OK
15 minute summer	Existing 1	10	8.057	0.057	55.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	55.2	2.976	0.007	0.1854	21.5

Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	4.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.064	4.00	10.000	1200	-8.461	-11.284	1.500
2			10.000	1200	-8.621	12.637	1.691
3			10.000	1200	18.069	13.317	3.000
4	0.093	4.00	10.000	1200	17.783	18.173	1.500
5	0.064	4.00	10.000	1200	45.159	-11.669	1.500
6			10.000	1200	43.976	14.981	1.754
Virtual Manhole			10.000	1200	19.722	11.154	3.100

Links

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)
1.000	5	6	26.676	0.600	8.500	8.246	0.254	105.0	300	4.29	50.0
1.001	6	3	25.960	0.600	8.246	8.000	0.246	105.5	300	4.57	50.0
3.000	4	3	4.864	0.600	8.500	8.300	0.200	24.3	300	4.03	50.0
2.001	2	3	26.699	0.600	8.309	7.000	1.309	20.4	300	4.41	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.534	108.4	11.6	1.200	1.454	0.064	0.0	66	1.011
1.001	1.530	108.1	11.6	1.454	1.700	0.064	0.0	66	1.008
3.000	3.201	226.2	16.8	1.200	1.400	0.093	0.0	55	1.899
2.001	3.496	247.1	11.6	1.391	2.700	0.064	0.0	44	1.811

Links

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)
2.000	1	2	23.922	0.600	8.500	8.309	0.191	125.2	300	4.28	50.0
1.002	3	Virtual Manhole	2.722	0.600	7.000	6.900	0.100	27.2	300	4.59	50.0

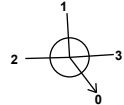
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	1.403	99.2	11.6	1.200	1.391	0.064	0.0	69	0.948
1.002	3.025	213.8	39.9	2.700	2.800	0.221	0.0	88	2.338

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	26.676	105.0	300	Circular	10.000	8.500	1.200	10.000	8.246	1.454
1.001	25.960	105.5	300	Circular	10.000	8.246	1.454	10.000	8.000	1.700
3.000	4.864	24.3	300	Circular	10.000	8.500	1.200	10.000	8.300	1.400
2.001	26.699	20.4	300	Circular	10.000	8.309	1.391	10.000	7.000	2.700
2.000	23.922	125.2	300	Circular	10.000	8.500	1.200	10.000	8.309	1.391
1.002	2.722	27.2	300	Circular	10.000	7.000	2.700	10.000	6.900	2.800

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.001	6	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
3.000	4	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
2.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
2.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	Virtual Manhole	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	-8.461	-11.284	10.000	1.500	1200		0	2.000	8.500	300
2	-8.621	12.637	10.000	1.691	1200		1	2.000	8.309	300
3	18.069	13.317	10.000	3.000	1200		0	2.001	8.309	300
							1	3.000	8.300	300
							2	2.001	7.000	300
							3	1.001	8.000	300
							0	1.002	7.000	300
4	17.783	18.173	10.000	1.500	1200		0	3.000	8.500	300
5	45.159	-11.669	10.000	1.500	1200		0	1.000	8.500	300
6	43.976	14.981	10.000	1.754	1200		1	1.000	8.246	300
							0	1.001	8.246	300
Virtual Manhole	19.722	11.154	10.000	3.100	1200		1	1.002	6.900	300

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Detailed	Additional Storage (m ³ /ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440	10080
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0	100	0	10	0
10	0	10	0	100	40	10	0
30	0	10	0				

Node Virtual Manhole Online Weir Control

Flap Valve	x	Invert Level (m)	9.999	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	1.000		

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.000
Side Inf Coefficient (m/hr)	0.10000	Porosity	0.95	Time to half empty (mins)	

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	190.0	0.0	2.500	190.0	0.0	2.501	0.0	0.0

Node 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	23.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	9.700	Length (m)	23.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	1000.0		

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 99.05%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.582	0.082	14.1	0.1690	0.0000	OK
15 minute summer	2	9	8.360	0.051	14.1	0.0579	0.0000	OK
10080 minute winter	3	8760	7.717	0.717	0.7	130.3108	0.0000	SURCHARGED
15 minute summer	4	10	8.569	0.069	20.5	0.1723	0.0000	OK
15 minute summer	5	10	8.575	0.075	14.1	0.1545	0.0000	OK
15 minute summer	6	10	8.321	0.075	14.1	0.0844	0.0000	OK
10080 minute winter	Virtual Manhole	9960	7.718	0.818	0.1	0.9246	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	2.000	2	14.1	1.231	0.142	0.2776	
15 minute summer	2	2.001	3	14.5	2.208	0.059	0.2872	
10080 minute winter	3	1.002	Virtual Manhole	0.1	0.013	0.000	0.1917	
10080 minute winter	3	Infiltration		0.0				
15 minute summer	4	3.000	3	20.5	1.834	0.091	0.0544	
15 minute summer	5	1.000	6	14.1	1.049	0.130	0.3639	
15 minute summer	6	1.001	3	13.9	1.045	0.128	0.3453	
10080 minute winter	Virtual Manhole	Weir		0.0				0.0

Results for 10 year +10% A Critical Storm Duration. Lowest mass balance: 99.05%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.621	0.121	29.8	0.2514	0.0000	OK
15 minute summer	2	10	8.379	0.070	29.8	0.0790	0.0000	OK
10080 minute summer	3	10140	8.148	1.148	1.4	208.4931	0.0000	SURCHARGED
15 minute summer	4	10	8.607	0.107	43.3	0.2662	0.0000	OK
15 minute summer	5	10	8.611	0.111	29.8	0.2304	0.0000	OK
15 minute summer	6	10	8.358	0.112	29.8	0.1267	0.0000	OK
10080 minute summer	Virtual Manhole	10200	8.148	1.248	0.1	1.4114	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	2.000	2	29.8	1.542	0.300	0.4685	
15 minute summer	2	2.001	3	29.8	2.343	0.121	0.7301	
10080 minute summer	3	1.002	Virtual Manhole	0.1	0.013	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
15 minute summer	4	3.000	3	43.3	2.184	0.191	0.0966	
15 minute summer	5	1.000	6	29.8	1.256	0.275	0.6368	
15 minute summer	6	1.001	3	29.7	1.283	0.275	0.6013	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 99.05%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.643	0.143	40.2	0.2967	0.0000	OK
10080 minute winter	2	10200	8.503	0.194	0.3	0.2195	0.0000	OK
10080 minute winter	3	9840	8.503	1.503	1.1	273.0044	0.0000	SURCHARGED
15 minute summer	4	10	8.628	0.128	58.4	0.3203	0.0000	OK
15 minute summer	5	10	8.632	0.132	40.2	0.2736	0.0000	OK
10080 minute winter	6	9780	8.503	0.257	0.3	0.2908	0.0000	OK
10080 minute winter	Virtual Manhole	9960	8.503	1.603	0.0	1.8131	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	2.000	2	40.2	1.671	0.405	0.5814	
10080 minute winter	2	2.001	3	0.3	0.189	0.001	1.5836	
10080 minute winter	3	1.002	Virtual Manhole	0.0	0.013	0.000	0.1917	
10080 minute winter	3	Infiltration		0.0				
15 minute summer	4	3.000	3	58.4	2.331	0.258	0.1221	
15 minute summer	5	1.000	6	40.2	1.344	0.371	0.8009	
10080 minute winter	6	1.001	3	0.3	0.340	0.003	1.7482	
10080 minute winter	Virtual Manhole	Weir		0.0				0.0

Results for 100 year +10% A Critical Storm Duration. Lowest mass balance: 99.05%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	1	10260	8.905	0.405	0.6	0.8376	0.0000	SURCHARGED
10080 minute summer	2	10260	8.904	0.595	0.6	0.6735	0.0000	SURCHARGED
10080 minute summer	3	10200	8.904	1.904	2.1	345.8694	0.0000	SURCHARGED
10080 minute summer	4	10140	8.904	0.404	0.9	1.0087	0.0000	SURCHARGED
10080 minute summer	5	10320	8.904	0.404	0.6	0.8372	0.0000	SURCHARGED
10080 minute summer	6	10320	8.904	0.658	0.6	0.7447	0.0000	SURCHARGED
10080 minute summer	Virtual Manhole	10200	8.904	2.004	0.1	2.2668	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	1	2.000	2	0.6	0.484	0.006	1.6846	
10080 minute summer	2	2.001	3	0.6	0.430	0.002	1.8801	
10080 minute summer	3	1.002	Virtual Manhole	0.1	0.016	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
10080 minute summer	4	3.000	3	0.9	0.773	0.004	0.3425	
10080 minute summer	5	1.000	6	0.6	0.414	0.006	1.8785	
10080 minute summer	6	1.001	3	0.6	0.413	0.006	1.8281	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.05%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	1	10140	9.733	1.233	0.9	2.5517	0.0000	FLOOD RISK
10080 minute summer	2	10140	9.733	1.424	0.9	1.6101	0.0000	FLOOD RISK
10080 minute summer	3	10140	9.733	2.733	4.8	454.4310	0.0000	FLOOD RISK
10080 minute summer	4	10260	9.733	1.233	2.3	6.4487	0.0000	FLOOD RISK
10080 minute summer	5	10140	9.733	1.233	0.9	2.5514	0.0000	FLOOD RISK
10080 minute summer	6	10140	9.733	1.487	0.9	1.6814	0.0000	FLOOD RISK
10080 minute summer	Virtual Manhole	10140	9.733	2.833	0.1	3.2039	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	1	2.000	2	0.9	0.547	0.009	1.6846	
10080 minute summer	2	2.001	3	0.9	0.430	0.004	1.8801	
10080 minute summer	3	1.002	Virtual Manhole	0.1	0.016	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
10080 minute summer	4	3.000	3	3.6	0.857	0.016	0.3425	
10080 minute summer	5	1.000	6	0.9	0.468	0.008	1.8785	
10080 minute summer	6	1.001	3	0.9	0.433	0.008	1.8281	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	21.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.370	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Existing	0.053	4.00	10.000	1000	0.000	0.000	1.000
Existing 1	0.000		10.000	1000	0.000	10.000	2.000

Links

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)
Existing	Existing	Existing 1	10.000	0.600	9.000	8.000	1.000	10.0	1000	4.02	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
Existing	10.602	8327.0	9.6	0.000	1.000	0.053	0.0	25	1.858

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
Existing	10.000	10.0	1000	Circular	10.000	9.000	0.000	10.000	8.000	1.000

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
Existing	Existing	1000	Manhole	Adoptable	Existing 1	1000	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Existing	0.000	0.000	10.000	1.000	1000				
						0	Existing	9.000	1000
Existing 1	0.000	10.000	10.000	2.000	1000		1	Existing	8.000
						1	Existing	8.000	1000

Simulation Settings

Rainfall Methodology	FSR	Summer CV	1.000	Drain Down Time (mins)	240
FSR Region	England and Wales	Winter CV	1.000	Additional Storage (m³/ha)	20.0
M5-60 (mm)	21.000	Analysis Speed	Normal	Check Discharge Rate(s)	x
Ratio-R	0.370	Skip Steady State	x	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440	10080
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------	-------

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	0	0	0

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	0	0	0
100	40	0	0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.032	0.032	14.0	0.0585	0.0000	OK
15 minute summer	Existing 1	10	8.030	0.030	14.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	14.0	2.052	0.002	0.0682	5.5

Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.038	0.038	20.9	0.0706	0.0000	OK
15 minute summer	Existing 1	10	8.036	0.036	20.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	20.9	2.300	0.003	0.0909	8.1

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.043	0.043	26.5	0.0791	0.0000	OK
15 minute summer	Existing 1	10	8.041	0.041	26.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	26.5	2.452	0.003	0.1081	10.3

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.048	0.048	34.4	0.0892	0.0000	OK
15 minute summer	Existing 1	10	8.046	0.046	34.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	34.4	2.618	0.004	0.1313	13.4

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Existing	10	9.057	0.057	48.1	0.1053	0.0000	OK
15 minute summer	Existing 1	10	8.054	0.054	48.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Existing	Existing	Existing 1	48.2	2.866	0.006	0.1681	18.7

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	21.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.370	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.064	4.00	10.000	1200	-8.461	-11.284	1.500
2			10.000	1200	-8.621	12.637	1.691
3			10.000	1200	18.069	13.317	3.000
4	0.093	4.00	10.000	1200	17.783	18.173	1.500
5	0.064	4.00	10.000	1200	45.159	-11.669	1.500
6			10.000	1200	43.976	14.981	1.754
Virtual Manhole			10.000	1200	19.722	11.154	3.100

Links

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)
1.000	5	6	26.676	0.600	8.500	8.246	0.254	105.0	300	4.29	50.0
1.001	6	3	25.960	0.600	8.246	8.000	0.246	105.5	300	4.57	50.0
3.000	4	3	4.864	0.600	8.500	8.300	0.200	24.3	300	4.03	50.0
2.001	2	3	26.699	0.600	8.309	7.000	1.309	20.4	300	4.41	50.0
2.000	1	2	23.922	0.600	8.500	8.309	0.191	125.2	300	4.28	50.0
1.002	3	Virtual Manhole	2.722	0.600	7.000	6.900	0.100	27.2	300	4.59	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.534	108.4	11.6	1.200	1.454	0.064	0.0	66	1.011
1.001	1.530	108.1	11.6	1.454	1.700	0.064	0.0	66	1.008
3.000	3.201	226.2	16.8	1.200	1.400	0.093	0.0	55	1.899
2.001	3.496	247.1	11.6	1.391	2.700	0.064	0.0	44	1.811
2.000	1.403	99.2	11.6	1.200	1.391	0.064	0.0	69	0.948
1.002	3.025	213.8	39.9	2.700	2.800	0.221	0.0	88	2.338

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	26.676	105.0	300	Circular	10.000	8.500	1.200	10.000	8.246	1.454
1.001	25.960	105.5	300	Circular	10.000	8.246	1.454	10.000	8.000	1.700
3.000	4.864	24.3	300	Circular	10.000	8.500	1.200	10.000	8.300	1.400
2.001	26.699	20.4	300	Circular	10.000	8.309	1.391	10.000	7.000	2.700

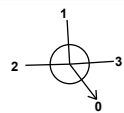
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.001	6	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
3.000	4	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
2.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	23.922	125.2	300	Circular	10.000	8.500	1.200	10.000	8.309	1.391
1.002	2.722	27.2	300	Circular	10.000	7.000	2.700	10.000	6.900	2.800

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	Virtual Manhole	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	-8.461	-11.284	10.000	1.500	1200				
						0	2.000	8.500	300
2	-8.621	12.637	10.000	1.691	1200		1	2.000	8.309
						0	2.001	8.309	300
3	18.069	13.317	10.000	3.000	1200		1	3.000	8.300
						2	2.001	7.000	300
						3	1.001	8.000	300
						0	1.002	7.000	300
4	17.783	18.173	10.000	1.500	1200		0	3.000	8.500
5	45.159	-11.669	10.000	1.500	1200		0	1.000	8.500
						0	1.000	8.500	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
6	43.976	14.981	10.000	1.754	1200	1 	1	1.000	8.246	300
						0 	0	1.001	8.246	300
Virtual Manhole	19.722	11.154	10.000	3.100	1200	1 	1	1.002	6.900	300

Simulation Settings

Rainfall Methodology	FSR	Summer CV	1.000	Drain Down Time (mins)	240
FSR Region	England and Wales	Winter CV	1.000	Additional Storage (m ³ /ha)	20.0
M5-60 (mm)	21.000	Analysis Speed	Detailed	Check Discharge Rate(s)	x
Ratio-R	0.370	Skip Steady State	x	Check Discharge Volume	x

Storm Durations

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0	100	0	10	0
10	0	10	0	100	40	10	0
30	0	10	0				

Node Virtual Manhole Online Weir Control

Flap Valve	x	Invert Level (m)	9.999	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	1.000		

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.000
Side Inf Coefficient (m/hr)	0.10000	Porosity	0.95	Time to half empty (mins)	

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	190.0	0.0	2.500	190.0	0.0	2.501	0.0	0.0

Node 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	23.000	Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	9.700	Length (m)	23.000	Inf Depth (m)
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	1000.0	

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.594	0.094	18.5	0.1949	0.0000	OK
15 minute summer	2	9	8.366	0.057	18.5	0.0647	0.0000	OK
10080 minute winter	3	9660	7.916	0.916	0.7	166.4120	0.0000	SURCHARGED
15 minute summer	4	10	8.581	0.081	26.9	0.2011	0.0000	OK
15 minute summer	5	10	8.586	0.086	18.5	0.1779	0.0000	OK
15 minute summer	6	10	8.332	0.086	18.5	0.0975	0.0000	OK
10080 minute winter	Virtual Manhole	9600	7.916	1.016	0.1	1.1494	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	2.000	2	18.5	1.346	0.186	0.3332	
15 minute summer	2	2.001	3	18.8	2.275	0.076	0.4117	
10080 minute winter	3	1.002	Virtual Manhole	-0.1	0.013	0.000	0.1917	
10080 minute winter	3	Infiltration		0.0				
15 minute summer	4	3.000	3	26.9	1.958	0.119	0.0669	
15 minute summer	5	1.000	6	18.5	1.121	0.171	0.4449	
15 minute summer	6	1.001	3	18.3	1.128	0.170	0.4220	
10080 minute winter	Virtual Manhole	Weir		0.0				0.0

Results for 10 year +10% A Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.617	0.117	27.7	0.2417	0.0000	OK
15 minute summer	2	9	8.377	0.068	27.7	0.0764	0.0000	OK
10080 minute summer	3	10200	8.231	1.231	1.4	223.5916	0.0000	SURCHARGED
15 minute summer	4	10	8.602	0.102	40.3	0.2550	0.0000	OK
15 minute summer	5	10	8.607	0.107	27.7	0.2213	0.0000	OK
15 minute summer	6	10	8.354	0.108	27.7	0.1216	0.0000	OK
10080 minute summer	Virtual Manhole	10260	8.231	1.331	0.1	1.5055	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	2.000	2	27.7	1.512	0.279	0.4445	
15 minute summer	2	2.001	3	27.7	2.337	0.112	0.6739	
10080 minute summer	3	1.002	Virtual Manhole	0.1	0.033	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
15 minute summer	4	3.000	3	40.3	2.149	0.178	0.0914	
15 minute summer	5	1.000	6	27.7	1.235	0.256	0.6026	
15 minute summer	6	1.001	3	27.6	1.259	0.255	0.5695	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	8.633	0.133	35.2	0.2754	0.0000	OK
10080 minute winter	2	10140	8.527	0.218	0.3	0.2466	0.0000	OK
10080 minute winter	3	9960	8.527	1.527	1.1	277.3506	0.0000	SURCHARGED
15 minute summer	4	10	8.618	0.118	51.2	0.2950	0.0000	OK
15 minute summer	5	10	8.622	0.122	35.2	0.2533	0.0000	OK
10080 minute winter	6	9900	8.527	0.281	0.3	0.3178	0.0000	OK
10080 minute winter	Virtual Manhole	9960	8.527	1.627	0.0	1.8402	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	2.000	2	35.2	1.613	0.355	0.5282	
10080 minute winter	2	2.001	3	0.3	0.189	0.001	1.6723	
10080 minute winter	3	1.002	Virtual Manhole	0.0	0.013	0.000	0.1917	
10080 minute winter	3	Infiltration		0.0				
15 minute summer	4	3.000	3	51.2	2.265	0.226	0.1101	
15 minute summer	5	1.000	6	35.2	1.305	0.325	0.7232	
10080 minute winter	6	1.001	3	0.3	0.340	0.003	1.8042	
10080 minute winter	Virtual Manhole	Weir		0.0				0.0

Results for 100 year +10% A Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	1	10200	8.831	0.331	0.6	0.6855	0.0000	SURCHARGED
10080 minute summer	2	10200	8.831	0.522	0.6	0.5905	0.0000	SURCHARGED
10080 minute summer	3	10260	8.831	1.831	2.1	332.5638	0.0000	SURCHARGED
10080 minute summer	4	10200	8.831	0.331	0.9	0.8258	0.0000	SURCHARGED
10080 minute summer	5	10320	8.831	0.331	0.6	0.6862	0.0000	SURCHARGED
10080 minute summer	6	10320	8.831	0.585	0.6	0.6620	0.0000	SURCHARGED
10080 minute summer	Virtual Manhole	10260	8.831	1.931	0.0	2.1840	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	1	2.000	2	0.6	0.484	0.006	1.6846	
10080 minute summer	2	2.001	3	0.6	0.505	0.002	1.8801	
10080 minute summer	3	1.002	Virtual Manhole	0.0	0.029	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
10080 minute summer	4	3.000	3	0.9	0.773	0.004	0.3425	
10080 minute summer	5	1.000	6	0.6	0.414	0.006	1.8785	
10080 minute summer	6	1.001	3	0.6	0.413	0.006	1.8281	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	1	10200	9.393	0.893	0.9	1.8485	0.0000	SURCHARGED
10080 minute summer	2	10200	9.393	1.084	0.9	1.2259	0.0000	SURCHARGED
10080 minute summer	3	10260	9.393	2.393	5.2	434.5731	0.0000	SURCHARGED
10080 minute summer	4	10140	9.393	0.893	1.2	2.2272	0.0000	SURCHARGED
10080 minute summer	5	10320	9.393	0.893	0.9	1.8482	0.0000	SURCHARGED
10080 minute summer	6	10320	9.393	1.147	0.9	1.2970	0.0000	SURCHARGED
10080 minute summer	Virtual Manhole	10200	9.393	2.493	0.1	2.8192	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	1	2.000	2	0.9	0.547	0.009	1.6846	
10080 minute summer	2	2.001	3	0.9	0.430	0.004	1.8801	
10080 minute summer	3	1.002	Virtual Manhole	0.1	0.016	0.000	0.1917	
10080 minute summer	3	Infiltration		0.0				
10080 minute summer	4	3.000	3	4.2	0.837	0.019	0.3425	
10080 minute summer	5	1.000	6	0.9	0.468	0.008	1.8785	
10080 minute summer	6	1.001	3	0.9	0.433	0.008	1.8281	
10080 minute summer	Virtual Manhole	Weir		0.0				0.0

Appendix A.5 – Indicative Drainage Layout



PERMEABLE PAVING
AREA DRAINING TO PAVING: 960m²
AREA OF PAVING: 530m²
SUB-BASE DEPTH: 300mm
SUB-BASE POROSITY: 0.3
INFILTRATION: NOT PERMITTED

GEO-CELLULAR SOAKAWAY
AREA DRAINING TO SOAKAWAY: 2205 m²
AREA OF PAVING: 190m²
DEPTH: 2.5m
POROSITY: 0.95
INFILTRATION: 0.1m/hr (Assumed)

PETROL INTERCEPTOR 5.3m

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GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS AND SPECIALISTS' DRAWINGS AND THE SPECIFICATION.
2. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT BRITISH STANDARDS, EUROPEAN NORMS, CODES OF PRACTICE AND BUILDING PRACTICE.
3. ALL DIMENSIONS ARE TO BE CHECKED BY THE CONTRACTOR PRIOR TO STARTING THE WORKS ON SITE. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
4. INFILTRATION FEATURES WILL BE SUBJECT TO SITE SPECIFIC INFILTRATION TESTING AND TRIAL HOLES.
5. ALL DRAINAGE SYSTEMS WILL NEED TO BE INSTALLED AND DESIGNED FOR SUITABLE LOADING REQUIREMENTS.
6. THE CONTRACTOR SHALL OBTAIN PRIOR APPROVAL AND ALL NECESSARY LICENCES FROM THE HIGHWAY AUTHORITY AND/OR SEWERAGE UNDERTAKER BEFORE CARRYING OUT ANY WORKS.

KEY:

- SURFACE WATER DRAIN
- SURFACE WATER MANHOLE
- PETROL INTERCEPTOR
- PERMEABLE SURFACE
- GEOCELLULAR SOAKAWAY

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CLIENT
Avery Healthcare Group Limited

PROJECT
CENTRAL AVENUE GRAVESEND

SCALE	PROJ REF	ORIGINATOR	CHECKED BY
1:200	3085	SH	SMB

DWG REF	DWG No.
INDICATIVE DRAINAGE LAYOUT	HC-3085-501

Appendix A.6 – Maintenance Schedules

Operation and Maintenance Schedule – Pervious paving / surfacing		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (for driveways this can be a standard cosmetic sweep over whole surface).	At minimum once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – particular attention must be paid to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using a suitable weed killer which will not adversely affect water quality. Weed killer should be applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving / surfacing.	As required when damage or erosion is detected following inspection. For block paving systems jointing material to be replaced shortly after installation and subsequently when required.
	Remedial work to any depressions. Rutting and cracked or broken blocks and replace lost jointing material (where block paving is used).	
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

General Maintenance Requirements for Permeable Surfacing (additional requirements may apply depending on type of surfacing material used).

Operation and Maintenance Schedule – Crate Soakaways		
Maintenance Schedule	Required Action	Typical Frequency
Routine maintenance	Inspect for sediment and debris in pre-treatment components and storage crate system	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required based on inspections)
Occasional maintenance	Remove sediment and debris from pre-treatment components and storage crate system	As required, based on inspections
Remedial Actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of geotextile surround if not intact or clogged	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check crate system to ensure emptying is occurring	Annually

General Operation and Maintenance Table for Soakaways.

SUMMARY DRAINAGE REPORT



APPENDIX B – GROUND INVESTIGATION REPORT



GROUND INVESTIGATION LAND AT CENTRAL AVENUE GRAVESEND

**Prepared for: Avery Healthcare Limited, Octopus Healthcare
and Willowbank Healthcare Developments Ltd**

ASL Report No. 002-21-719-10

April 2022

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LAND AT CENTRAL AVENUE
GRAVESEND**

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GROUND INVESTIGATION LAND AT CENTRAL AVENUE GRAVESEND

1 INTRODUCTION

In January 2022, ASL were instructed by Avery Healthcare Limited to undertake the necessary ground investigation and consultancy services associated with the proposed development of the site known as Land at Central Avenue, Gravesend.

A ground investigation is required in order to determine the geotechnical properties of the ground conditions at the site ahead of its proposed development. It is understood that the proposed development comprises the demolition of the existing structures and redevelopment to provide a sixty-two bedroom care home (Use Class C2) together with associated access, car and cycle parking, structural landscaping, and amenity space provision. A proposed development layout is presented as Appendix I.

ASL has previously completed a Desk Study Report (report reference 002-21-719-11, dated February 2021). This report assessed the potential for environmental and geotechnical risk issues and liabilities pertaining to the future development of the site. Based on the findings of the desk study it was recommended that an intrusive ground investigation was completed ahead of any development works to determine the founding properties of the underlying ground conditions and to determine the actual contaminative status of the site. It was also recommended that the intrusive investigation should include an assessment of hazardous ground gas.

The scope of works for this project was set out in ASL's proposal reference 002-21-719.elo.3529Rev1, dated 26th January 2022 which was formally accepted by Avery Healthcare Limited in their email dated 27th January 2022 together with associated purchase order number HL-Gravesend-019.

This report presents the factual results from an intrusive investigation and subsequent laboratory analyses and monitoring together with interpretative comment in terms of the contaminative status of the site and the geotechnical properties of the ground conditions encountered at the site in relation to the proposed development. This report should be read in conjunction with ASL's Desk Study Report for the site.

This report has been prepared for the sole benefit of the joint Clients, Avery Healthcare Limited, Octopus Healthcare and Willowbank Healthcare Developments Ltd and their associated representatives and agents. The report has been written based on the results of data searches and ground conditions encountered at the time of the investigation and the results of subsequent analyses. Future changes in legislation and advances in current best practises or provision of more detailed design proposals will result in this report requiring review and possible further assessment after the date of issue. The general notes section within this report should be noted in relation to the limitations of this investigation and assessment.



2 THE SITE

The site is located to the south-west of the junction between Central Avenue to the east and Ascot Road to the north approximately 1.8km to the south of Gravesend town centre at approximate National Grid Reference TQ649724 as presented as Figure 1.

The site comprises a rectangular shaped piece of land with maximum dimensions of approximately 65m by 60m with the long axis aligned east to west. The site is generally flat lying with only minor elevation changes present.

The site is separated into two main areas.

The first area comprises the majority of the site in the north and east. This portion of the site is occupied by the Ascot Arms public house. During the site walkover the public house was not in use and the windows and doors had been secured against unauthorised access with steel sheet panels.

The public house is constructed with brick walls and a sloping tiled roof and extends to two storeys in height. A cellar hatch is located centrally to the northern elevation indicating that a basement structure is present. The nature and extent of the basement structure is not known.

The public house is generally surrounded by areas of tarmacadam hardstanding to the north-east, north and north-west used for access and vehicle parking. An electrical substation is located in the north-west of this area.

The public house is generally surrounded by soft landscaped areas to the south-east, south and west. Locally picnic benches are present in the south providing outside seating areas. A covered decking area is located on the south-eastern elevation of the public house. A palisade fence runs from the south-east of the site to the north-west of the site. This palisade fence separates the site from the remainder of the site in the south and south-west and is surrounded by mature trees.

The second area in the south and south-west comprises a portion of a larger grassed playing field.

The northern and eastern boundaries of the public house portion of the site are generally formed by heras fencing and locally concrete Jersey Blocks at vehicle access points to prevent unauthorised access. The western boundary is formed by wooden fencing in the north and metal palisade fencing centrally and in the south. The southern boundary is not physically marked with this area open to further areas of grassed playing field.

The site is bound to the east by Central Avenue with residential dwellings beyond, to the north by Ascot Road with residential dwellings beyond, to the west by Aintree Close with residential dwellings beyond and to the south by a playing field with residential dwellings beyond.

The general site layout is presented as Figure 2.

It is understood that the proposed development comprises the demolition of the existing structures and redevelopment to provide a sixty-two bedroom care home (Use Class C2) together with associated access, car and cycle parking, structural landscaping, and amenity space provision. A proposed development layout is presented as Appendix I.



3 ENVIRONMENTAL SETTING

The British Geological Survey (BGS) Sheets No. 271 – Dartford (Solid and Drift) and the Geology of Britain Viewer indicates the site to be devoid of drift deposits and to be directly underlain by solid geology comprising the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated). The chalk stratum is generally described as 'white, soft with courses of flint'. The chalk stratum is indicated to be 70m thick in the vicinity of the site.

In addition to the published geology, it is expected that Made Ground and/or Topsoil will be present at the surface of beneath hardstandings given the current use of the site.

The site is located in an area that may not be affected by coal mining and at unlikely risk from non-coal mining activities.

The site is located in an area at 'inconclusive' risk from rock mining. There is one man made mining cavity located within 0.5km of the site. The listing relates to a vertical shaft with chambers at the base for the extraction of chalk located approximately 270m to the south.

There are no BGS recorded mineral sites located within 0.5km of the site.

The site is located in an area indicated to have a very significant soluble rock risk with a 'high possibility' of occurrence, however there are no recorded natural cavities in the vicinity of the site.

The environmental database search indicates the site is in a lower probability radon area and that new developments or extensions do not require radon protection measures.

The Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated) is classified by the EA as a 'Principal Aquifer'.

The site is located in a Source Protection Zone (SPZ) II (Outer Protection Zone) and an SPZ III (Total Catchment). A boundary with a SPZ I (inner protection zone) is located approximately 265m to the north.

There are four abstractions from groundwater located within 1.0km of the site. The first listing relates to the abstraction of groundwater for industrial processing located approximately 445m to the east. The second listing relates to the abstraction of groundwater for spray irrigation located approximately 755m to the south-west. The remaining listings relate to the abstraction of groundwater for potable supply located approximately 765m and 840m to the north.

The nearest surface water feature is an unnamed stream located approximately 815m to the west. The unnamed stream is not classified chemically or biologically by the EA in the vicinity of the site.

There is one abstraction from surface water within 1.0km of the site. This listing relates to the abstraction of surface water for sand and gravel washing located approximately 760m to the north.



4 GROUND INVESTIGATION, TESTING AND MONITORING

4.1 Ground Investigation

The scope of works was defined for the project by ASL and comprised six windowless sample boreholes and one hand dug trial pit. The intrusive investigation was designed to target the location of the proposed development, to target potential sources of contamination and to provide general site coverage within accessible areas. The investigation was completed to obtain information relating to the contaminative status of the site and the geotechnical properties of the underlying ground conditions. It should be noted that the locations of exploratory locations have been limited by the presence of existing structures. The positions of the exploratory holes have been surveyed and plotted approximately on Figure 2. The investigation works were completed under the supervision of a UXO specialist who cleared all exploratory locations.

The ground investigation was carried out in general accordance with BS5930+A1 (2020) 'Code of Practice for Site Investigations' and BS10175+A2:2017 'Investigation of Potentially Contaminated Sites - Code of Practice' and in accordance with current best practice.

The scope of works for the ground investigation was as follows:

- 6 No. Windowless Sample (WS) boreholes to a maximum depth of approximately 5.45m bgl;
- 1 No. hand dug trial pit (HP) to a depth of approximately 0.56m bgl;
- Insitu standard penetration tests (SPT) at regular intervals within all WS;
- Installation of gas and groundwater monitoring wells at selected WS (3 No.);
- Chemical and geotechnical laboratory testing of selected soil samples;
- Gas and groundwater monitoring programme.

The ground investigation was undertaken on 17th February 2022. The intrusive investigation was supervised by a suitably experienced geotechnical engineer from ASL. The exploratory holes were logged by the supervising engineer and the logs are presented in Appendix II.

4.2 Gas and Groundwater Monitoring

Monitoring wells were installed at WS1, WS3 and WS6. Details of the response zones are presented on the exploratory hole logs in Appendix II.

Two gas and groundwater monitoring events were completed on 3rd and 10th March 2022. The monitoring events comprise level measurements of methane, oxygen, carbon dioxide, carbon monoxide, hydrogen sulphide, relative and atmospheric pressure, gas flow rate and groundwater level.

The results of the gas and groundwater level monitoring are presented in Appendix II.

4.3 Permeability Testing

Falling head permeability testing was completed at all of the monitoring installations on 10th March 2022. The falling head permeability tests were completed by filling the installations with clean water and monitoring the rate at which the water fell.

The results of the permeability testing are presented in Appendix II.



4.4 Chemical Laboratory Testing

Selected soil samples were scheduled for chemical testing for a range of contaminants in order to determine the general contaminative status of conditions on the site.

The samples were scheduled for chemical laboratory testing for the following determinants:

Arsenic, Boron (water soluble), Beryllium, Cadmium, Chromium (total and VI), Copper, Cyanide (free and total) Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Poly-cyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), pH, Phenols, Sulphate (soluble), Total Sulphur, Total Sulphate, fraction of organic carbon, Asbestos Presence and ID (Made Ground and Topsoil only).

Further to this, selected samples were scheduled for a full Waste Acceptance Criteria (WAC) suite.

Selected soil samples were scheduled for the following determinants in leachate:

Arsenic, Boron, Beryllium, Cadmium, Calcium, Chromium (total and hexavalent), Copper, Cyanide (free and total), Dissolved Organic Carbon, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc and pH.

The chemical testing is being undertaken by a UKAS accredited laboratory in accordance with the MCERTS accreditation where available.

The results of the chemical laboratory testing are presented in full in Appendix III

4.5 Geotechnical Laboratory Testing

Geotechnical laboratory testing was completed on selected soil samples. The samples have been scheduled for moisture content analysis and Atterberg Limit testing to assess volume change potential and materials properties and sulphate testing to assess the concrete classification for the proposed development.

The results of the laboratory testing are presented in Appendix III and IV.



5 GROUND AND GROUNDWATER CONDITIONS

5.1 Materials Encountered

The BGS indicates the site to be devoid of drift deposits and to be directly underlain by solid geology comprising the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated).

The intrusive investigation generally confirmed the published geology of chalk. In addition to the published geology, minor thicknesses of Made Ground and/or Made Ground Topsoil were encountered at the surface or beneath hardstandings across the site. Further to this, cohesive materials were encountered at all exploratory locations above the chalk materials that have been interpreted as drift geology of Clay with Flints.

Table 1 presents a summary of the ground conditions encountered during the intrusive investigation. Full details of the conditions encountered are presented on the exploratory hole logs in Appendix II.

Table 1 Summary of Strata Encountered

Description	Top of Unit (m bgl)		Thickness of Unit (m)		SPT 'N' Value
	Min	Max	Min	Max	
Made Ground (Topsoil) Soft dark brown slightly sandy slightly gravelly CLAY with frequent rootlets and occasional roots. Gravel is angular to subrounded fine to coarse flint, chalk, brick, plastic, charcoal and wood.	0.00	0.00	0.20	0.30	None Taken
Made Ground Black, grey and brown sandy locally slightly clayey angular to subangular fine to coarse GRAVEL of roadstone and tarmacadam.	0.00	0.00	0.30	0.30	None Taken
Clay with Flints Soft to stiff locally dry brown and light brown slightly gravelly slightly sandy to sandy silty CLAY with rare to occasional rootlets and locally rare roots and locally rare subangular cobbles of flint. Gravel is angular to subrounded fine to coarse flint and chalk.	0.20	0.30	0.36*	1.90	7-16
Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated) Recovered as structureless CHALK composed of locally friable white, cream, yellow and yellow brown slightly sandy locally slightly gravelly to gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. Locally rare to occasional angular to subangular fine to coarse gravel of rinded flint. Locally rare subangular cobbles of rinded flint.	0.70	2.20	0.81*	4.75*	11->50

Notes: * = Base not proven

In addition to the strata summarised in Table 1, concrete paving slabs and associated mortar and concrete was encountered at the surface at WS3 to a depth of 0.28m bgl.

Three SPTs were completed within typically cohesive materials interpreted as Clay with Flints that recorded SPT 'N' values between 7 and 16 indicating low to high strength cohesive materials.

Twenty-three SPTs were completed within typically cohesive materials interpreted as Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated) that recorded SPT 'N' values between 11 and >50 indicating the presence of competent chalk materials. Based on the findings of the intrusive



investigation, the higher SPT 'N' values are coincident with flint bands within the chalk materials and are therefore not considered to be representative of the bulk chalk material properties.

A plot of SPT 'N' value versus depth below ground level is presented as Figure 3.

Three samples of cohesive materials interpreted as Clay with Flints recovered from depths of 0.7m and 1.6m bgl were scheduled for Atterberg Limit testing to determine the geotechnical properties of the materials encountered.

The results of the Atterberg Limit testing indicate the Clay with Flints materials tested to comprise clays of low to intermediate plasticity with liquid limits of between 29% and 40%, plastic limits of between 11% and 19% and modified plasticity indices of between approximately 14.3% and 18.9% indicating the materials tested to be of low volume change potential.

Natural moisture contents of between 10% and 21% were recorded for the materials tested indicating the materials to generally be in a state of potential of desiccation.

Two samples of cohesive materials interpreted as the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated) recovered from depths of 0.8m and 2.6m bgl were scheduled for Atterberg Limit testing to determine the geotechnical properties of the materials encountered.

The results of the Atterberg Limit testing indicate the chalk materials tested to comprise clays of low to intermediate plasticity with liquid limits of 35% and 49%, plastic limits of between 15% and 27% and modified plasticity indices of approximately 14% and 19.8% indicating the materials tested to be of low volume change potential.

Natural moisture contents of 9% and 29% were recorded for the materials tested indicating the shallower materials tested to be in a state of potential of desiccation.

The geotechnical laboratory analysis test results are presented in full in Appendix IV.

5.2 Permeability Testing

Falling head permeability testing was completed at all monitoring installations on 10th March 2022. The falling head permeability tests were completed within chalk materials and locally cohesive materials interpreted as Clay with Flints.

The falling head permeability tests recorded infiltration rates between 4.22×10^{-6} m/s and 1.58×10^{-4} m/s at WS1 and WS6 respectively.

Full details are presented in Appendix II.

5.3 UXO

The UXO supervision and magnetometer surveying completed during the fieldwork did not identify any evidence of potential UXO at the exploratory locations.

5.4 Visual and Olfactory Evidence of Contamination

No significant visual or olfactory evidence of contamination was noted during the intrusive investigation. However, the near surface soils were noted to contain construction



materials. Materials of this type are considered to be a potential source of contamination in the form of asbestos.

Based on the visual and olfactory evidence of contamination and based on the findings of the desk study, a general suite of analysis including asbestos was generally considered appropriate to confirm the contaminative ground conditions at the site.

It is noted that the desk study identified the electrical substation in the north-west to be a potential source of contamination in the form of oil based hydrocarbons and polychlorinated biphenyl (PCB). A selected soil sample has been scheduled for hydrocarbon testing in this area as a risk driver species and to characterise the contaminative status of the site. If significant hydrocarbons are not identified, it is considered that PCB will also not be present.

5.5 Groundwater

Groundwater was not encountered during the intrusive investigation however damp strata was identified at WS1, WS3, WS5 and WS6 at depths from approximately 3.0m and 3.3m bgl.

Groundwater was not recorded within any of the monitoring installations during the monitoring programme.

Full details are presented in Appendix II.

5.6 Gas

As part of the monitoring programme below ground gas levels within monitoring standpipes were measured during two events completed on 3rd and 10th March 2022. The results are presented in full in Appendix II.

Methane, hydrogen sulphide and carbon monoxide were not recorded in excess of the relevant analytical detection limits of the apparatus used during the monitoring programme.

Carbon dioxide was recorded in excess of the analytical detection limits of the apparatus used at all of the monitoring installations during the monitoring programme except WS1 during the first monitoring event at concentrations between 0.6% and 0.9% v/v.

Oxygen was recorded above the analytical detection limits of the apparatus used at all monitoring installations during the monitoring programme at concentrations between 19.2% and 20.7% v/v.

Average downhole pressures and average flow rates were recorded as zero during the monitoring programme.

The first monitoring event was completed during a period of lower atmospheric pressure whilst the second monitoring event was completed during a period of higher atmospheric pressure.



6 GEOTECHNICAL ASSESSMENT

6.1 General

It is understood that the proposed development comprises the demolition of the existing structures and redevelopment to provide a sixty-two bedroom care home (Use Class C2) together with associated access, car and cycle parking, structural landscaping, and amenity space provision. A proposed development layout is presented as Appendix I.

The ground conditions at the site generally comprise a limited thickness of Made Ground Topsoil or Made Ground at the surface or beneath hardstandings. The superficial deposits were underlain by cohesive materials interpreted as Clay with Flints and in turn chalk materials of the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated).

6.2 Buried Structures

A cellar hatch is located centrally to the northern elevation indicating that a basement structure is present beneath the existing public house. The nature and extent of the basement structure is not known. This structure has the potential to impact on the foundation solution for the proposed development.

During the demolition and site clearance works, it is recommended that the extent and depth of any significant excavations carried out to remove buried structures are surveyed. This foundation assessment should be reviewed following the completion of these works to confirm that the recommendation remains appropriate.

It is recommended that any large or deep excavations are backfilled with geotechnically suitable materials in accordance with an engineering specification for the site.

6.3 Foundation Assessment

Due to their inconsistency and variability the Made Ground Topsoil and Made Ground materials are not considered a suitable founding stratum in their current condition.

It is considered that conventional strip or pad foundations could be adopted for the proposed development with foundations placed within the Clay with Flints or chalk materials at a minimum depth of 1.0m bgl (assuming restricted new planting) and designed to a net allowable bearing pressure of 100kN/m² to limit total settlements to 25mm and differential settlements to acceptable levels. Foundations should be deepened through any soft, loose or otherwise unsuitable materials particularly in the vicinity of WS2 where foundations up to approximately 1.5m bgl and placed at least 150mm into the founding stratum.

Subject to the nature and extent of any excavations created by the removal of the existing basement, conventional foundations may not provide a practical or economic foundation solution in this area. However, conventional foundations may be adopted in this area and placed within the natural Clay with Flints or chalk materials. Foundations should be stepped down within the natural strata from areas outside the extent of the basement and extending through all fill materials and placed at least 150mm into natural strata. The excavation developed to remove the basement should be filled with suitably compacted fill.



Should higher loads be required for the proposed development, it is considered that the use of conventional foundations may not be feasible and that an alternative foundation solution such as piles should be considered for the site. If a piled foundation solution is required, it is recommended that deeper boreholes are undertaken at the site to obtain further geotechnical information on the deeper ground conditions.

Where foundations span across varying strata, i.e. Clay with Flints and chalk materials, such footings could be subject to differential settlement potentially leading to structural distress. Consideration should be given to inclusion of appropriate mesh reinforcement to span across the interface between different stratum types extending at least 1m either side of the interface. This should reduce the potential for differential settlement to occur.

Plasticity index results indicate the cohesive Clay with Flints and chalk materials to be of low volume change potential. Therefore, where foundations are within the influencing distance of existing, proposed or recently removed trees, foundations may need to be locally deepened in accordance with NHBC guidelines for low volume change potential soils.

The cohesive materials have been identified to be in a potential state of desiccation, therefore consideration should be given to the inclusion of appropriate heave precautions into the foundation design.

All foundations should be appropriately designed in accordance with CIRIA C574 'Engineering in Chalk'.

6.4 Floor Slabs

Due to the presence of shallow cohesive nature strata, it is recommended that suspended floor slabs with a suitable floor void are adopted for the proposed development.

6.5 Road Pavements

It is considered that for the basis of design of any areas of hardstandings or road pavements a design CBR value of 3% could be adopted within the natural strata following the removal of any Made Ground Topsoil and Topsoil materials and suitable preparation of the formation layer. A design CBR value of 1% could be adopted within the Made Ground following the removal of the overlying Topsoil.

It should be noted that the formation should be proof rolled and any 'soft' spots removed and replaced with suitable fill. The formation is likely to deteriorate if left uncovered and therefore the road should be constructed within a short time frame after stripping of superficial materials or a protective layer should be left in place. The natural strata at formation level may be frost susceptible and suitable precautions should be adopted.

6.6 Excavations

Excavation of the materials encountered on site is likely to be achieved using conventional plant, however, should any obstructions remain in the ground at shallow depths, such as former foundations the use of pneumatic/hydraulic breakout equipment may be required, particularly within confined excavations.

Shallow excavations should remain stable in the short term however, deeper excavations may be susceptible to collapse. Consequently, temporary support should be considered for all excavations where collapse is to be avoided. Heavier duty closed shoring should be



provided for any excavation where man entry is necessary in compliance with statutory requirements to ensure safe working conditions.

6.7 Dewatering

Groundwater was not encountered during the intrusive investigation or subsequent monitoring programme. Damp strata was locally encountered from depths between approximately 3.0m and 3.3m bgl.

It is therefore considered unlikely that groundwater issues will occur within shallow excavations associated with the proposed development. Where localised inflows occur within shallow excavations, it is considered these may be sufficiently controlled by conventional sump pumping techniques. However, instability and spalling of excavations is anticipated in conjunction with groundwater inflows.

6.8 Buried Concrete Classification

Based on the results of chemical laboratory testing undertaken on samples recovered from the site, it is considered that a Design Sulphate Class “DS-1” (based on total potential sulphate) and an ACEC site classification “AC-1” should be adopted for all concrete placed in contact with the ground within open excavations, such as foundations and services.

6.9 Drainage Design and Surface Water Management

Falling head permeability tests were completed at all monitoring installations on 10th March 2022. The falling head permeability tests recorded infiltration rates between 4.22×10^{-6} m/s and 1.58×10^{-4} m/s at WS1 and WS6 respectively.

Based on the results of the permeability testing completed, the use of shallow soakaways or other infiltration drainage systems may be feasible within the chalk strata present at the site. It is recommended that soakaways should be appropriately designed and located away from proposed or existing structures in accordance with CIRIA C574 ‘Engineering in Chalk’.

If soakaways or other infiltration drainage systems are adopted at the proposed development, it is recommended that trial pit soakaway testing is completed at the locations of proposed drainage structures to confirm the ground conditions and drainage characteristic in these areas.

It is recommended that the advice of a specialist drainage engineer is sought with regards to the design and installation of any drainage systems which may form part of the proposed development.

6.10 Gas Protection Measures

The environmental database search indicates the site to be in a lower probability radon area and that no radon protective measures are necessary in the construction of new dwellings or extensions.

The gas monitoring results indicate gas conditions corresponding to a worst case Hazardous Gas Flow (HGF) of <0.07/hr indicating Characteristic Situation 1 (CS1) characterised as very low potential hazard.



Based on the results of the ground gas monitoring, the findings of the desk study that did not identify significant potential sources of hazardous ground gas and guidance provided in BS8485, it is considered that gas protection measures are not required as part of the proposed development.

This conclusion should be agreed with the relevant regulatory authorities prior to the commencement of development works to confirm that the assessment completed meets with their requirements and further monitoring to verify these results is not required.

6.11 Ground Dissolution Risk

The site is located in an area indicated to have a very significant soluble rock risk with a 'high possibility' of occurrence, however there are no recorded natural cavities in the vicinity of the site. Further to this, the environmental database search indicates the site to be at 'very low' risk from ground dissolution stability hazards.

Based on the findings of the Desk Study Report, the potential risk from ground dissolution at the site is considered to be very low.

It is considered that the findings of the current intrusive investigation have confirmed the findings of the Desk Study Report with competent chalk materials encountered at shallow depth across the site. However, it is recommended that where less competent chalk or any other anomalous ground is encountered during the development works the materials are inspected by a suitably qualified geotechnical engineer to assess whether the materials pose a constraint to the development works.



7 CONTAMINATION ASSESSMENT – HUMAN HEALTH

7.1 Introduction

The results of the chemical laboratory testing undertaken on selected soil samples (see Section 4.4), have been compared where possible to the relevant industry guidance as detailed in the following section.

Defra have published Development of Category 4 Screening Levels (C4SL) for Assessment of Land Affected by Contamination (document reference SP1010, dated 20th December 2013). This document includes proposed C4SL for six contaminants of concern. In March 2014, it was agreed that the C4SL could be used as part of the planning process. The chemical laboratory test results have therefore been compared where relevant to the C4SL. The C4SL have been derived based on the proposed end use of the site. In this instance an end use of 'residential without gardens' has been considered the most appropriate. Should the proposed development at the site change the potential risk posed by the identified contamination should be reviewed.

It is noted that the C4SL for benzo(a)pyrene has been derived as a surrogate marker for all genotoxic PAH species including this determinant assuming the assessed site investigation data conforms with the Culp et al 2010 assessment. The remaining genotoxic PAH species included in the priority 16 PAH suite of analysis are benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, dibenzo(ah)anthracene and indeno(123cd)pyrene. An assessment of the site investigation data has been completed and shown the site investigation data to conform with the upper and lower limits from Culp 2010 assessment and therefore assessment criteria are not considered necessary for these determinants and benzo(a)pyrene may be used as a surrogate marker.

C4SLs have not been provided for the full range of determinants assessed as part of this contamination assessment. Further Generic Assessment Criteria (GAC) in accordance with this guidance are currently in production. Contaminated Land Exposure Assessment (CLEA) guidance to assess the risk to human health (Document References SC050021/SR2, SC050021/SR3, SC050021/SR4 and SC050021/SR7) is available. GAC for the relevant contaminants of concern included in this report have been derived in accordance with this CLEA guidance and spreadsheet Version 1.06. These criteria are considered to remain appropriate as C4SL are proposed to be more pragmatic whilst still highly precautionary when compared to the previously published guidance and associated SGVs. The GAC in this report are therefore considered to be conservative and define a lower level of risk in consideration of the potential risk to human health when compared to the current guidance and C4SL. The derived GAC are presented in Appendix V.

Laboratory data at the site recorded an average result of approximately 3.88% for soil organic matter calculated using fraction of organic carbon results. The GAC for the site are therefore calculated assuming 3.88% SOM.

7.2 Chemical Test Results - Soils

The results of the chemical laboratory testing undertaken on the selected soil samples are summarised in Table 2. Only those determinants recorded in excess of their relevant laboratory detection limits are assessed here.



At tier 1, TPH (C10-C40) is assessed using the GAC for the aliphatic TPH fraction >C12-C16. This GAC is selected as it is the most stringent TPH fraction GAC representative of the recorded TPH.

It is noted that significant hydrocarbon contamination was not recorded in the vicinity of the electrical substation. As a result, chemical laboratory analysis for PCB's was not considered necessary.

The chemical test results on soil are presented in full in Appendix III.

Table 2 Summary of Soils Data with Respect to Human Health (Tier 1)

Contaminants	Max Conc. (mg/kg)	Defra C4SL mg/kg (Residential without gardens)	CLEA Derived GAC mg/kg (Residential without gardens)	No. of Tests
Arsenic	14	40 (0)	-	5
Beryllium	1.1	-	99.3 (0)	5
Boron	1.3	-	10800 (0)	5
Cadmium	1.4	150 (0)	-	5
Chromium	32	-	1110 (0)	5
Copper	64	-	6590 (0)	5
Lead	110	310 (0)	-	5
Mercury	0.6	-	238 (0)	5
Nickel	27	-	189 (0)	5
Vanadium	42	-	581 (0)	5
Zinc	160	-	40400 (0)	5
TPH (C10-C40)	28	-	201^ (0)	5
Benzo(a)pyrene	1.5	5.3 (0)	-	5
Naphthalene	0.33	-	10.2 (0)	5
Acenaphthene	0.44	-	607^ (0)	5
Fluorene	0.29	-	4940 (0)	5
Phenanthrene	2.9	-	5200 (0)	5
Anthracene	0.37	-	39300 (0)	5
Fluoranthene	3.4	-	1650 (0)	5
Pyrene	2.7	-	3960 (0)	5

Note: 1. Number in brackets represents the number of results above guideline values.
2. ^ Denotes theoretical saturation limit taken as representative.

None of the contaminants of concern summarised in Table 2 are recorded in excess of their relevant screening criterion.

In addition to the determinants summarised in Table 2, asbestos was analysed for in four samples of near surface soils. Asbestos was not identified at any of the samples analysed.

No further assessment of the potential risk from contaminants of concern including asbestos in soil is considered necessary. No remediation of soils in order to be protective of human health is considered necessary.

However, it is also recommended that the chemical laboratory test results within this report should be forwarded to the mains water service provider to ensure that their requirements for service line construction are satisfied.



8 CONTAMINATION ASSESSMENT – CONTROLLED WATERS

8.1 Introduction

To assess the potential risk to controlled waters from the recorded concentrations in soils, the use of leachability is generally used to determine contaminant mobility within the ground with the results of these tests compared to the determinants respective environmental quality standards (EQS) or other applicable standards such as UK drinking water standards (DWS). As groundwater has been identified as potentially at risk, the DWS is used in this assessment where available. For organic determinants, the use of leachability is not considered reliable. These determinants are assessed using half the inert WAC criteria. Exceedances of these criterion are considered to require further assessment.

8.2 Summary of Results - Soils

Table 3 presents a summary of the screening criteria compared with the recorded concentrations of determinants at the site. Only those determinants recorded in excess of their relevant laboratory detection limits are assessed here.

The chemical test results are presented in full in Appendix III.

Table 3 Summary of Soils Data with Respect to Controlled Waters (Tier 1)

Determinant	Max Conc. (mg/l)	Tier 1 Value (mg/l)	No. of Exceedances
Arsenic	0.0043	0.01	0 (3)
Beryllium	0.0002	0.004	0 (3)
Boron	0.038	1	0 (3)
Chromium	0.0016	0.05	0 (3)
Copper	0.047	2	0 (3)
Lead	0.0046	0.01	0 (3)
Nickel	0.0083	0.02	0 (3)
Vanadium	0.0071	0.06	0 (3)
Zinc	0.016	5	0 (3)
TPH (C10-C40)	28	250	0 (5)
PAH total	18.4	50	0 (5)

Notes 1. Numbers in brackets denote the number of tests undertaken.
2. Organic determinant concentrations in mg/kg.

None of the contaminants of concern summarised in Table 3 are recorded in excess of their relevant screening criteria.

Based on the findings of this contamination assessment, no further assessment of the potential risk to controlled waters from contamination present in soil is considered necessary. No remediation of soil to be protective of controlled waters is considered necessary.



9 WASTE DISPOSAL

Based on the results of the chemical laboratory analysis, the Made Ground Topsoil and Clay with Flints at the site may be classified as inert in terms of waste disposal and should be considered as such until further testing is completed to confirm otherwise.

Chemical laboratory analysis has not been completed on the chalk materials. However, it is anticipated that the chalk materials may be classified as inert following suitable classification testing.

Prior to disposal, the characteristics of any excavated soils will need final classification in consultation with the relevant waste disposal facility and further testing and analysis may be required on the actual materials requiring off-site disposal.



10 DISCOVERY STRATEGY

There is the potential for more significantly contaminated materials, differing ground conditions and buried structures to be present at the site between exploratory hole locations. Should any of these conditions be identified during the development works, ASL should be contacted immediately to allow further assessment to be completed to ensure the identified critical receptors are not at risk.

This assessment may take the form of additional intrusive investigation, sampling and laboratory analyses subject to the nature of the conditions encountered.



11 CONCLUSIONS AND RECOMMENDATIONS

A ground investigation has been completed at the site, to characterise the ground and groundwater conditions. A geotechnical and contamination assessment has been completed based on the results of these investigations. The conclusions of this assessment are summarised as follows:

It is recommended that an appropriate asbestos survey is completed ahead of demolition the demolition works. If asbestos is identified, these materials should be removed by a suitably licensed contractor.

A basement structure is indicated to be present beneath the existing public house. It is recommended that the extent and depth of any significant excavations to remove buried structures are surveyed. This foundation assessment should be reviewed following the completion of these works to confirm that the recommendation remains appropriate.

It is recommended that any large or deep excavations are backfilled with geotechnically suitable materials in accordance with an engineering specification for the site.

Conventional strip or pad foundations could be adopted for the proposed development within the Clay with Flints or chalk materials at a minimum depth of 1.0m bgl (assuming restricted new planting) and designed to a net allowable bearing pressure of 100kN/m².

Subject to the nature and extent of any excavations created by the removal of buried structures, traditional foundations may not provide a practical or economic foundation solution in this area. However, conventional foundations may be adopted in this area and placed within the natural Clay with Flints or chalk materials. Foundations should be stepped down within the natural strata from areas outside the extent of the basement and extending through all fill materials and placed at least 150mm into natural strata. The excavation developed to remove the basement should be filled with suitably compacted fill.

Should higher loads be required for the proposed development, an alternative foundation solution such as piles should be considered for the site. If a piled foundation solution is required, it is recommended that deeper boreholes are undertaken at the site to obtain further geotechnical information on the deeper ground conditions.

All foundations should be deepened through any areas of deeper Made Ground, soft, loose or otherwise unsuitable materials.

Consideration should be given to inclusion of appropriate mesh reinforcement to span across the interface between different stratum types to reduce the potential for differential settlement to occur.

Where foundations are within the influencing distance of trees, foundations may need to be locally deepened in accordance with NHBC guidelines for low volume change potential soils.

Consideration should be given to the inclusion of appropriate heave precautions into the foundation design.

All foundations should be appropriately designed in accordance with CIRIA C574 'Engineering in Chalk'.



It is recommended that suspended floor slabs with a suitable floor void are adopted for the proposed development.

A design CBR value of 3% could be adopted within the natural strata and 1% could be adopted within the Made Ground following the removal of any Topsoil materials and suitable preparation of the formation layer. The natural strata at formation level may be frost susceptible and suitable precautions should be adopted.

A Design Sulphate Class “DS-1” and an ACEC site classification “AC-1” should be adopted for all concrete placed in contact with the ground within open excavations, such as foundations and services.

The use of shallow soakaways or other infiltration drainage systems may be feasible within the chalk strata present at the site. It is recommended that soakaways should be appropriately designed and located away from proposed or existing structures in accordance with CIRIA C574 ‘Engineering in Chalk’.

If soakaways or other infiltration drainage systems are adopted at the proposed development, it is recommended that trial pit soakaway testing is completed at the locations of proposed drainage structures to confirm the ground conditions and drainage characteristic in these areas.

Gas protection measures are not required as part of the proposed development.

Ground dissolution risks at the site are considered to be very low. However, it is recommended that where less competent chalk or any other anomalous ground is encountered during the development works the materials are inspected by a suitably qualified geotechnical engineer to assess whether the materials pose a constraint to the development works.

The contamination assessment has not identified a potential risk to human health or controlled waters. No further assessment of the potential risk from contaminants of concern including asbestos in soil is considered necessary. No remediation of soils is considered necessary.

It is also recommended that the chemical laboratory test results within this report should be forwarded to the mains water service provider to ensure that their requirements for service line construction are satisfied.

The Made Ground Topsoil and Clay with Flints at the site may be classified as inert. It is anticipated that the chalk materials may be classified as inert following suitable classification testing.



REFERENCES

ASL 'Desk Study Report, Land at Central Avenue, Gravesend', report reference 002-21-719-11, dated February 2021

BGS Sheet No. 271 – Dartford (Solid and Drift)

British Geological Survey GeoIndex

DEFRA R&D Publication CLR 11 “Model Procedures for the Management of Land Contamination” dated September 2004.

DEFRA R&D Publication CLR 12 “A Quality Approach for Contaminated Land Consultancy” dated 1997.

www.environment-agency.gov.uk

www.ukradon.org

BS5930+A1:2020 “Code of Practice for Site Investigation”

BS10175+A2:2017 “Code of Practice for the Investigation of Potentially Contaminated Sites”

BS1377-1:2016 “Method of Tests for Soils for Civil Engineering Purposes”

Environmental Quality Standards (EQS) for List 1 dangerous substances, EC Dangerous Substances Directive (76/464/EEC)

Guidance on the Water Supply (Water Quality) Regulations 2000 (England) and the Water Supply (Water Quality) Regulations 2001 (Wales), Drinking Water Inspectorate, May 2005.

Concrete – Complementary British Standards to BS EN 206-1 Part 1: Method of specifying and guidance for the specifier (BS 8500-1:2019)

Concrete – Complementary British Standard to BS EN 206-1 – Part 2: Specification for constituent materials and concrete (BS 8500-2:2019)

Environment Agency's Publication 'Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources' R&D Publication 20

Environment Agency's 'Remedial Targets Worksheet, Release 3.1' (2006)

Total Petroleum Hydrocarbon Criteria Working Group Series Volume 3 and 4, 1997

Human health toxicological assessment of contaminants in soil (Report Reference SC050021/SR2, dated January 2009);

Updated technical background to the CLEA model (Report Reference SC050021/SR3, dated January 2009);

CLEA Software (Version 1.06) Handbook (Report Reference SC050021/SR4, dated September 2009);

Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values (Report Reference SC050021/SR7, dated November 2008).

NHBC Standards 2022

BS8485 'Code of practice for the characterisation and remediation from ground gas in affected developments', 2019



GENERAL NOTES

The interpretation made in this report is based on the information obtained during the course of the desk study and ground investigation. It should be appreciated that any desk study information is not necessarily exhaustive and that further information relevant to the site and its proposed usage may be available. There may be conditions present on the site that have not been revealed by the ground investigation which as a result have not been addressed within this report.

The accuracy of any map extracts cannot be guaranteed, and it should be recognised that different conditions on site may have existed between and subsequent to the various map surveys.

The qualitative assessment of risk presented in this report presents an assessment of potential pollutant linkages between sources, pathways and receptors. A level of risk is attributed to these linkages. However, a low or insignificant risk does not imply that elevated concentrations of various determinants are not present on the site when compared to background or 'greenfield' conditions.

The level of risk attributed is based on a number of factors and the interpretation of this risk may be applied in a different manner for a different end use or environmental setting. The presence of contaminants may be assessed in alternative ways by institutional bodies regardless of whether an apparent risk is present based on the identified pollutant linkages in this assessment.

This report may express an opinion on possible configurations of strata underlying the site between or beyond the exploratory holes or on the possible presence of features based on either visual, verbal or published evidence, this is for guidance only and no liability can be accepted for its accuracy.

Comments made on ground conditions are based on the observations made at the time of the investigation works. It should be noted that groundwater levels may vary due to seasonal fluctuation or other factors. Observations made with respect to below ground gas concentrations may also vary due to seasonal factors and atmospheric conditions.

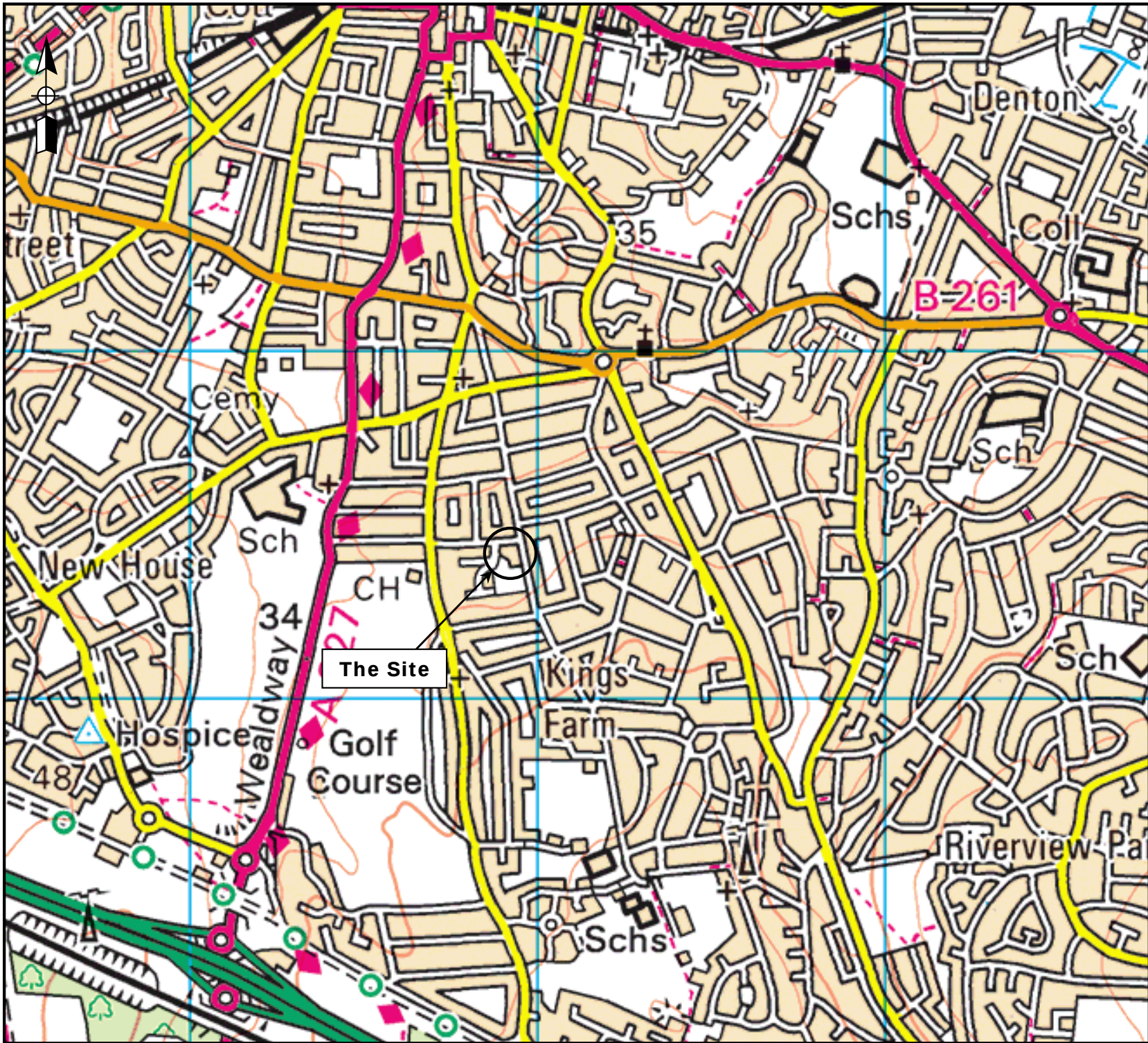
This report has been prepared in relation to the proposed development as detailed herein. Should the nature of the development change following the submission of this report a re-assessment of the conditions recorded on the site may be necessary.

This report may not be used in the assessment of the conditions at any site other than the site described herein.

This report has been prepared for the sole use of the client and the client's agents and advisors in relation to the proposed development as detailed herein. The issue of this report to third parties not involved in the proposed development as described herein is not permitted without the prior permission being received in writing by ASL. Reproduction of this report to include all figures, drawings and appendices is prohibited without the prior written consent of ASL.



FIGURES



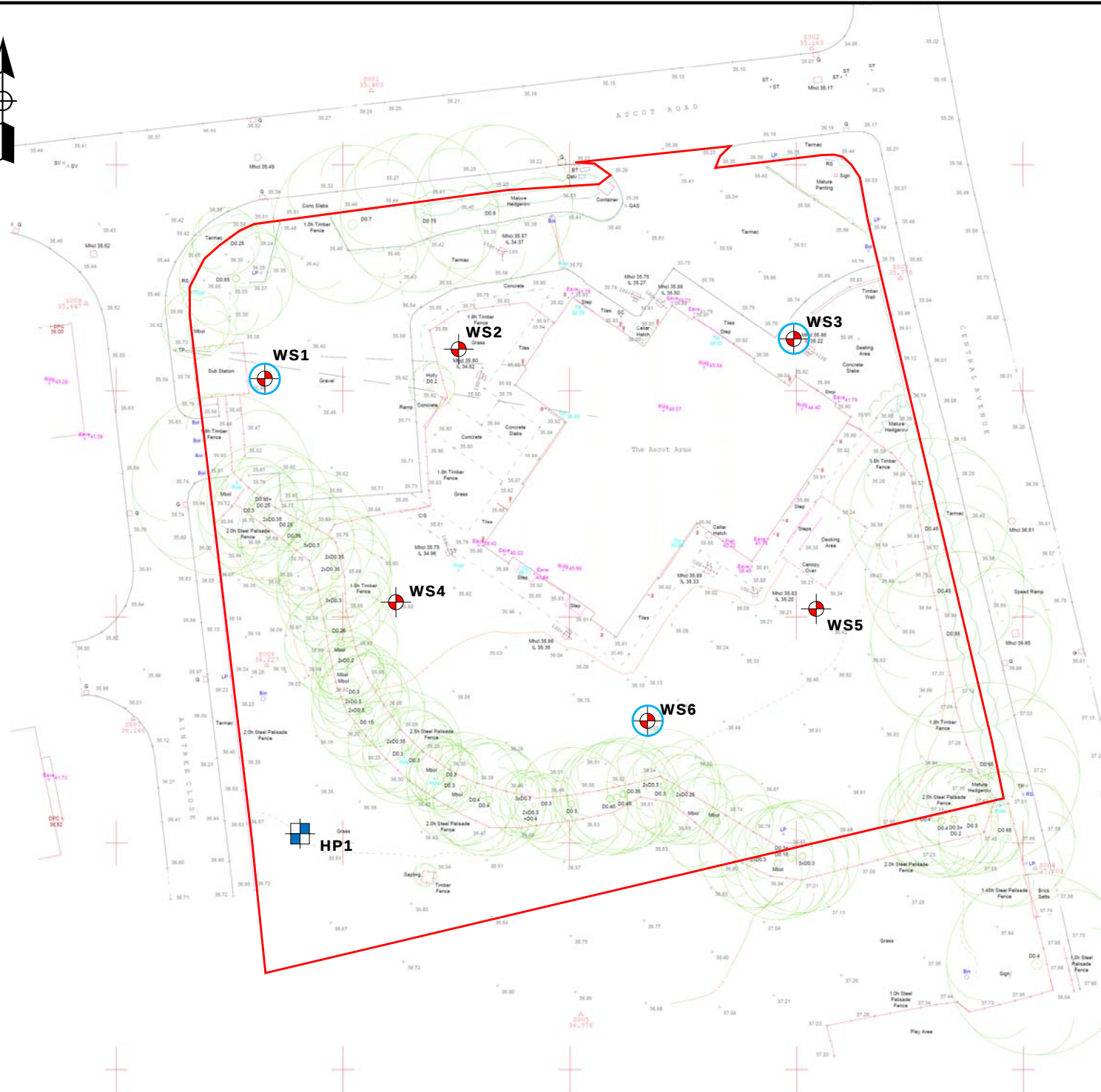
Reproduced under licence to ASL. Licence No. 100044800
OS Map Sheet No. 178 Map of Thames Estuary, Rochester & Southend-on-Sea, 1:50,000 Scale, dated 2016

Drawing No.	Figure 1
Drawing Name	Site Layout Plan
Project	Land at Central Avenue, Gravesend
Client Name	Avery Healthcare Group
Project No.	002-21-719

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Key

-  Windowless Sample Borehole Location
-  Hand excavated Trial Pit
-  Monitoring Installation
-  Approximate Site Boundary

Drawing No.	Figure 2
Drawing Name	Site Location Plan
Project	Land at Central Avenue, Gravesend
Client Name	Avery Healthcare Group
Project No.	002-21-719

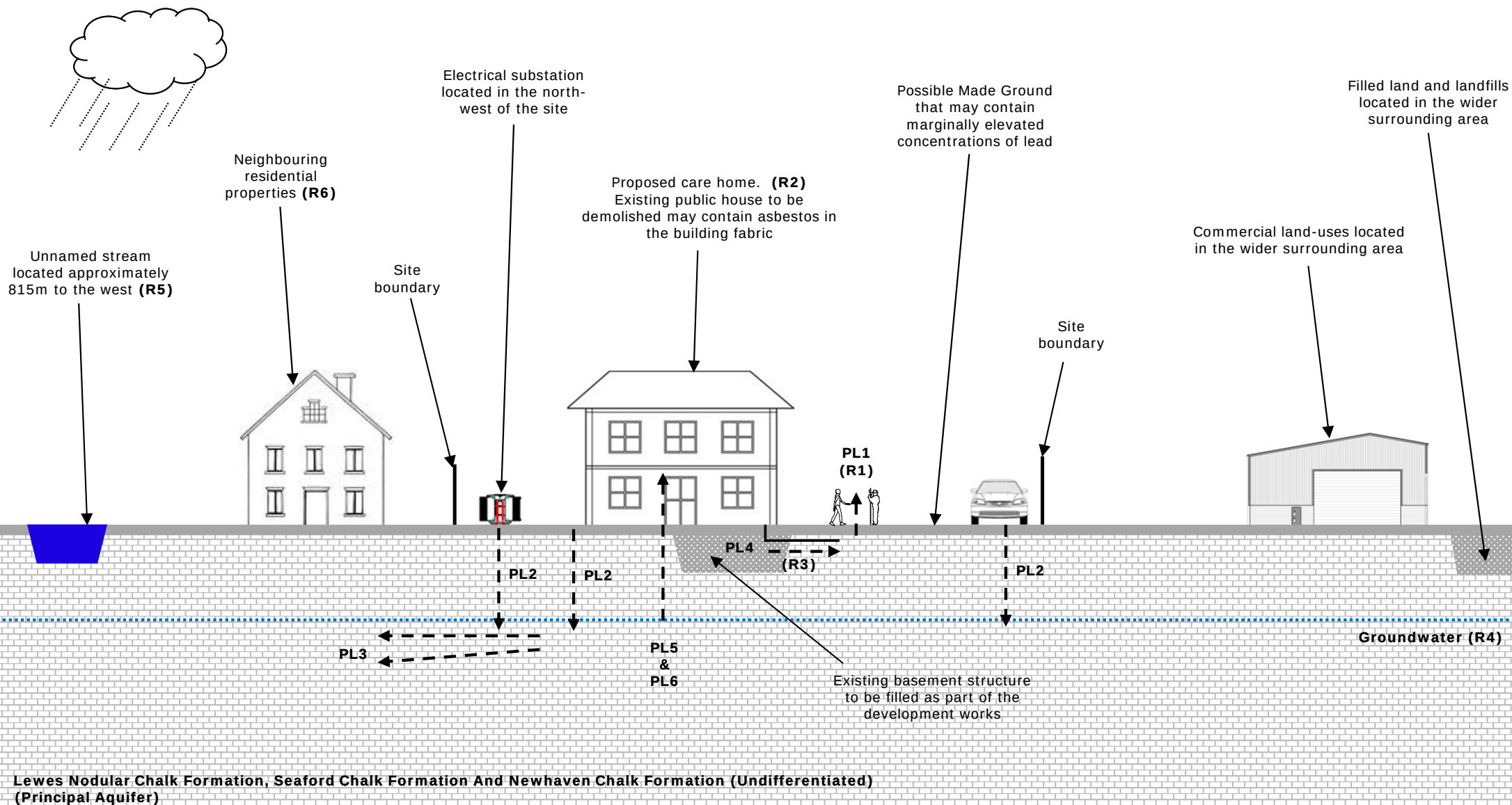
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E

Drawing No. **Figure 3**Drawing Name **Conceptual Site Model**Project Name **Land at Central Avenue, Gravesend**Client Name **Avery Healthcare Group**Project No. **002-21-719****Summary of Pollutant Linkages** (for full details see contamination associated report)**Receptors:**

R1 - Construction and maintenance workers;
R2 - Current and future site users;
R3 - Service Lines;
R4 - Groundwater;
R5 - Surface watercourses;
R6 - Neighbouring properties and residents.

Pathways:

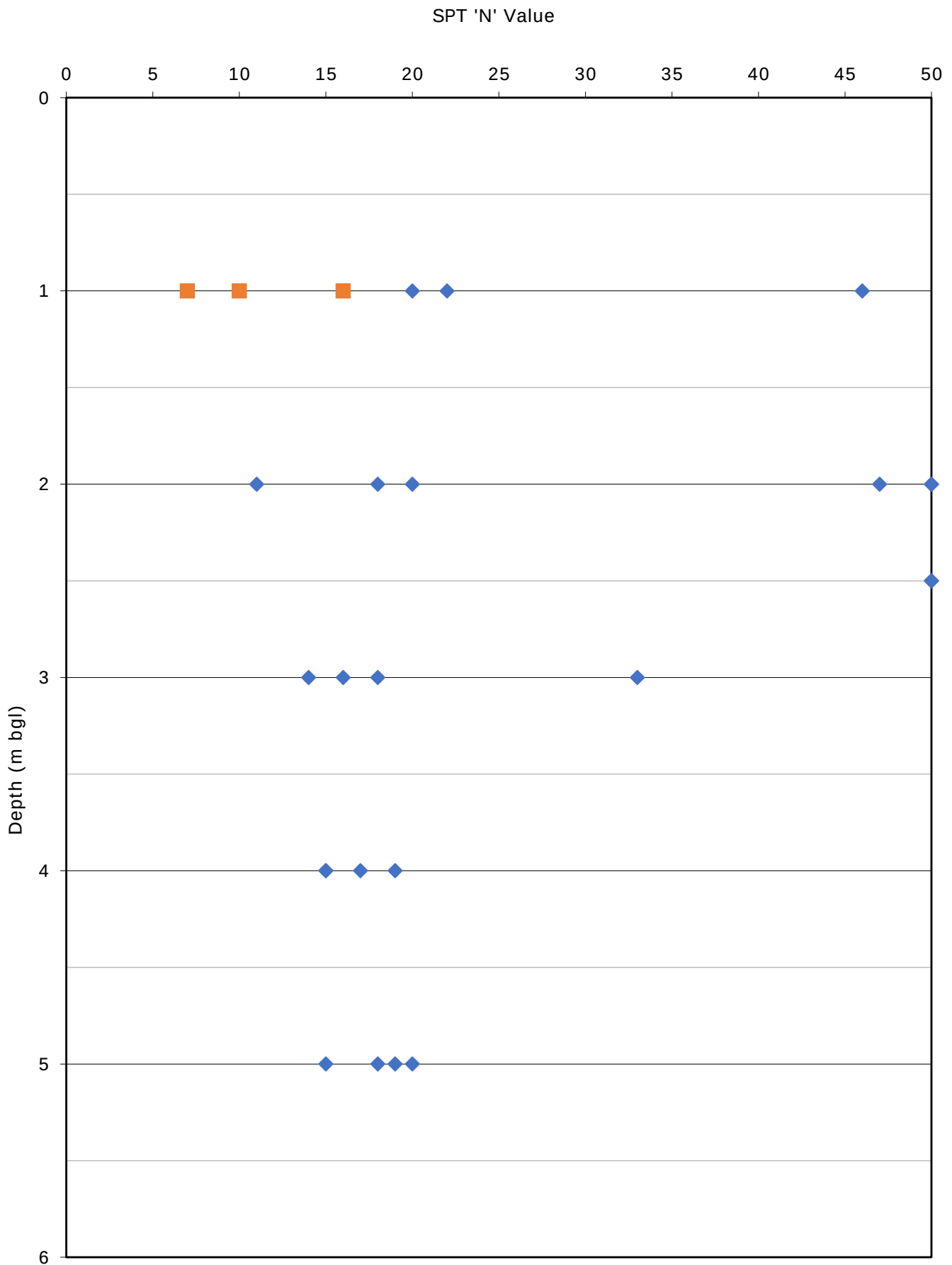
PL1 - Direct Physical Contact;
PL2 - Migration from soils to groundwater via leaching;
PL3 - Migration within groundwater;
PL4 - Migration via service lines;
PL5 - Volatilisation of contaminants from soils and groundwater;
PL6 - Migration of hazardous ground gas.

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Drawing No.	Figure 4	Legend ■ Clay with Flints ◆ Chalk	ASL Holly Farm Business Park Honiley Warwickshire CV8 1NP T: +44 (0)1926 485 508 E: info@aslenvironmental.co.uk W: www.aslenvironmental.co.uk	
Drawing Name	SPT 'N' Value Versus Depth Below Ground Level			
Project Name	Land at Central Avenue, Gravesend			
Client Name	Avery Healthcare Group			
Project No.	002-21-719			



APPENDIX I

PROPOSED DEVELOPMENT LAYOUT



100m TREE CLOSE

Notes

Do not scale, use figured dimensions only.

All dimensions to be verified on site prior to the commencement of any work or the production of any shop drawing. All discrepancies to be reported to the Architect.

This drawing is to be read in conjunction with all related Architect's and Engineer's drawings and any other relevant information.

This drawing is copyright © of TDC Architects Ltd.

REV	DATE	REVISION	INITIALS	CHECK

DRAWING STATUS

AS-RECORDED	☐
AS-BUILT	☐
FOR CONSTRUCTION	☐
FOR COORDINATION	☐
FOR PLANNING	☒
FOR DISCUSSION	☐



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Project
Proposed Care Home,
Central Avenue, Gravesend

Drawing Title
Proposed Site Plan

Scale
1:200 @ A1

Date
Dec 2020

Drawn by
GF

Checked by
SEL

Job No.
A202043

Drawing No.
AL(9)901

Rev.
-



APPENDIX II

FIELD RECORDS

Land at Central Avenue, Gravesend

Project No.:

002-21-719

Hole Type

TP

Location:

Central Avenue, Gravesend, Kent

Co-ords:
564897.69 E
172380.33 N

Level:
36.46m AOD

Scale

1:25

Client:

Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd

Start	Dates:	Finish
17/02/2022		17/02/2022

Logged By

SP

[illegible][illegible]

Hand dug pit to completed depth. Groundwater not encountered. Backfilled with arisings on completion.

Key

Key
D - Disturbed Sample
ES- Environmental Sample
B - Bulk Sample
U - Undisturbed Sample
SS - Surface Sample
VS - Validation Sample

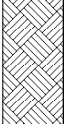
N/R - No Recovery
HVP - Hand Vane Shear Test
W/S - Water Strike
W - Water Sample



 www.aslenvironmental.co.uk										Window Sample No.	
										WS1 Sheet 1 of 2	
Project Name:						Project No.:				Hole Type	
Land at Central Avenue, Gravesend						002-21-719				WLS	
Location:						Co-ords:		Level:		Scale	
Central Avenue, Gravesend, Kent						564894.09 E 172419.99 N		35.41m AOD		1:25	
Client:						Start		Dates:		Finish	
Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd						17/02/2022		17/02/2022		Logged By SP	

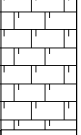
Sample and In Situ Testing					Depth (m)	Level (m)	Stratum Description	Legend	W/S	Well
Depth (m)	Type	SPT	HPV (KPa)	PID (ppm)						
0.01	D1				0.03	35.38	MADE GROUND: Black and grey sandy angular to subangular fine to coarse GRAVEL of roadstone and tarmacadam.			
0.20	ES2				0.30	35.11	MADE GROUND: Brown grey sandy slightly clayey angular to subangular fine to coarse GRAVEL of roadstone.			
0.50	D3				0.70	34.71	Firm brown slightly sandy slightly gravelly silty CLAY with rare rootlets. Gravel is angular to subrounded fine to coarse flint and chalk. (Clay with Flints)			
0.80	D4						Firm becoming stiff below 1.0m bgl dry light brown sandy silty CLAY with rare angular to rounded fine to coarse gravel of flint. (Clay with Flints)			
1.00 - 1.45 1.00	D5 SPT (S)	N=10 (2,2/2,2,3,3)								
1.60	D6									
2.00 - 2.45 2.00	D7 SPT (S)	N=47 (5,7/11,12,12,12)			2.20	33.21	Recovered as structureless CHALK composed of white, cream locally yellow slightly sandy SILT. Occasional angular to subangular fine to coarse gravel of rinded flint. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))			
2.60	D8									
3.00 - 3.45 3.00	D9 SPT (S)	N=14 (3,2/4,3,3,4)			3.00	32.41	Recovered as structureless CHALK composed of white, cream locally yellow slightly sandy SILT. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))			
3.60	D10									
4.00 - 4.45 4.00	D11 SPT (S)	N=15 (6,4/3,3,4,5)								
4.60	D12									
5.00 - 5.45	D13									
							Continued on Next Sheet			

Remarks Windowless sampling from ground level to completed depth. Damp strata noted at 3.30m bgl. Installed with combined gas and groundwater monitoring standpipe on completion.		Key D - Disturbed Sample ES - Environmental Sample B - Bulk Sample U - Undisturbed Sample SS - Surface Sample VS - Validation Sample W - Water Sample N/R - No Recovery HVP - Hand Vane Shear Test W/S - Water Strike		
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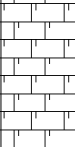
		www.aslenvironmental.co.uk					Window Sample No. WS1 Sheet 2 of 2					
Project Name: Land at Central Avenue, Gravesend						Project No.: 002-21-719			Hole Type WLS			
Location: Central Avenue, Gravesend, Kent						Co-ords: 564894.09 E 172419.99 N		Level: 35.41m AOD		Scale 1:25		
Client: Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd						Start 17/02/2022		Dates: Finish 17/02/2022		Logged By SP		
Sample and In Situ Testing					Depth (m)	Level (m)	Stratum Description	Legend	WS	Well		
Depth (m)	Type	SPT	HPV (KPa)	PID (ppm)								
5.00	SPT (S)	N=19 (3,3/3,4,6,6)					Recovered as structureless CHALK composed of white, cream locally yellow slightly sandy SILT. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))					
					5.45	29.96	End of Borehole at 5.450m					
6 7 8 9 10												
Remarks Windowless sampling from ground level to completed depth. Damp strata noted at 3.30m bgl. Installed with combined gas and groundwater monitoring standpipe on completion.							Key D - Disturbed Sample ES - Environmental Sample B - Bulk Sample U - Undisturbed Sample SS - Surface Sample VS - Validation Sample W - Water Sample N/R - No Recovery HVP - Hand Vane Shear Test W/S - Water Strike					

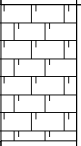
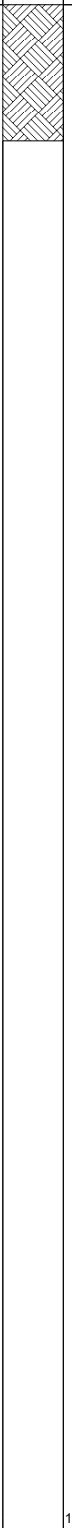
 www.aslenvironmental.co.uk										Window Sample No.	
										WS2	
										Sheet 1 of 1	
Project Name: Land at Central Avenue, Gravesend							Project No.: 002-21-719		Hole Type WLS		
Location: Central Avenue, Gravesend, Kent							Co-ords: 564910.14 E 172421.48 N		Level: 35.77m AOD		
Client: Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd							Start Dates: Finish 17/02/2022 17/02/2022		Logged By SP		
Sample and In Situ Testing					Depth (m)	Level (m)	Stratum Description	Legend	WS	Well	
Depth (m)	Type	SPT	HPV (KPa)	PID (ppm)							
0.10	ES1				0.25	35.52	MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY with frequent rootlets and occasional roots. Gravel is angular to subrounded fine to coarse flint, brick, charcoal, chalk and wood. (Topsoil)				
0.70	ES2						Firm brown slightly sandy slightly gravelly silty CLAY with occasional rootlets and rare roots. Gravel is angular to subrounded fine to coarse flint and chalk. (Clay with Flints)				
0.95 1.00 - 1.45 1.00	D3 D4 SPT (S)	N=7 (1,2/1,1,2,3)			0.90	34.87	Stiff dry light brown sandy silty CLAY with rare angular to rounded fine to coarse flint. (Clay with Flints)				
1.50	D5										
1.80	D6				1.67	34.10	Recovered as structureless CHALK composed of friable white, cream and yellow brown slightly sandy gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. Rare angular to subangular fine to coarse rinded flint gravel. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
2.00 - 2.45 2.00	D7 SPT (S)	N=50 (10,11/50 for 280mm)									
2.50 - 2.95 2.50	D8 SPT (S)	N=50 (11,14/50 for 280mm)									
					2.93	32.84	End of Borehole at 2.930m				
Remarks							Key				
Windowless sample from ground level to completed depth. Borehole terminated at 2.93m bgl due to competent strata. Groundwater not encountered. Backfilled with arisings on completion.							D - Disturbed Sample ES - Environmental Sample B - Bulk Sample U - Undisturbed Sample SS - Surface Sample VS - Validation Sample W - Water Sample		N/R - No Recovery HVP - Hand Vane Shear Test W/S - Water Strike		
											

 www.aslenvironmental.co.uk										Window Sample No. WS3 Sheet 1 of 2	
Project Name: Land at Central Avenue, Gravesend						Project No.: 002-21-719		Hole Type WLS			
Location: Central Avenue, Gravesend, Kent						Co-ords: 564941.94 E 172424.62 N		Level: 35.87m AOD			
Client: Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd						Start Dates: Finish 17/02/2022 17/02/2022		Logged By SP			
Sample and In Situ Testing					Depth (m)	Level (m)	Stratum Description	Legend	WS	Well	
Depth (m)	Type	SPT	HPV (KPa)	PID (ppm)							
0.04 0.08					0.04	35.83	MADE GROUND: Concrete paving slab.				
					0.08	35.79	MADE GROUND: Mortar.				
							MADE GROUND: Concrete.				
0.28					0.28	35.59	Firm brown slightly sandy slightly gravelly silty CLAY with occasional rootlets and rare roots. Gravel is angular to subrounded fine to coarse flint and chalk. (Clay with Flints)				
0.50	ES1	N=20 (3,5/4,5,5,6)					Recovered as structureless CHALK composed of friable white, cream and yellow brown slightly sandy gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. Rare angular to subangular fine to coarse rinded flint gravel. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
0.70	ES2										
0.90	D3										
1.00 - 1.45	D4										
1.00	SPT (S)										
1.50	D5	N=11 (1,2/2,3,3,3)					Recovered as structureless CHALK composed of white, cream and locally yellow slightly sandy slightly gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
1.80	D6										
2.00 - 2.45	D7										
2.00	SPT (S)										
2.60	D8	N=16 (6,3/3,4,4,5)					Recovered as structureless CHALK composed of cream and yellow slightly sandy slightly gravelly SILT. Gravel is very weak low density cream with black specks angular to subangular fine to coarse. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
3.00 - 3.45	D9										
3.00	SPT (S)										
3.60	D10										
4.00 - 4.45	D11	N=15 (3,3/3,4,4,4)					Recovered as structureless CHALK composed of white, cream and locally yellow slightly sandy slightly gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
4.00	SPT (S)										
4.60	D12										
5.00 - 5.45	D13						Continued on Next Sheet				
Remarks Windowless sampling from ground level to completed depth. Damp strata noted at 3.0m bgl. Installed with combined gas and groundwater monitoring standpipe on completion.						Key D - Disturbed Sample ES - Environmental Sample B - Bulk Sample U - Undisturbed Sample SS - Surface Sample VS - Validation Sample W - Water Sample N/R - No Recovery HVP - Hand Vane Shear Test W/S - Water Strike					

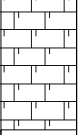
 www.aslenvironmental.co.uk										Window Sample No. WS3 Sheet 2 of 2	
Project Name: Land at Central Avenue, Gravesend						Project No.: 002-21-719		Hole Type WLS			
Location: Central Avenue, Gravesend, Kent						Co-ords: 564941.94 E 172424.62 N		Level: 35.87m AOD		Scale 1:25	
Client: Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd						Start 17/02/2022		Dates: Finish 17/02/2022		Logged By SP	
Sample and In Situ Testing					Depth (m)	Level (m)	Stratum Description	Legend	WS	Well	
Depth (m)	Type	SPT	HPV (KPa)	PID (ppm)							
5.00	SPT (S)	N=15 (3,2/3,4,4,4)			5.45	30.42	Recovered as structureless CHALK composed of white, cream and locally yellow slightly sandy slightly gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
End of Borehole at 5.450m											
6 7 8 9 10											

 www.aslenvironmental.co.uk										Window Sample No.				
										WS4				
										Sheet 1 of 1				
Project Name: Land at Central Avenue, Gravesend							Project No.: 002-21-719		Hole Type WLS					
Location: Central Avenue, Gravesend, Kent							Co-ords: 564905.55 E 172400.34 N	Level: 35.93m AOD	Scale 1:25					
Client: Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd							Start 17/02/2022	Dates: Finish 17/02/2022	Logged By SP					
Sample and In Situ Testing					Depth (m)	Level (m)	Stratum Description	Legend	WS	Well				
Depth (m)	Type	SPT	HPV (KPa)	PID (ppm)										
0.10	ES1	N=16 (3,3/3,4,5,4)			0.28	35.65	MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY with frequent rootlets and occasional roots. Gravel is angular to subrounded fine to coarse flint, brick, charcoal and wood. (Topsoil)							
0.40	ES2				0.45	35.48					Firm brown slightly sandy slightly gravelly silty CLAY with occasional rootlets and rare roots. Gravel is angular to subrounded fine to coarse flint and chalk. (Clay with Flints)			
0.70	D3													
1.00 - 1.45 1.00	D4 SPT (S)													
1.60	D5											subangular cobble of flint.		
2.00 - 2.45 2.00	D7 SPT (S)	N=50 (10,11/50 for 255mm)			2.00	33.93	Recovered as structureless CHALK composed of friable white, cream and yellow brown slightly sandy gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. Rare angular to subangular fine to coarse rinded flint gravel. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))							
2.50 - 2.95 2.50	D8 SPT (S)	N=50 (25 for 125mm/50 for 275mm)			2.81	33.12					End of Borehole at 2.810m			
Remarks							Key							
Windowless sample from ground level to completed depth. Borehole terminated at 2.81m bgl due to competent strata. Groundwater not encountered. Backfilled with arisings on completion.							D - Disturbed Sample ES - Environmental Sample B - Bulk Sample U - Undisturbed Sample SS - Surface Sample VS - Validation Sample W - Water Sample		N/R - No Recovery HVP - Hand Vane Shear Test W/S - Water Strike					

 www.aslenvironmental.co.uk										Window Sample No. WS5 Sheet 1 of 2	
Project Name: Land at Central Avenue, Gravesend						Project No.: 002-21-719		Hole Type WLS			
Location: Central Avenue, Gravesend, Kent						Co-ords: 564945.27 E 172402.14 N		Level: 36.44m AOD			
Client: Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd						Start Dates: Finish 17/02/2022 17/02/2022		Logged By SP			
Sample and In Situ Testing					Depth (m)	Level (m)	Stratum Description	Legend	WS	Well	
Depth (m)	Type	SPT	HPV (KPa)	PID (ppm)							
0.10	ES1				0.30	36.14	MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY with frequent rootlets and occasional roots. Gravel is angular to subrounded fine to coarse flint, brick and wood. (Topsoil)				
0.50	ES2					35.74	Soft to firm brown slightly sandy slightly gravelly silty CLAY with occasional rootlets and rare roots. Gravel is angular to subrounded fine to coarse flint and chalk. (Clay with Flints)				
0.80	D3				2.30	34.14	Recovered as structureless CHALK composed of friable white, cream and yellow brown slightly sandy gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. Rare angular to subangular fine to coarse rinded flint gravel. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
1.00 - 1.45	D4	N=22 (6,6/6,6,5,5)									
1.00	SPT (S)										
1.50	D5										
1.80	D6				2.30	34.14	Recovered as structureless CHALK composed of white, cream and locally yellow slightly sandy slightly gravelly SILT. Gravel is very weak low density white with black species angular to subangular fine to coarse. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
2.00 - 2.45	D7	N=20 (5,4/5,4,5,6)									
2.00	SPT (S)										
2.60	D8										
3.00 - 3.45	D9	N=18 (3,3/4,4,5,5)			2.30	34.14	Recovered as structureless CHALK composed of white, cream and locally yellow slightly sandy slightly gravelly SILT. Gravel is very weak low density white with black species angular to subangular fine to coarse. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
3.00	SPT (S)										
3.60	D10										
4.00 - 4.45	D11	N=17 (3,3/3,4,4,6)									
4.00	SPT (S)				2.30	34.14	Recovered as structureless CHALK composed of white, cream and locally yellow slightly sandy slightly gravelly SILT. Gravel is very weak low density white with black species angular to subangular fine to coarse. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
4.60	D12										
5.00 - 5.45	D13										
Continued on Next Sheet											
Remarks Windowless sampling from ground level to completed depth. Damp strata noted at 3.0m bgl. Backfilled with arisings on completion.							Key D - Disturbed Sample ES - Environmental Sample B - Bulk Sample U - Undisturbed Sample SS - Surface Sample VS - Validation Sample W - Water Sample N/R - No Recovery HVP - Hand Vane Shear Test W/S - Water Strike				

		www.aslenvironmental.co.uk					Window Sample No. WS5 Sheet 2 of 2				
Project Name: Land at Central Avenue, Gravesend						Project No.: 002-21-719		Hole Type WLS			
Location: Central Avenue, Gravesend, Kent						Co-ords: 564945.27 E 172402.14 N		Level: 36.44m AOD		Scale 1:25	
Client: Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd						Start 17/02/2022		Dates: Finish 17/02/2022		Logged By SP	
Sample and In Situ Testing					Depth (m)	Level (m)	Stratum Description	Legend	WS	Well	
Depth (m)	Type	SPT	HPV (KPa)	PID (ppm)							
5.00	SPT (S)	N=18 (3,3/3,4,6,5)			5.45	30.99	Recovered as structureless CHALK composed of white, cream and locally yellow slightly sandy slightly gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated)) End of Borehole at 5.450m				
Remarks Windowless sampling from ground level to completed depth. Damp strata noted at 3.0m bgl. Backfilled with arisings on completion.							Key D - Disturbed Sample ES - Environmental Sample B - Bulk Sample U - Undisturbed Sample SS - Surface Sample VS - Validation Sample W - Water Sample N/R - No Recovery HVP - Hand Vane Shear Test W/S - Water Strike				

 www.aslenvironmental.co.uk										Window Sample No. WS6 Sheet 1 of 2	
Project Name: Land at Central Avenue, Gravesend							Project No.: 002-21-719		Hole Type WLS		
Location: Central Avenue, Gravesend, Kent							Co-ords: 564929.17 E 172390.03 N	Level: 36.39m AOD	Scale 1:25		
Client: Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd							Start 17/02/2022	Dates: Finish 17/02/2022	Logged By SP		
Sample and In Situ Testing					Depth (m)	Level (m)	Stratum Description	Legend	WS	Well	
Depth (m)	Type	SPT	HPV (KPa)	PID (ppm)							
0.10	ES1	N=46 (3,3/5,11,14,16)			0.30	36.09	MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY with frequent rootlets and occasional roots. Gravel is angular to subrounded fine to coarse flint, brick, wood and rare chalk and charcoal. (Topsoil)				
0.50	ES2						Soft to firm brown slightly sandy slightly gravelly locally gravelly silty CLAY with occasional rootlets and rare roots. Gravel is angular to subrounded fine to coarse flint and chalk. (Clay with Flints)				
0.70	D3										
1.00 - 1.45 1.00	D4 SPT (S)	N=18 (7,6/5,4,4,5)			1.25	35.14	Recovered as structureless CHALK composed of friable white, cream and yellow brown slightly sandy gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. Rare angular to subangular fine to coarse rinded flint gravel. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
1.60	D5										
2.00 - 2.45 2.00	D6 SPT (S)										
2.60	D7	N=33 (4,5/6,7,10,10)			2.00	34.39	Recovered as structureless CHALK composed of white, cream and yellow slightly sandy slightly gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated))				
3.00 - 3.45 3.00	D8 SPT (S)										
3.60	D9										
4.00 - 4.45 4.00	D10 SPT (S)	N=19 (5,3/4,4,5,6)									
4.60	D11										
5.00 - 5.45	D12										
							Continued on Next Sheet				
Remarks Windowless sampling from ground level to completed depth. Damp strata noted at 3.0m bgl. Installed with combined gas and groundwater monitoring standpipe on completion.							Key D - Disturbed Sample ES - Environmental Sample B - Bulk Sample U - Undisturbed Sample SS - Surface Sample VS - Validation Sample W - Water Sample N/R - No Recovery HVP - Hand Vane Shear Test W/S - Water Strike				

		www.aslenvironmental.co.uk					Window Sample No. WS6 Sheet 2 of 2				
Project Name: Land at Central Avenue, Gravesend						Project No.: 002-21-719		Hole Type WLS			
Location: Central Avenue, Gravesend, Kent						Co-ords: 564929.17 E 172390.03 N		Level: 36.39m AOD		Scale 1:25	
Client: Avery Healthcare Ltd, Octopus Healthcare and Willowbank Healthcare Developments Ltd						Start 17/02/2022		Dates: Finish 17/02/2022		Logged By SP	
Sample and In Situ Testing					Depth (m)	Level (m)	Stratum Description	Legend	WS	Well	
Depth (m)	Type	SPT	HPV (KPa)	PID (ppm)							
5.00	SPT (S)	N=20 (3,4/4,4,6,6)			5.45	30.94	Recovered as structureless CHALK composed of white, cream and yellow slightly sandy slightly gravelly SILT. Gravel is very weak low density white with black specks angular to subangular fine to coarse. (Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (Undifferentiated)) End of Borehole at 5.450m				
6 7 8 9 10											
Remarks Windowless sampling from ground level to completed depth. Damp strata noted at 3.0m bgl. Installed with combined gas and groundwater monitoring standpipe on completion.							Key D - Disturbed Sample ES - Environmental Sample B - Bulk Sample U - Undisturbed Sample SS - Surface Sample VS - Validation Sample W - Water Sample N/R - No Recovery HVP - Hand Vane Shear Test W/S - Water Strike				



Hole ID	Event	GW Level (m bgl)	Borehole Depth (m bgl)	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	CO (ppm)	H ₂ S (ppm)	Downhole Pressure (Pa)		Average Flow Rate (l/hr)	
									Average	Peak	Average	Peak
Start	1	-	-	<0.1	<0.1	20.8	<1	<1	0	-	0	-
Finish	1	-	-	<0.1	<0.1	20.7	<1	<1	0	-	0	-
WS1	1	DRY	3.11	<0.1	<0.1	20.7	<1	<1	0	-	0	-
WS3	1	DRY	3.02	<0.1	0.6	20.7	<1	<1	0	-	0	-
WS6	1	DRY	3.04	<0.1	0.8	19.2	<1	<1	0	-	0	-

Notes: Date: 03/03/22

Atmospheric Pressure: 1011, Weather Conditions: 12°C overcast, dry

Hole ID	Event	GW Level (m bgl)	Borehole Depth (m bgl)	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	CO (ppm)	H ₂ S (ppm)	Downhole Pressure (Pa)		Average Flow Rate (l/hr)	
									Average	Peak	Average	Peak
Start	2	-	-	<0.1	<0.1	20.5	<1	<1	0	-	0	-
Finish	2	-	-	<0.1	<0.1	20.5	<1	<1	0	-	0	-
WS1	2	DRY	3.11	<0.1	0.6	20.0	<1	<1	0	-	0	-
WS3	2	DRY	3.02	<0.1	0.9	19.5	<1	<1	0	-	0	-
WS6	2	DRY	3.05	<0.1	0.8	19.5	<1	<1	0	-	0	-

Notes: Date: 10/03/22

Atmospheric Pressure: 1015, Weather Conditions: 13.5°C Overcast, dry

Table IIa

Gas and Groundwater Monitoring Results

Site Name: Land at Central Avenue, Gravesend

Project No. 002-21-719

Prepared for: Avery Healthcare Limited, Octopus Healthcare and Willowbank Healthcare Developments Ltd

Project No:	002-21-719
Project:	Land at Central Avenue, Gravesend
Date:	10/03/2022
Borehole No.:	WS1

[illegible]

Diameter of piezometer (or where surrounded by granular filter, the diameter of the filter)	96.5	mm
Diameter of standpipe	50	mm
Top of response zone	1.00	m bgl
Base of response zone	3.14	m bgl
Length of response zone (saturated)	2.14	m
L/D	22.18	
Area	0.0019625	m ²
Starting Water Level	3.14	m

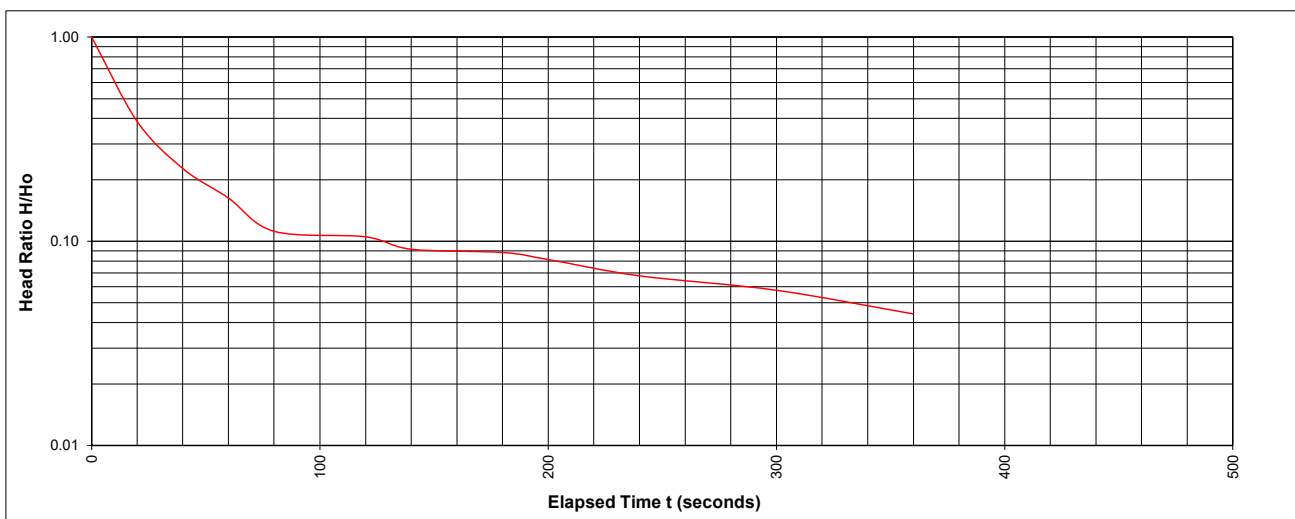
Comments:
Test carried out in general accordance with the methodology set out in BS 5930:1999

Time Interval (t_1)	0	seconds
Time Interval (t_2)	360	seconds

Method	Intake Factor (F)	
a = Soil flush with bottom at impervious boundary	0.193	○
b = Soil flush with bottom in uniform soil	0.265	○
c = Well or hole extended at impervious boundary	3.413	○
d = Well or hole extended in uniform soil	3.543	○
e = Soil in casing with bottom at impervious boundary	0.003	○
f = Soil in casing with bottom in uniform soil	0.003	○
Test carried out in piezometer tube	4.0362	●

Intake Factor (F)	4.0362	
Permeability (k) - General Method	4.22E-06	m / s

Installation surcharged with approximately 30 litres of water in approximately 160 seconds.



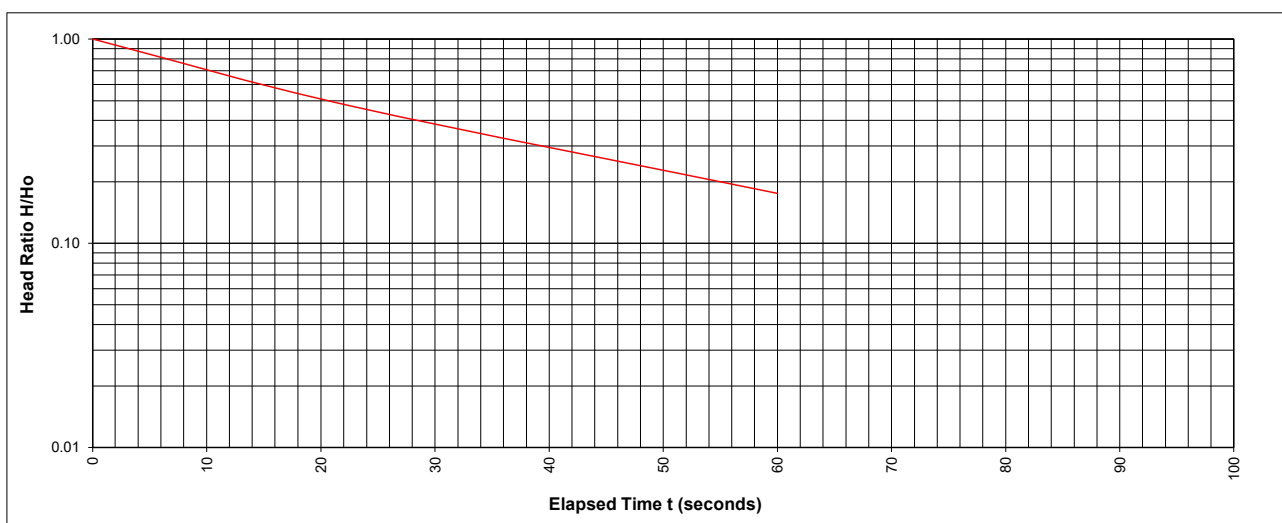
The Geo-Environmental Service Provider

[illegible]

Comments:	
Test carried out in general accordance with the methodology set out in BS 5930:1999	

Method	Intake Factor (F)	
a = Soil flush with bottom at impervious boundary	0.193	○
b = Soil flush with bottom in uniform soil	0.265	○
c = Well or hole extended at impervious boundary	3.317	○
d = Well or hole extended in uniform soil	3.446	○
e = Soil in casing with bottom at impervious boundary	0.003	○
f = Soil in casing with bottom in uniform soil	0.004	○
Test carried out in piezometer tube	3.9240	⊙

Installation surcharged with approximately 30 litres of water in approximately 160 seconds.



The Geo-Environmental Service Provider

[illegible]

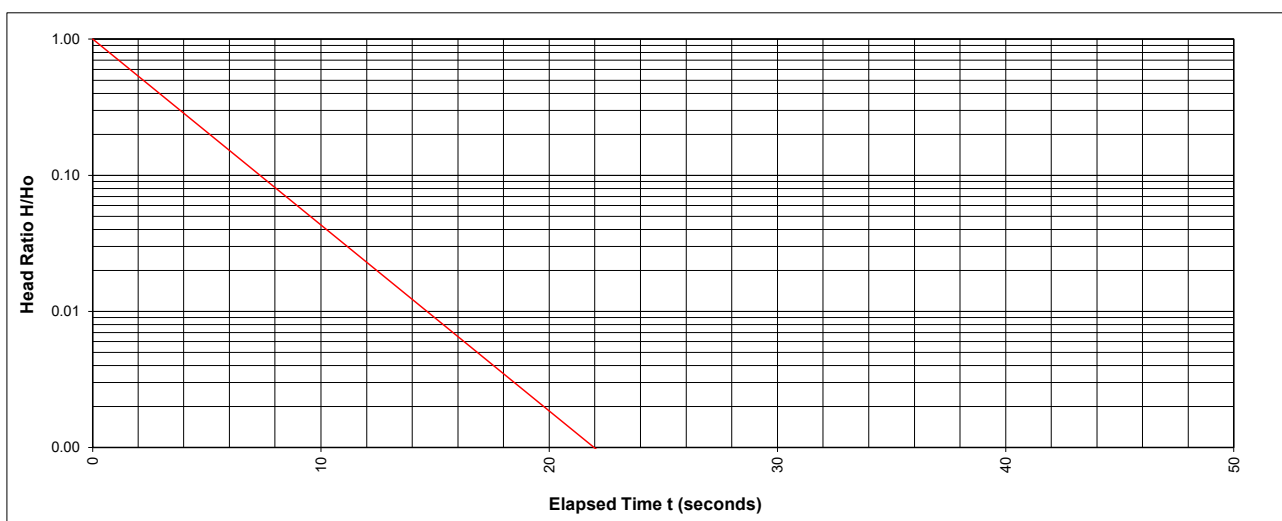
Diameter of piezometer (or where surrounded by granular filter, the diameter of the filter)	96.5	mm
Diameter of standpipe	50	mm
Top of response zone	1.00	m bgl
Base of response zone	3.05	m bgl
Length of response zone (saturated)	2.05	m
L/D	21.24	
Area	0.0019625	m ²
Starting Water Level	3.05	m

Comments:
Test carried out in general accordance with the methodology set out in BS 5930:1999

Method	Intake Factor (F)	
a = Soil flush with bottom at impervious boundary	0.193	○
b = Soil flush with bottom in uniform soil	0.265	○
c = Well or hole extended at impervious boundary	3.305	○
d = Well or hole extended in uniform soil	3.433	○
e = Soil in casing with bottom at impervious boundary	0.004	○
f = Soil in casing with bottom in uniform soil	0.004	○
Test carried out in piezometer tube	3.9099	●

Intake Factor (F)	3.9099	
Permeability (k) - General Method	1.58E-04	m/s

Installation surcharged with approximately 30 litres of water in approximately 160 seconds.





APPENDIX III

CHEMICAL LABORATORY TEST RESULTS

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Herts,
WD18 8YS

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Analytical Report Number : 22-41640

Project / Site name:	Central Avenue, Gravesend	Samples received on:	23/02/2022
Your job number:	002-21-719	Samples instructed on/ Analysis started on:	23/02/2022
Your order number:	002-21-719	Analysis completed by:	04/03/2022
Report Issue Number:	1	Report issued on:	04/03/2022
Samples Analysed:	3 leachate samples - 8 soil samples		

Signed:



Anna Goc
Technical Reviewer (Reporting Team)
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: 22-41640
 Project / Site name: Central Avenue, Gravesend
 Your Order No: 002-21-719

Lab Sample Number				2184155	2184156	2184157	2184158	2184159
Sample Reference				HP1	WS1	WS2	WS3	WS4
Sample Number				ES1	D3	ES1	D5	D3
Depth (m)				0.10	0.50	0.10	1.50	0.70
Date Sampled				17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
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	29	39	< 0.1
Moisture Content	%	0.01	NONE	19	13	16	8.0	4.9
Total mass of sample received	kg	0.001	NONE	1.0	1.0	1.0	1.0	1.0

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	-
Asbestos Analyst ID	N/A	N/A	N/A	GFI		GFI		

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.2	8.4	7.8	9.3	8.1
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Total Sulphate as SO ₄	mg/kg	50	MCERTS	620	370	590	-	-
Total Sulphate as SO ₄	%	0.005	MCERTS	-	-	-	0.055	0.027
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0081	0.0050	0.014	0.060	0.0042
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	60.0	4.2
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	-	18	1.3
Total Sulphur	mg/kg	50	MCERTS	530	210	440	-	-
Total Sulphur	%	0.005	MCERTS	-	-	-	0.023	0.013
Ammoniacal Nitrogen as NH ₄	mg/kg	0.5	MCERTS	-	-	-	< 0.5	< 0.5
Ammonium as NH ₄ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-	-	< 0.05	< 0.05
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	0.033	0.0064	0.023	-	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	-	-	< 2.0	< 2.0

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	< 0.05	< 0.05	< 0.05	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	-
Phenanthrene	mg/kg	0.05	MCERTS	0.23	< 0.05	1.0	-	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.20	-	-
Fluoranthene	mg/kg	0.05	MCERTS	0.65	< 0.05	2.0	-	-
Pyrene	mg/kg	0.05	MCERTS	0.63	< 0.05	1.7	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.37	< 0.05	0.95	-	-
Chrysene	mg/kg	0.05	MCERTS	0.36	< 0.05	0.84	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.45	< 0.05	0.98	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.20	< 0.05	0.57	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.39	< 0.05	0.92	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.22	< 0.05	0.51	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.24	< 0.05	0.56	-	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	3.74	< 0.80	10.3	-	-
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Analytical Report Number: 22-41640
Project / Site name: Central Avenue, Gravesend
Your Order No: 002-21-719

Lab Sample Number				2184155	2184156	2184157	2184158	2184159
Sample Reference				HP1	WS1	WS2	WS3	WS4
Sample Number				ES1	D3	ES1	D5	D3
Depth (m)				0.10	0.50	0.10	1.50	0.70
Date Sampled				17/02/2022	17/02/2022	17/02/2022	17/02/2022	17/02/2022
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								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	7.5	14	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.1	0.94	0.87	-	-
Boron (water soluble)	mg/kg	0.2	MCERTS	0.5	0.5	1.3	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.7	0.5	1.4	-	-
Chromium (hexavalent)	mg/kg	4	NONE	< 4.0	< 4.0	< 4.0	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	32	30	32	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	44	16	64	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	84	15	110	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	27	26	27	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	42	36	42	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	56	160	-	-
Magnesium (water soluble)	mg/kg	5	NONE	-	-	-	< 5.0	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	-	< 2.5	< 2.5
Petroleum Hydrocarbons								
TPH C10 - C40 _{EH, CU, ID, TOTAL}	mg/kg	10	MCERTS	24	< 10	22	-	-
TPH2 (C6 - C10) _{HS, ID, TOTAL}	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-41640
Project / Site name: Central Avenue, Gravesend
Your Order No: 002-21-719

Lab Sample Number				2184160	2184161	2184162
Sample Reference				WS5	WS5	WS6
Sample Number				ES1	D6	ES1
Depth (m)				0.10	1.80	0.10
Date Sampled				17/02/2022	17/02/2022	17/02/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Stone Content	%	0.1	NONE	23	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	16	18	16
Total mass of sample received	kg	0.001	NONE	1.0	1.0	1.0

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	GFI		GFI

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.0	8.5	7.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	-	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	-	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	670	-	600
Total Sulphate as SO ₄	%	0.005	MCERTS	-	0.048	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.011	0.0079	0.018
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	7.9	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	6.1	-
Total Sulphur	mg/kg	50	MCERTS	360	-	370
Total Sulphur	%	0.005	MCERTS	-	0.017	-
Ammoniacal Nitrogen as NH ₄	mg/kg	0.5	MCERTS	-	< 0.5	-
Ammonium as NH ₄ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	< 0.05	-
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	0.022	-	0.028
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	< 2.0	-

Total Phenols

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

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	0.33
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	0.44
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	0.29
Phenanthrene	mg/kg	0.05	MCERTS	2.3	-	2.9
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	0.37
Fluoranthene	mg/kg	0.05	MCERTS	3.4	-	3.3
Pyrene	mg/kg	0.05	MCERTS	2.7	-	2.6
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.2	-	1.6
Chrysene	mg/kg	0.05	MCERTS	1.5	-	1.3
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.7	-	1.6
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.89	-	0.72
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.5	-	1.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.77	-	0.72
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.21	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.75	-	0.72

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	16.9	-	18.4
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Analytical Report Number: 22-41640
Project / Site name: Central Avenue, Gravesend
Your Order No: 002-21-719

Lab Sample Number				2184160	2184161	2184162
Sample Reference				WS5	WS5	WS6
Sample Number				ES1	D6	ES1
Depth (m)				0.10	1.80	0.10
Date Sampled				17/02/2022	17/02/2022	17/02/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	-	11
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.97	-	0.96
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	-	0.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	-	0.6
Chromium (hexavalent)	mg/kg	4	NONE	< 4.0	-	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	30	-	27
Copper (aqua regia extractable)	mg/kg	1	MCERTS	47	-	41
Lead (aqua regia extractable)	mg/kg	1	MCERTS	67	-	88
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.6	-	0.6
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	25	-	24
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	40	-	39
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	75	-	77
Magnesium (water soluble)	mg/kg	5	NONE	-	< 5.0	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	< 2.5	-
Petroleum Hydrocarbons						
TPH C10 - C40 _{EH_CU_ID_TOTAL}	mg/kg	10	MCERTS	22	-	28
TPH2 (C6 - C10) _{HS_ID_TOTAL}	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-41640

Project / Site name: Central Avenue, Gravesend

Your Order No: 002-21-719

Lab Sample Number				2184163	2184164	2184165
Sample Reference				HP1	WS2	WS6
Sample Number				ES1	ES1	ES1
Depth (m)				0.10	0.10	0.10
Date Sampled				17/02/2022	17/02/2022	17/02/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)				Units	Limit of detection	Accreditation Status

General Inorganics

pH (automated)	pH Units	N/A	ISO 17025	7.3	7.8	7.5
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Free Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1	< 1	< 1
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	9.40	7.41	12.2

Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	< 1.0	4.3	< 1.0
Beryllium (dissolved)	µg/l	0.2	ISO 17025	0.2	0.2	0.2
Boron (dissolved)	µg/l	10	ISO 17025	38	36	21
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.6	1.2	1.1
Copper (dissolved)	µg/l	0.7	ISO 17025	47	23	27
Lead (dissolved)	µg/l	1	ISO 17025	4.5	4.6	4.0
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	8.3	3.9	3.4
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0
Vanadium (dissolved)	µg/l	1.7	ISO 17025	5.0	7.1	3.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	16	13	12

Calcium (dissolved)	mg/l	0.012	ISO 17025	5.4	19	9.7
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U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-41640

Project / Site name: Central Avenue, Gravesend

* 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 *
2184155	HP1	ES1	0.1	Brown loam and gravel with vegetation and glass
2184156	WS1	D3	0.5	Brown clay and loam with gravel and vegetation.
2184157	WS2	ES1	0.1	Brown loam and clay with vegetation and stones.
2184158	WS3	D5	1.5	Light brown clay and sand with chalk and stones.
2184159	WS4	D3	0.7	Light brown sandy clay with gravel.
2184160	WS5	ES1	0.1	Brown loam and clay with vegetation and stones.
2184161	WS5	D6	1.8	Beige clay and sand with chalk and gravel
2184162	WS6	ES1	0.1	Brown clay and loam with gravel and vegetation.

Analytical Report Number : 22-41640

Project / Site name: Central Avenue, Gravesend

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
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	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
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Free cyanide in soil	Determination of free 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
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
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 EPA-16 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
pH at 20oC in leachate (automated)	Determination of pH in leachate by electrometric measurement.	In house method.	L099B	W	ISO 17025
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

Analytical Report Number : 22-41640

Project / Site name: Central Avenue, Gravesend

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
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 Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
TPH2 (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
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
Dissolved Organic Carbon in leachate	Determination of dissolved organic carbon in leachate by the measurement on a non-dispersive infrared analyser of carbon dioxide released by acidification.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Free cyanide in leachate	Determination of free 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	ISO 17025
Total cyanide in leachate - 1µg/l	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Fraction Organic Carbon FOC Automated	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method	L009	D	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

Analytical Report Number : 22-41640

Project / Site name: Central Avenue, Gravesend

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
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For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' 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.

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

Scott Pritchard
ASL Environmental
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e: scott.pritchard@aslenvironmental.co.uk

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

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

Analytical Report Number : 22-41643

Project / Site name:	Central Avenue, Gravesend	Samples received on:	23/02/2022
Your job number:	002-21-719	Samples instructed on/ Analysis started on:	23/02/2022
Your order number:	002-21-719	Analysis completed by:	04/03/2022
Report Issue Number:	1	Report issued on:	07/03/2022
Samples Analysed:	3 10:1 WAC samples		


Signed:

Anna Goc
Technical Reviewer (Reporting Team)
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.

i2 Analytical

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Waste Acceptance Criteria Analytical Results							
Report No:	22-41643						
				Client: ASL			
Location	Central Avenue, Gravesend						
Lab Reference (Sample Number)	2184172 / 2184173			Landfill Waste Acceptance Criteria			
Sampling Date	17/02/2022			Limits			
Sample ID	WS1 D3			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	0.6			3%	5%	6%	
Loss on Ignition (%) **	2.6			--	--	10%	
BTEX (µg/kg) **	< 10			6000	--	--	
Sum of PCBs (mg/kg) **	< 0.007			1	--	--	
Mineral Oil (mg/kg) EH, IO, CU, AL	< 10			500	--	--	
Total PAH (WAC-17) (mg/kg)	< 0.85			100	--	--	
pH (units)**	8.4			--	>6	--	
Acid Neutralisation Capacity (mmol / kg)	16			--	To be evaluated	To be evaluated	
Eluate Analysis							
	10:1		10:1	Limit values for compliance leaching test			
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l		mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)			
Arsenic *	0.0015		0.0125	0.5	2	25	
Barium *	0.0116		0.0989	20	100	300	
Cadmium *	< 0.0001		< 0.0008	0.04	1	5	
Chromium *	0.0036		0.031	0.5	10	70	
Copper *	0.0071		0.061	2	50	100	
Mercury *	< 0.0005		< 0.0050	0.01	0.2	2	
Molybdenum *	0.0010		0.0089	0.5	10	30	
Nickel *	0.0049		0.042	0.4	10	40	
Lead *	0.0033		0.029	0.5	10	50	
Antimony *	< 0.0017		< 0.017	0.06	0.7	5	
Selenium *	< 0.0040		< 0.040	0.1	0.5	7	
Zinc *	0.011		0.093	4	50	200	
Chloride *	0.45		3.9	800	15000	25000	
Fluoride	0.53		4.6	10	150	500	
Sulphate *	0.99		8.5	1000	20000	50000	
TDS*	58		500	4000	60000	100000	
Phenol Index (Monohydric Phenols) *	< 0.010		< 0.10	1	-	-	
DOC	9.49		81.1	500	800	1000	
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.0						
Dry Matter (%)	87						
Moisture (%)	13						
Results are expressed on a dry weight basis, after correction for moisture content where applicable. * = UKAS accredited (liquid eluate analysis only)							
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation ** = MCERTS accredited							
Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3. This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.							

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Waste Acceptance Criteria Analytical Results						
Report No:	22-41643					
				Client: ASL		
Location	Central Avenue, Gravesend					
Lab Reference (Sample Number)	2184174 / 2184175			Landfill Waste Acceptance Criteria		
Sampling Date	17/02/2022			Limits		
Sample ID	WS2 ES1			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Depth (m)	0.10					
Solid Waste Analysis						
TOC (%)**	2.3			3%	5%	6%
Loss on Ignition (%) **	5.5			--	--	10%
BTEX (µg/kg) **	< 10			6000	--	--
Sum of PCBs (mg/kg) **	< 0.007			1	--	--
Mineral Oil (mg/kg) EH, 10, CU, AL	< 10			500	--	--
Total PAH (WAC-17) (mg/kg)	7.67			100	--	--
pH (units)**	8.1			--	>6	--
Acid Neutralisation Capacity (mmol / kg)	6.0			--	To be evaluated	To be evaluated
Eluate Analysis						
	10:1		10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l		mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0062		0.0520	0.5	2	25
Barium *	0.0295		0.248	20	100	300
Cadmium *	< 0.0001		< 0.0008	0.04	1	5
Chromium *	0.0023		0.019	0.5	10	70
Copper *	0.028		0.23	2	50	100
Mercury *	< 0.0005		< 0.0050	0.01	0.2	2
Molybdenum *	0.0025		0.0210	0.5	10	30
Nickel *	0.0046		0.038	0.4	10	40
Lead *	0.0060		0.051	0.5	10	50
Antimony *	< 0.0017		< 0.017	0.06	0.7	5
Selenium *	< 0.0040		< 0.040	0.1	0.5	7
Zinc *	0.014		0.12	4	50	200
Chloride *	0.78		6.6	800	15000	25000
Fluoride	< 0.050		< 0.50	10	150	500
Sulphate *	1.5		12	1000	20000	50000
TDS*	88		740	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010		< 0.10	1	-	-
DOC	11.3		94.7	500	800	1000
Leach Test Information						
Stone Content (%)	29					
Sample Mass (kg)	1.0					
Dry Matter (%)	84					
Moisture (%)	16					
Results are expressed on a dry weight basis, after correction for moisture content where applicable. * = UKAS accredited (liquid eluate analysis only)						
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation ** = MCERTS accredited						
Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3. This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.						

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Waste Acceptance Criteria Analytical Results						
Report No:	22-41643					
				Client: ASL		
Location	Central Avenue, Gravesend					
Lab Reference (Sample Number)	2184176 / 2184177			Landfill Waste Acceptance Criteria		
Sampling Date	17/02/2022			Limits		
Sample ID	W55 ES1			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Depth (m)	0.10					
Solid Waste Analysis						
TOC (%)**	2.2			3%	5%	6%
Loss on Ignition (%) **	5.1			--	--	10%
BTEX (µg/kg) **	< 10			6000	--	--
Sum of PCBs (mg/kg) **	< 0.007			1	--	--
Mineral Oil (mg/kg) EH, 10, CU, AL	< 10			500	--	--
Total PAH (WAC-17) (mg/kg)	10.1			100	--	--
pH (units)**	7.5			--	>6	--
Acid Neutralisation Capacity (mmol / kg)	1.4			--	To be evaluated	To be evaluated
Eluate Analysis						
	10:1		10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l		mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0018		0.0148	0.5	2	25
Barium *	0.0076		0.0631	20	100	300
Cadmium *	< 0.0001		< 0.0008	0.04	1	5
Chromium *	0.0012		0.0097	0.5	10	70
Copper *	0.012		0.097	2	50	100
Mercury *	< 0.0005		< 0.0050	0.01	0.2	2
Molybdenum *	0.0010		0.0082	0.5	10	30
Nickel *	0.0032		0.026	0.4	10	40
Lead *	0.0033		0.027	0.5	10	50
Antimony *	< 0.0017		< 0.017	0.06	0.7	5
Selenium *	< 0.0040		< 0.040	0.1	0.5	7
Zinc *	0.0036		0.030	4	50	200
Chloride *	1.6		13	800	15000	25000
Fluoride	0.32		2.7	10	150	500
Sulphate *	1.2		10	1000	20000	50000
TDS*	65		540	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010		< 0.10	1	-	-
DOC	12.2		101	500	800	1000
Leach Test Information						
Stone Content (%)	23					
Sample Mass (kg)	1.0					
Dry Matter (%)	84					
Moisture (%)	16					
Results are expressed on a dry weight basis, after correction for moisture content where applicable. * = UKAS accredited (liquid eluate analysis only)						
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation ** = MCERTS accredited						
Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3. This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.						

Analytical Report Number : 22-41643

Project / Site name: Central Avenue, Gravesend

* 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 *
2184172	WS1	D3	0.5	Brown clay and loam with gravel and vegetation.
2184174	WS2	ES1	0.1	Brown loam and clay with vegetation and stones.
2184176	WS5	ES1	0.1	Brown loam and clay with vegetation and stones.

Analytical Report Number : 22-41643

Project / Site name: Central Avenue, Gravesend

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
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance"	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
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. MCERTS accredited except Coronene.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	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 organic carbon (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
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil"	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025

Analytical Report Number : 22-41643
Project / Site name: Central Avenue, Gravesend

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
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' 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
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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



APPENDIX IV

GEOTECHNICAL LABORATORY TEST DATA



Laboratory Report



Contract Number: 58316

Client Ref: **002-21-719**

Report Date: **08-03-2022**

Client PO: **002-21-719**

Client **ASL**
Holly Farm Business Park
Honiley
Warwickshire
CV8 1NP

Contract Title: **Central Avenue, Gravesend**
For the attention of: **Scott Pritchard**

Date Received: **25-02-2022**

Date Completed: **08-03-2022**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	5
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	5
Samples Received - @ Non Accredited Test	5
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories:

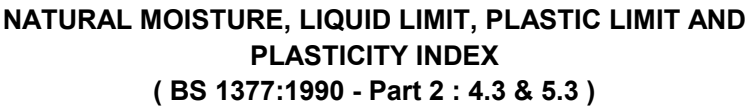
Emma Sharp (Business Support Manager) - Paul Evans (Director) - Richard John (Quality/Technical Manager)

Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager) - Wayne Honey (Quality Assistant / Administrator / Health and Safety Coordinator)

GEO Site & Testing Services Ltd

Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN

Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

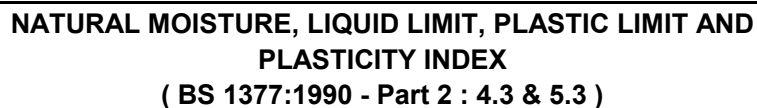


Contract Number	58316	
Site Name	Central Avenue, Gravesend	
Date Tested	03/03/2022	
	DESCRIPTIONS	

[illegible]

Operators	Checked	07/03/2022	Richard John (Advanced Testing Manager)
Conor Davison	Approved	07/03/2022	Paul Evans (Quality/Technical Manager)



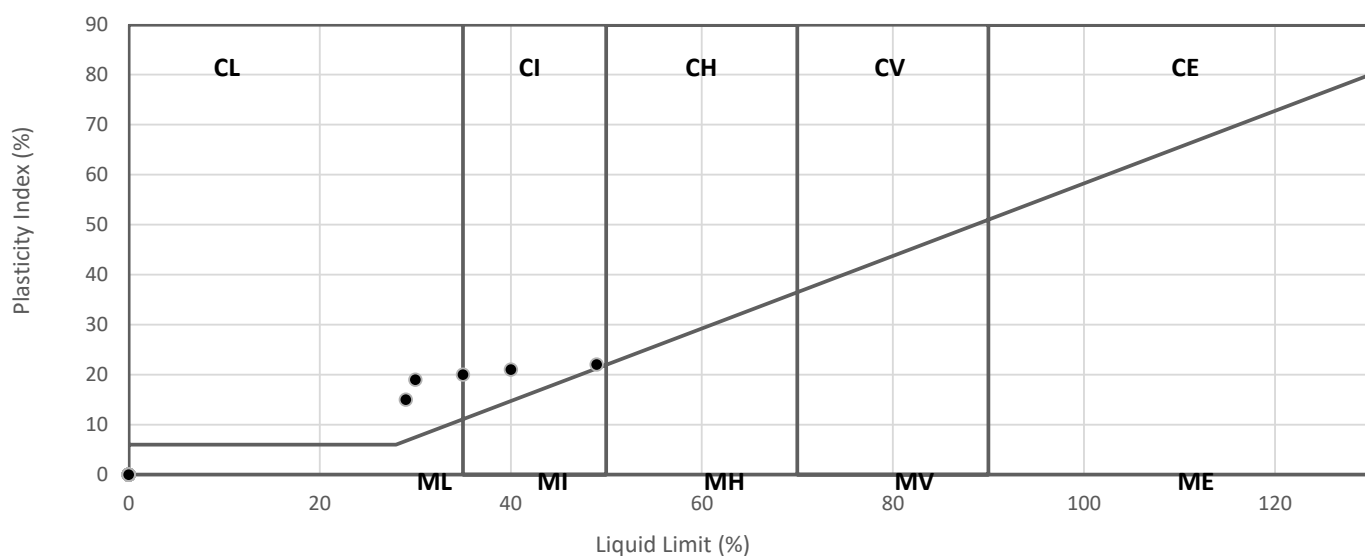


Contract Number	58316	
Project Location	Central Avenue, Gravesend	
Date Tested	03/03/2022	

[illegible]

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION BS 5930:1999+A2:2010



Operators	Checked	07/03/2022	Richard John (Advanced Testing Manager)
Conor Davison	Approved	07/03/2022	Paul Evans (Quality/Technical Manager)





APPENDIX V

QUALITATIVE RISK ASSESSMENT

STEP 2: BASIC SETTINGS

Apply Settings to Model

Back to Guide

SELECT LAND USE

Residential without produce

RATIO MODE

☐

LAND USE OPTIONS

RECEPTOR

Female (com)

BUILDING

Small terraced house

SOIL TYPE

Sandy clay loam

START AC

1

END AC

6

pH

7

SOM (%)

3.88

EXPOSURE PATHWAYS

ORAL ROUTES

direct soil and dust ingestion

☒

consumption of homegrown produce

☐

soil attached to homegrown produce

☐

DERMAL ROUTES

indoor

☒

outdoor

☒

INHALATION ROUTES

indoor dust

☒

outdoor dust

☒

indoor vapour

☒

outdoor vapour

☒

STEP 5: RESULTS

Find AC

Print Reports

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[illegible]

STEP 5: RESULTS

Find AC

[Print Reports](#)

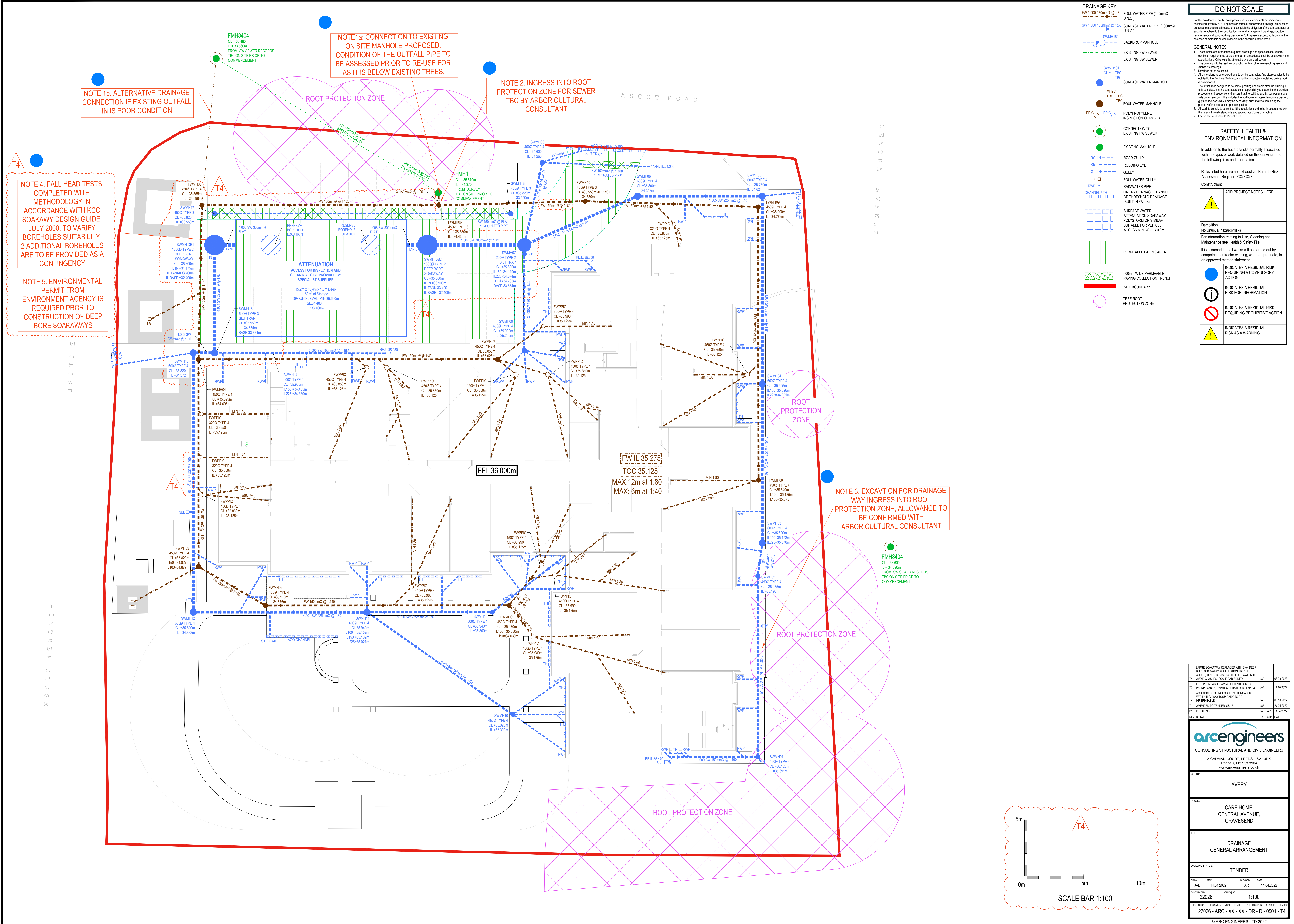
[Back to Guide](#)

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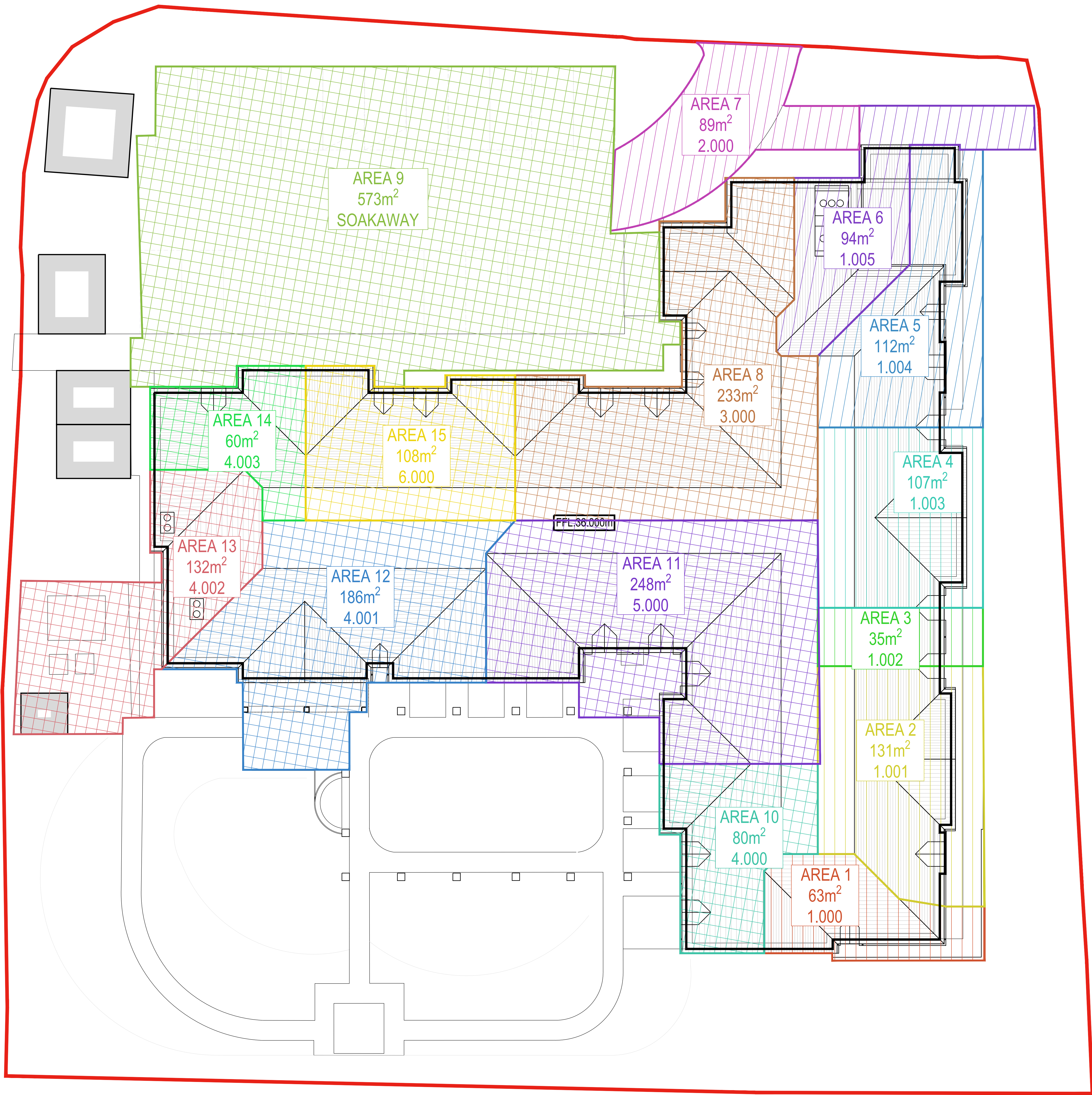
SUMMARY DRAINAGE REPORT



APPENDIX C – DRAINAGE DRAWINGS

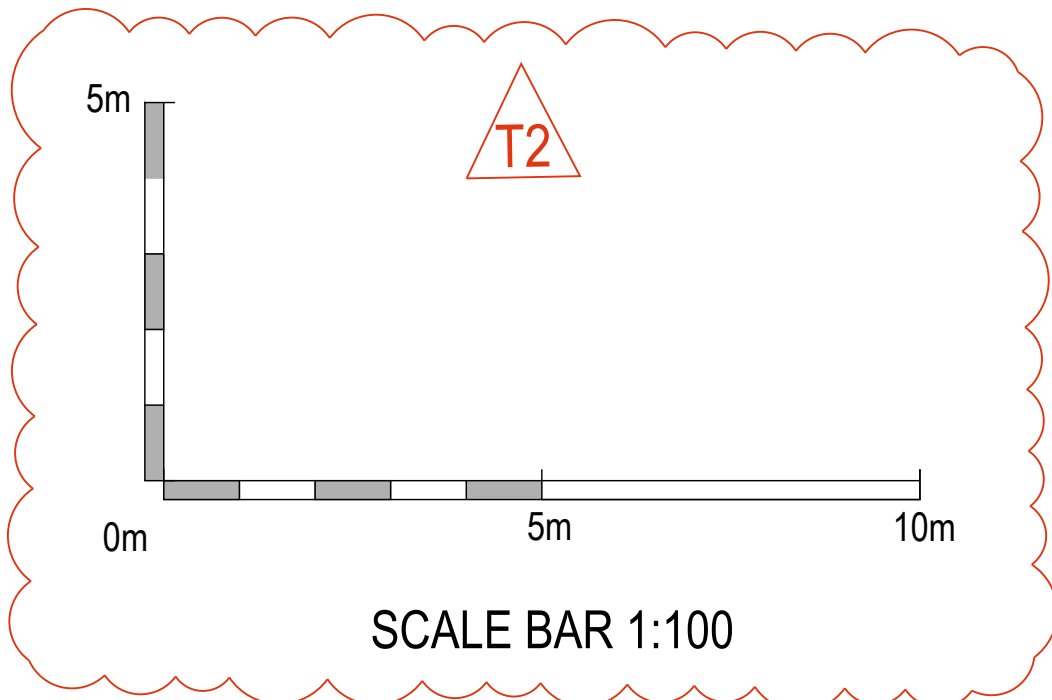


**APPENDIX D – MICRO DRAINAGE DESIGN CALCULATIONS AND
DRAINAGE AREA PLAN**



- DRAINAGE AREA 1 - 1.000 - 63m²
- DRAINAGE AREA 2 - 1.001 - 131m²
- DRAINAGE AREA 3 - 1.002 - 35m²
- DRAINAGE AREA 4 - 1.003 - 107m²
- DRAINAGE AREA 5 - 1.004 - 112m²
- DRAINAGE AREA 6 - 1.005 - 94m²
- DRAINAGE AREA 7 - 2.000 - 89m²
- DRAINAGE AREA 8 - 3.000 - 233m²
- DRAINAGE AREA 9 - SOAKAWAY - 573m²
- DRAINAGE AREA 10 - 4.000 - 80m²
- DRAINAGE AREA 11 - 5.000 - 248m²
- DRAINAGE AREA 12 - 4.001 - 186m²
- DRAINAGE AREA 13 - 4.002 - 132m²
- DRAINAGE AREA 14 - 4.003 - 60m²
- DRAINAGE AREA 15 - 6.000 - 108m²

TOTAL - 2251m²



DO NOT SCALE

For the avoidance of doubt, no approvals, reviews, comments or indication of satisfaction given by ARC Engineers in terms of associated drawings, products or proposed materials shall reduce or extinguish the obligation of the sub-contractor or supplier to adhere to the specification, general arrangement drawings, statutory requirements and good working practice. ARC Engineers accept no liability for the selection of materials or workmanship in the execution of the works.

GENERAL NOTES

- These notes are intended to augment drawings and specifications. Where conflict of requirements exists the order of precedence shall be as shown in the specifications. Otherwise the exact provision shall govern.
- This drawing is to be read in conjunction with all other relevant Engineers and Architects drawings.
- Drawings not to be scaled.
- All dimensions to be checked on site by the contractor. Any discrepancies to be notified to the Engineer/Architect and further instructions obtained before work is commenced.
- The structure is designed to be self-supporting and stable after the building is fully complete. It is the contractors sole responsibility to determine the erection procedure and sequence and ensure that the building and its components are safe during erection. This includes the addition of whatever temporary bracing, girders or beams, which may be necessary, such material ensuring the property of the contractor upon completion.
- All work to comply to current building regulations and to be in accordance with the relevant British Standards and appropriate Codes of Practice.
- For further notes refer to Project Notes.

SAFETY, HEALTH & ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following risks and information.

Risks listed here are not exhaustive. Refer to Risk Assessment Register: XXXXXXX

Construction:

ADD PROJECT NOTES HERE

Demolition:

No Unusual hazards/risks

For information relating to Use, Cleaning and Maintenance see Health & Safety File

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION

INDICATES A RESIDUAL RISK FOR INFORMATION

INDICATES A RESIDUAL RISK REQUIRING PROHIBITIVE ACTION

INDICATES A RESIDUAL RISK AS A WARNING

T2 SCALE BAR ADDED

JAB

08.03.2023

T1 INITIAL ISSUE

JAB

04.10.2022

REVI DETAIL

BY

CHK DATE

arcengineers

CONSULTING STRUCTURAL AND CIVIL ENGINEERS

3 CADMAN COURT, LEEDS, LS27 0RX

Phone: 0113 263 3504

www.arc-engineers.co.uk

CLIENT:

AVERY

PROJECT:

CARE HOME,
CENTRAL AVENUE,
GRAVESEND

TITLE:

DRAINAGE
CATCHMENT AREAS

DRAWING STATUS:

TENDER

ISSUED

DATE

04.10.2022

DESIGNED

AA

DATE

04.10.2022

CONTRACT NO.

22026

SCALE @ AS

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PROJECT NO.

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for GRAVESEND SW.SWS

Pipe Sizes GRAVESEND SW Manhole Sizes GRAVESEND SW

FEH Rainfall Model	
Return Period (years)	2
FEH Rainfall Version	2013
Site Location GB 564926 172407 TQ 64926 72407	
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	500

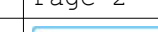
Designed with Level Soffits

Network Design Table for GRAVESEND SW.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	7.857	0.079	99.5	0.006	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	16.057	0.201	79.9	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	2.953	0.037	79.8	0.004	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	14.132	0.177	79.8	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	16.648	0.277	60.1	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	11.056	0.276	40.1	0.009	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	10.780	0.269	40.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	7.062	0.106	66.6	0.009	5.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.13	35.470	0.006	0.0	0.0	0.0	1.01	17.8	1.1
1.001	50.00	5.37	35.391	0.019	0.0	0.0	0.0	1.13	19.9	3.4
1.002	50.00	5.41	35.190	0.023	0.0	0.0	0.0	1.13	19.9	4.2
1.003	50.00	5.57	35.078	0.034	0.0	0.0	0.0	1.46	58.2	6.1
1.004	50.00	5.74	34.901	0.045	0.0	0.0	0.0	1.69	67.2	8.1
1.005	50.00	5.83	34.624	0.054	0.0	0.0	0.0	2.07	82.4	9.7
1.006	50.00	5.91	34.348	0.054	0.0	0.0	0.0	2.07	82.4	9.7
2.000	50.00	5.10	34.260	0.009	0.0	0.0	0.0	1.23	21.8	1.6

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Network Design Table for GRAVESEND SW.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.000	9.789	0.500	19.6	0.023	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	3.000	0.100	30.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.008	10.748	0.100	107.5	0.029	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	15.810	0.198	79.8	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit	
5.000	11.133	0.273	40.8	0.025	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	15.411	0.195	79.0	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.002	23.013	0.384	59.9	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.003	7.085	0.118	60.0	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
6.000	9.969	0.845	11.8	0.011	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.004	2.579	0.086	30.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.005	1.308	0.022	59.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.006	9.784	0.350	28.0	0.029	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.009	4.279	0.050	85.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	50.00	5.07	35.250	0.023	0.0	0.0	0.0	2.29	40.4	4.2
1.007	50.00	5.93	34.079	0.086	0.0	0.0	0.0	2.40	95.3	15.5
1.008	50.00	6.07	33.979	0.115	0.0	0.0	0.0	1.26	50.1	20.8
4.000	50.00	5.23	35.300	0.008	0.0	0.0	0.0	1.13	19.9	1.4
5.000	50.00	5.09	35.300	0.025	0.0	0.0	0.0	2.05	81.7	4.5
4.001	50.00	5.41	35.027	0.052	0.0	0.0	0.0	1.47	58.5	9.4
4.002	50.00	5.64	34.832	0.065	0.0	0.0	0.0	1.69	67.3	11.7
4.003	50.00	5.70	34.448	0.071	0.0	0.0	0.0	1.69	67.2	12.8
6.000	50.00	5.06	35.250	0.011	0.0	0.0	0.0	2.95	52.1	2.0
4.004	50.00	5.72	34.330	0.082	0.0	0.0	0.0	2.40	95.3	14.8
4.005	50.00	5.74	34.244	0.082	0.0	0.0	0.0	1.70	67.6	14.8
4.006	50.00	5.80	34.222	0.111	0.0	0.0	0.0	2.48	98.8	20.0
1.009	50.00	6.13	33.872	0.226	0.0	0.0	0.0	1.41	56.2	40.8

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PIPELINE SCHEDULES for GRAVESEND SW.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	1	36.000	35.470	0.380	Junction	
1.001	o	150	2	36.120	35.391	0.579	Open Manhole	450
1.002	o	150	3	35.820	35.190	0.480	Open Manhole	600
1.003	o	225	4	35.820	35.078	0.517	Open Manhole	600
1.004	o	225	5	35.905	34.901	0.779	Open Manhole	600
1.005	o	225	6	35.750	34.624	0.901	Open Manhole	600
1.006	o	225	7	35.800	34.348	1.227	Open Manhole	600
2.000	o	150	11	35.600	34.260	1.190	Open Manhole	450
3.000	o	150	12	35.900	35.250	0.500	Open Manhole	450
1.007	o	225	8	35.800	34.079	1.496	Open Manhole	450
1.008	o	225	9	35.550	33.979	1.346	Junction	
4.000	o	150	13	35.920	35.300	0.470	Open Manhole	450
5.000	o	225	20	35.940	35.300	0.415	Open Manhole	450
4.001	o	225	14	35.940	35.027	0.688	Open Manhole	600
4.002	o	225	15	35.820	34.832	0.763	Open Manhole	600

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	7.857	99.5	2	36.120	35.391	0.579	Open Manhole	450
1.001	16.057	79.9	3	35.820	35.190	0.480	Open Manhole	600
1.002	2.953	79.8	4	35.820	35.153	0.517	Open Manhole	600
1.003	14.132	79.8	5	35.905	34.901	0.779	Open Manhole	600
1.004	16.648	60.1	6	35.750	34.624	0.901	Open Manhole	600
1.005	11.056	40.1	7	35.800	34.348	1.227	Open Manhole	600
1.006	10.780	40.1	8	35.800	34.079	1.496	Open Manhole	450
2.000	7.062	66.6	8	35.800	34.154	1.496	Open Manhole	450
3.000	9.789	19.6	8	35.800	34.750	0.900	Open Manhole	450
1.007	3.000	30.0	9	35.550	33.979	1.346	Junction	
1.008	10.748	107.5	10	35.550	33.879	1.446	Open Manhole	450
4.000	15.810	79.8	14	35.940	35.102	0.688	Open Manhole	600
5.000	11.133	40.8	14	35.940	35.027	0.688	Open Manhole	600
4.001	15.411	79.0	15	35.820	34.832	0.763	Open Manhole	600
4.002	23.013	59.9	16	35.820	34.448	1.147	Open Manhole	600

ARC Engineers Ltd		Page 4																																																																																																																																																																				
3 Cadman Court Leeds LS27 0RX	GRAVESEND SURFACE WATER																																																																																																																																																																					
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PIPELINE SCHEDULES for GRAVESEND SW.SWS Upstream Manhole <table><tr><th>PN</th><th>Hyd Sect</th><th>Diam (mm)</th><th>MH Name</th><th>C.Level (m)</th><th>I.Level (m)</th><th>D.Depth (m)</th><th>MH Connection</th><th>MH DIAM., L*W (mm)</th></tr><tr><td>4.003</td><td>o</td><td>225</td><td>16</td><td>35.820</td><td>34.448</td><td>1.147</td><td>Open Manhole</td><td>600</td></tr><tr><td>6.000</td><td>o</td><td>150</td><td>21</td><td>36.000</td><td>35.250</td><td>0.600</td><td>Junction</td><td></td></tr><tr><td>4.004</td><td>o</td><td>225</td><td>17</td><td>35.825</td><td>34.330</td><td>1.270</td><td>Open Manhole</td><td>600</td></tr><tr><td>4.005</td><td>o</td><td>225</td><td>18</td><td>35.825</td><td>34.244</td><td>1.356</td><td>Open Manhole</td><td>1200</td></tr><tr><td>4.006</td><td>o</td><td>225</td><td>19</td><td>35.500</td><td>34.222</td><td>1.053</td><td>Junction</td><td></td></tr><tr><td>1.009</td><td>o</td><td>225</td><td>10</td><td>35.550</td><td>33.872</td><td>1.453</td><td>Open Manhole</td><td>450</td></tr></table> Downstream Manhole <table><tr><th>PN</th><th>Length (m)</th><th>Slope (1:X)</th><th>MH Name</th><th>C.Level (m)</th><th>I.Level (m)</th><th>D.Depth (m)</th><th>MH Connection</th><th>MH DIAM., L*W (mm)</th></tr><tr><td>4.003</td><td>7.085</td><td>60.0</td><td>17</td><td>35.825</td><td>34.330</td><td>1.270</td><td>Open Manhole</td><td>600</td></tr><tr><td>6.000</td><td>9.969</td><td>11.8</td><td>17</td><td>35.825</td><td>34.405</td><td>1.270</td><td>Open Manhole</td><td>600</td></tr><tr><td>4.004</td><td>2.579</td><td>30.0</td><td>18</td><td>35.825</td><td>34.244</td><td>1.356</td><td>Open Manhole</td><td>1200</td></tr><tr><td>4.005</td><td>1.308</td><td>59.5</td><td>19</td><td>35.500</td><td>34.222</td><td>1.053</td><td>Junction</td><td></td></tr><tr><td>4.006</td><td>9.784</td><td>28.0</td><td>10</td><td>35.550</td><td>33.872</td><td>1.453</td><td>Open Manhole</td><td>450</td></tr><tr><td>1.009</td><td>4.279</td><td>85.6</td><td>22</td><td>35.550</td><td>33.822</td><td>1.503</td><td>Open Manhole</td><td>450</td></tr></table> Simulation Criteria for GRAVESEND SW.SWS <table><tr><td>Volumetric Runoff Coeff</td><td>1.000</td><td>Additional Flow - % of Total Flow</td><td>0.000</td></tr><tr><td>Areal Reduction Factor</td><td>1.000</td><td>MADD Factor * 10m³/ha Storage</td><td>0.000</td></tr><tr><td>Hot Start (mins)</td><td>0</td><td>Inlet Coefficient</td><td>0.800</td></tr><tr><td>Hot Start Level (mm)</td><td>0</td><td>Flow per Person per Day (l/per/day)</td><td>0.000</td></tr><tr><td>Manhole Headloss Coeff (Global)</td><td>0.500</td><td>Run Time (mins)</td><td>10000</td></tr><tr><td>Foul Sewage per hectare (l/s)</td><td>0.000</td><td>Output Interval (mins)</td><td>1</td></tr></table> Number of Input Hydrographs 0 Number of Storage Structures 1 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 Synthetic Rainfall Details <table><tr><td>Rainfall Model</td><td>FEH</td></tr><tr><td>Return Period (years)</td><td>100</td></tr><tr><td>FEH Rainfall Version</td><td>2013</td></tr><tr><td>Site Location</td><td>GB 564926 172407 TQ 64926 72407</td></tr><tr><td>Data Type</td><td>Point</td></tr><tr><td>Summer Storms</td><td>Yes</td></tr></table>			PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)	4.003	o	225	16	35.820	34.448	1.147	Open Manhole	600	6.000	o	150	21	36.000	35.250	0.600	Junction		4.004	o	225	17	35.825	34.330	1.270	Open Manhole	600	4.005	o	225	18	35.825	34.244	1.356	Open Manhole	1200	4.006	o	225	19	35.500	34.222	1.053	Junction		1.009	o	225	10	35.550	33.872	1.453	Open Manhole	450	PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)	4.003	7.085	60.0	17	35.825	34.330	1.270	Open Manhole	600	6.000	9.969	11.8	17	35.825	34.405	1.270	Open Manhole	600	4.004	2.579	30.0	18	35.825	34.244	1.356	Open Manhole	1200	4.005	1.308	59.5	19	35.500	34.222	1.053	Junction		4.006	9.784	28.0	10	35.550	33.872	1.453	Open Manhole	450	1.009	4.279	85.6	22	35.550	33.822	1.503	Open Manhole	450	Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000	Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000	Hot Start (mins)	0	Inlet Coefficient	0.800	Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000	Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	10000	Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1	Rainfall Model	FEH	Return Period (years)	100	FEH Rainfall Version	2013	Site Location	GB 564926 172407 TQ 64926 72407	Data Type	Point	Summer Storms	Yes	©1982-2020 Innovyze	
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Date 04/04/2022 File GRAVESEND SW.MDX	Designed by HM Checked by	
Innovyze Network 2020.1		
Synthetic Rainfall Details Winter Storms No Cv (Summer) 1.000 Cv (Winter) 1.000 Storm Duration (mins) 15		
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3 Cadman Court Leeds LS27 0RX	GRAVESEND SURFACE WATER	
Date 04/04/2022 File GRAVESEND SW.MDX	Designed by HM Checked by	
Innovyze	Network 2020.1	
<u>Online Controls for GRAVESEND SW.SWS</u> <u>Weir Manhole: 10, DS/PN: 1.009, Volume (m³): 1.1</u> Discharge Coef 0.544 Width (m) 0.450 Invert Level (m) 35.550		
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ARC Engineers Ltd		Page 7
3 Cadman Court Leeds LS27 0RX	GRAVESEND SURFACE WATER	
Date 04/04/2022 File GRAVESEND SW.MDX	Designed by HM Checked by	
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Storage Structures for GRAVESEND SW.SWS

Cellular Storage Manhole: 10, DS/PN: 1.009

Invert Level (m) 32.650 Safety Factor 5.0
 Infiltration Coefficient Base (m/hr) 0.03300 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.03300

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	182.7	182.7	2.010	0.0	291.1
2.000	182.7	290.8			

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3 Cadman Court
Leeds
LS27 0RX

Date 04/04/2022
File GRAVESEND SW.MDX

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GRAVESEND
SURFACE WATER

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Checked by

Network 2020.1

Page 8



Summary of Critical Results by Maximum Level (Rank 1) for GRAVESEND SW.SWS

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 0.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model

FEH

FEH Rainfall Version

2013

Site Location GB 564926 172407 TQ 64926 72407

Data Type

Point

Cv (Summer)

1.000

Cv (Winter)

1.000

Margin for Flood Risk Warning (mm) 300.0

DVD Status OFF

Analysis Timestep

Fine Inertia Status OFF

DTS Status

ON

Profile(s)

Summer and Winter

Duration(s) (mins)

15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Period(s) (years)

2, 30, 100

Climate Change (%)

0, 40, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1 15	Summer	100	+40%					35.620
1.001	2 15	Summer	100	+40%	100/15	Summer			35.630
1.002	3 15	Summer	100	+40%	30/15	Summer			35.430
1.003	4 15	Summer	100	+40%	100/15	Summer			35.325
1.004	5 15	Summer	100	+40%	100/15	Summer			35.264
1.005	6 15	Summer	100	+40%	100/15	Summer			35.144
1.006	7 15	Summer	100	+40%	30/15	Summer			35.017
2.000	11 15	Summer	100	+40%	30/15	Summer			34.914
3.000	12 15	Summer	100	+40%					35.334
1.007	8 15	Summer	100	+40%	30/15	Summer			34.893
1.008	9 15	Winter	100	+40%					34.204
4.000	13 15	Summer	100	+40%	100/15	Summer			35.719
5.000	20 15	Summer	100	+40%	100/15	Summer			35.722
4.001	14 15	Summer	100	+40%	100/15	Summer			35.689

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3 Cadman Court Leeds LS27 0RX	GRAVESEND SURFACE WATER	
Date 04/04/2022 File GRAVESEND SW.MDX	Designed by HM Checked by	
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Summary of Critical Results by Maximum Level (Rank 1) for GRAVESEND SW.SWS

PN	US/MH Name	Surcharged Flooded		Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)						
1.000	1	0.000	0.000	0.35			6.2	SURCHARGED*	
1.001	2	0.089	0.000	0.97			17.8	SURCHARGED	
1.002	3	0.090	0.000	1.78			21.4	SURCHARGED	
1.003	4	0.022	0.000	0.63			31.8	SURCHARGED	
1.004	5	0.138	0.000	0.67			40.0	SURCHARGED	
1.005	6	0.295	0.000	0.69			47.7	SURCHARGED	
1.006	7	0.444	0.000	0.70			48.9	SURCHARGED	
2.000	11	0.504	0.000	0.43			8.1	SURCHARGED	
3.000	12	-0.066	0.000	0.60			21.4	OK	
1.007	8	0.589	0.000	1.67			74.6	SURCHARGED	
1.008	9	0.000	0.000	2.10			93.7	SURCHARGED*	
4.000	13	0.269	0.000	0.39			7.1	FLOOD RISK	
5.000	20	0.197	0.000	0.32			22.1	FLOOD RISK	
4.001	14	0.437	0.000	0.87			45.1	FLOOD RISK	

ARC Engineers Ltd

3 Cadman Court
Leeds
LS27 0RX

Date 04/04/2022
File GRAVESEND SW.MDX

Innovyze

GRAVESEND
SURFACE WATER

Designed by HM
Checked by

Network 2020.1

Page 10



Summary of Critical Results by Maximum Level (Rank 1) for GRAVESEND SW.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
4.002	15	15 Summer	100	+40%	30/15 Summer				35.540
4.003	16	15 Summer	100	+40%	30/15 Summer				35.223
6.000	21	15 Summer	100	+40%					35.295
4.004	17	15 Summer	100	+40%	30/15 Summer				35.035
4.005	18	15 Summer	100	+40%	30/15 Summer				34.784
4.006	19	15 Winter	100	+40%					34.447
1.009	10	2160 Winter	100	+40%	100/480 Summer				34.290

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
4.002	15	0.483	0.000	0.91			56.0	FLOOD RISK	
4.003	16	0.550	0.000	1.25			60.7	SURCHARGED	
6.000	21	-0.105	0.000	0.20			10.2	OK*	
4.004	17	0.480	0.000	1.69			69.7	SURCHARGED	
4.005	18	0.315	0.000	2.38			71.1	SURCHARGED	
4.006	19	0.000	0.000	1.03			85.8	SURCHARGED*	
1.009	10	0.193	0.000	0.00			0.0	SURCHARGED	

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SUMMARY DRAINAGE REPORT



APPENDIX E – DRAINAGE EXCEEDANCE PLAN DRAWING

AIN TREE CLOSE

AIN TREE CLOSE

ASCOT ROAD

CENTRAL AVENUE

- DRAINAGE KEY:**
- FW 1.000 150mm @ 1.60 FOUL WATER PIPE (100mm UN O)
 - SW 1.000 150mm @ 1.60 SURFACE WATER PIPE (100mm UN O)
 - BACKDROP MANHOLE
 - EXISTING FW SEWER
 - EXISTING SW SEWER
 - SWMH01 CL = TBC IL = TBC SURFACE WATER MANHOLE
 - FM201 CL = TBC IL = TBC FOUL WATER MANHOLE
 - PPIC POLYPROPYLENE INSPECTION CHAMBER
 - CONNECTION TO EXISTING FW SEWER
 - EXISTING MANHOLE
 - ROAD GULLY
 - RODDING EYE
 - GULLY
 - FW GULLY
 - FOUL WATER GULLY
 - RWP RAINWATER PIPE
 - LINEAR DRAINAGE CHANNEL OR THRESHOLD DRAINAGE (BUILT IN FALLS)
 - SURFACE WATER ATTENUATION SOAKAWAY POLYSTORM OR SIMILAR SUITABLE FOR VEHICLE ACCESS MIN COVER 0.8m
 - PERMEABLE PAVING AREA
 - 600mm WIDE PERMEABLE PAVING COLLECTION TRENCH
 - SITE BOUNDARY
 - TREE ROOT PROTECTION ZONE
 - EXCEEDANCE FLOWS

EXTERNAL WORKS LEGEND

- DENOTES KERB TYPE K1 (125 x 225mm) HALF BALT
- ALL KERBS TO BE K1 UNLESS NOTED OTHERWISE
- DENOTES KERB TYPE D1 (125 x 150mm) DROPPED I
- PROPOSED SITE LEVEL
- EXISTING SITE LEVEL
- 300 THICK CAVITY FILL MASONRY WALL
- FOE (FLAG ON EDGE) WITH HEIGHT

DO NOT SCALE

For the avoidance of doubt, no approvals, reviews, comments or indication of satisfaction given by ARC Engineers in terms of submittal drawings, production or proposed materials shall reduce or extinguish the obligation of the sub-contractor or supplier to adhere to the specification, general arrangement drawings, statutory requirements and good working practice. ARC Engineers accept no liability for the selection of materials or workmanship in the execution of the works.

GENERAL NOTES

- These notes are intended to augment drawings and specifications. Where conflict of requirements exists the order of precedence shall be as shown in the specifications. Otherwise the original provision shall govern.
- This drawing is to be used in conjunction with all other relevant Engineers and Architects drawings.
- Drawings not to be scaled.
- All dimensions to be checked on site by the contractor. Any discrepancies to be notified to the Engineer/Architect and further instructions obtained before work is commenced.
- The structure is designed to be self supporting and stable after the building is fully complete. It is the contractor's sole responsibility to determine the erection procedure and sequence and ensure that the building and its components are safe during erection. This includes the addition of whatever temporary bracing, girders or beams which may be necessary, such material remaining the property of the contractor upon completion.
- All work to comply to current building regulations and to be in accordance with the relevant British Standards and appropriate Codes of Practice.
- For further notes refer to Project Notes.

SAFETY, HEALTH & ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following risks and information.

Risks listed here are not exhaustive. Refer to Risk Assessment Register: XXXXXXX

Construction:

ADD PROJECT NOTES HERE

Demolition

No Unusual hazards/risks

For information relating to Use, Cleaning and Maintenance see Health & Safety File

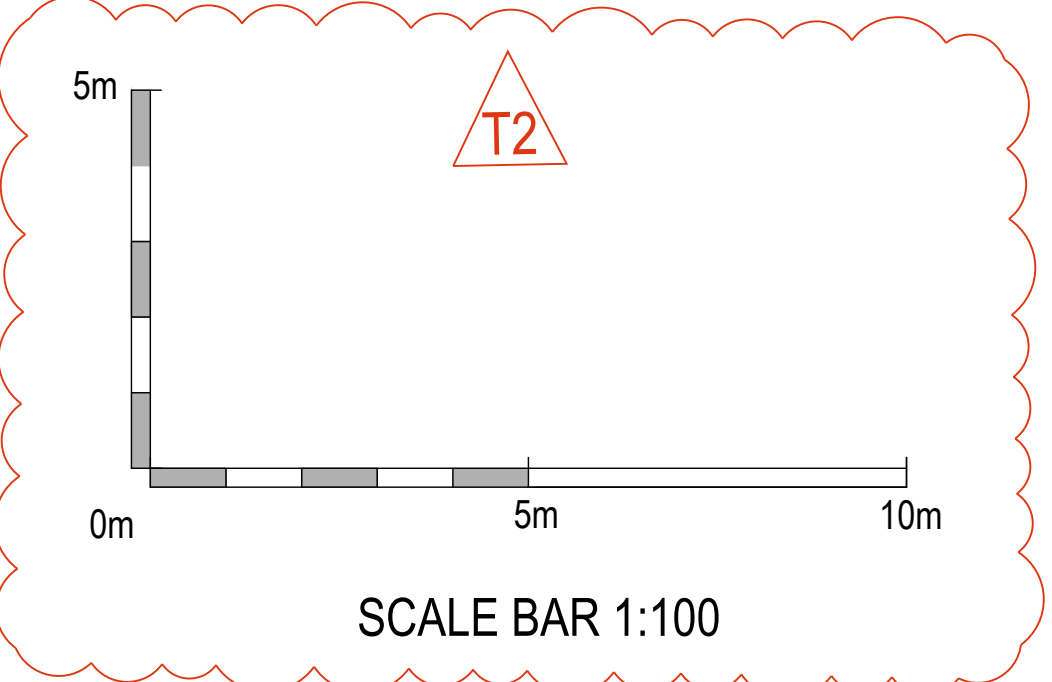
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION

INDICATES A RESIDUAL RISK FOR INFORMATION

INDICATES A RESIDUAL RISK REQUIRING PROHIBITIVE ACTION

INDICATES A RESIDUAL RISK AS A WARNING



T2	SCALE BAR ADDED	JAB	08.03.2023
T1	INITIAL ISSUE	JAB	05.10.2022
REV	DETAIL	BY	CHK DATE



CLIENT: AVERY

PROJECT: CARE HOME, CENTRAL AVENUE, GRAVESEND

TITLE: DRAINAGE EXCEEDANCE ROUTE PLAN

DRAWING STATUS: TENDER

ISSUE	DATE	05.10.2022	CREATED	DATE
JAB				

CONTRACT NO.	22026	SCALE @	1:100
PROJECT NO.	22026 - ARC - XX - XX - DR - D - 0504 - T2		

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SUMMARY DRAINAGE REPORT



APPENDIX F – SOAKAWAY, FALLING HEAD AND BOREHOLE LOGS

KEY:

WS - WINDOW SAMPLE

BH - BOREHOLE

I - INSTALLATION

TP - TRIAL PIT

HDP - HAND DUG TRIAL PIT

SP - SOAKAGE PIT

DCP - DYNAMIC CONE PENETRATION

DP - DYNAMIC PROBE

HA - HAND AUGER

PT - PERCOLATION TEST

GM - GAS MONITORING STANDPIPE

S - SAMPLE LOCATION

CLIENT:

JENNER CONTRACTORS

SITE ADDRESS:

NEW CARE HOME

CENTRAL AVENUE

GRAVESEND

DA12 5AW

DRAWING NO.:

FIGURE 1

DRAWING TITLE:

EXPLORATORY HOLE LOCATION PLAN

PROJECT NO.:

12992

DATE:

01/2023

DRAWN:

PJ

REVISION:

GROUND AND ENVIRONMENTAL SERVICES (GES) LIMITED

UNIT 2

MONTPELIER BUSINESS PARK

DENCORA WAY

ASHFORD

KENT TN23 4FG

TEL: 01233 646 237





Ground and Environmental Services Limited

Unit 2 Montpelier Business Park
Dencora Way, Ashford
Kent TN23 4FG

Tel: 01233 646237

Trial Pit No. SP1

Sheet: 1 of 1

Equipment & Methods.
JCB 3CX Pit Dimensions 1.80m by 0.50m.
Support Used: None

Project Name: New Care Home
Project Location: Gravesend
Client: Jenner Contractors

Job No:
12992

Co-ordinates:
E:
N:

Ground Level (m):

Date Started: 27/01/2023
Date Completed: 27/01/2023

Samples and In situ Testing

Depth
(m)

No.

Type

Result

Field Records

DESCRIPTION

Reduced
Level
(m)

Legend

Depth
(Thick)
(m)

2.95

D

MADE GROUND - Tarmac and Type 1.

MADE GROUND - Type 1 fill.

Brown, slightly silty CLAY.

-0.05

(0.05)

-0.20

(0.15)

0.20

-2.40

2.40

(0.50)

-2.90

-2.95

2.90

(2.95)

Clayey CHALK with frequent fine to cobble flint gravel.

Fine CHALK with frequent medium to cobble sub-angular to sub-rounded flint gravel and chalk gravel fragments.

End of Trial Pit 2.95 m
(Thickness of basal layer not proven)

Remarks:

Logged By:

Checked By:

PJ

Scale:
1:19.75

Approved By:

FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.



SOAKAWAY TESTING

Test in accordance with BRE 365 Guidelines

Project Reference Number: 12992 Client: Jenner Contractors

Site: New Care Home

Location: Central Avenue, Gravesend, DA12 5AW

SP 1 Test
1 / 1

Weather: Clear skies, sunny

Date of Test: 27-Jan-23

TRIAL PIT DIMENSIONS

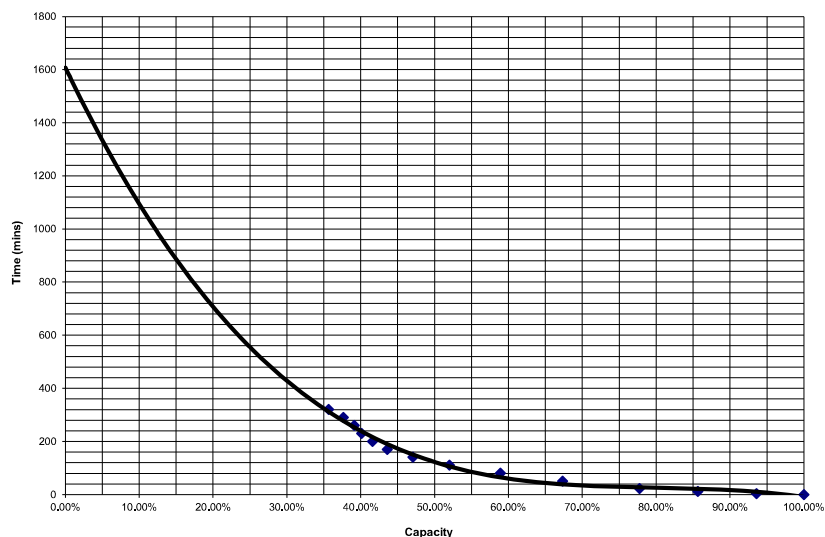
Width (m): 0.5 Length (m): 1.8

Depth (m): 2.95 Invert Depth (m): 0.93

Drainage time of test (mins): 321 (64% Drained)

SOAKAGE RESULTS

Depth	(%)	Time
0.93	100.00%	0
1.06	93.56%	4
1.22	85.64%	12
1.38	77.72%	23
1.59	67.33%	51
1.76	58.91%	81
1.9	51.98%	111
2	47.03%	141
2.07	43.56%	171
2.11	41.58%	201
2.14	40.10%	231
2.16	39.11%	261
2.19	37.62%	291
2.23	35.64%	321
2.95	0.00%	



INFILTRATION RATE

Depth (B.G.L) (m)	Infiltration Rate (m/s)
0.93 - 2.95	5.15E-06

Departures from the specified test method: None

Remarks: low infiltration-rate based on extrapolation of test data

Authorised Signatory: C SPANTON Date: 1 / 02 / 2023



SOAKAWAY TESTING

Test in accordance with BRE 365 Guidelines

Project Reference Number: 12992 Client: Jenner Contractors
Site: New Care Home
Location: Central Avenue, Gravesend, DA12 5AW

SP 2 Test
1 / 1

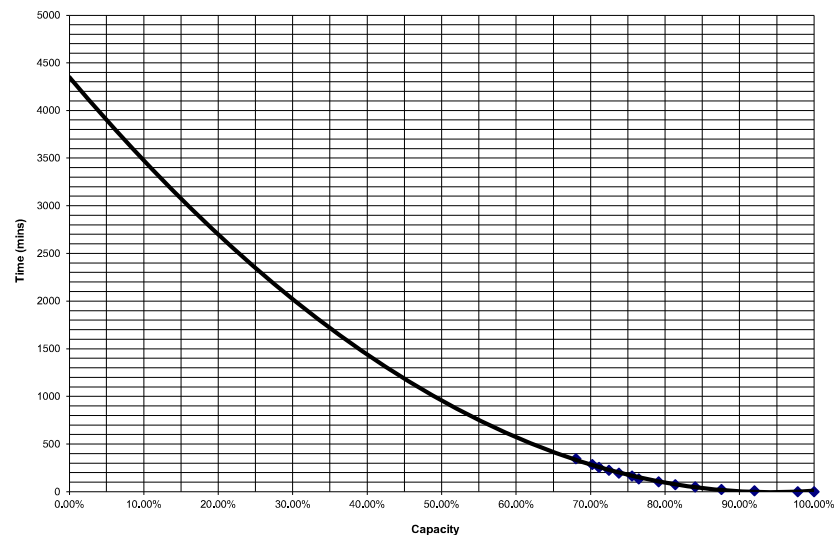
Weather: Clear skies, sunny
Date of Test: 27-Jan-23

TRIAL PIT DIMENSIONS

Width (m): 0.5 Length (m): 2
Depth (m): 3.25 Invert Depth (m): 1
Drainage time of test (mins): 346 (32% Drained)

SOAKAGE RESULTS

Depth	(%)	Time
1	100.00%	0
1.05	97.78%	1
1.18	92.00%	11
1.28	87.56%	26
1.36	84.00%	50
1.42	81.33%	76
1.47	79.11%	106
1.53	76.44%	136
1.55	75.56%	166
1.59	73.78%	196
1.62	72.44%	226
1.65	71.11%	256
1.67	70.22%	286
1.72	68.00%	346
3.25	0.00%	



INFILTRATION RATE

Depth (B.G.L) (m)	Infiltration Rate (m/s)
1.00-3.25	1.30E-06

Departures from the specified test method: None

Low infiltration - rate based on extrapolation of test data

Remarks: _____

Authorised Signatory: C SPANTON Date: 1 / 02 / 2023



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park
Dencora Way, Ashford
Kent TN23 4FG

Tel: 01233 646237

Trial Pit No. SP2

Sheet: 1 of 1

Equipment & Methods.
JCB 3CX Pit Dimensions 2.00m by 0.50m.
Support Used: None

Project Name: New Care Home
Project Location: Gravesend
Client: Jenner Contractors

Job No:
12992

Co-ordinates:
E:
N:

Ground Level (m):

Date Started: 27/01/2023
Date Completed: 27/01/2023

Samples and In situ Testing

Depth
(m)

No.

Type

Result

Field Records

DESCRIPTION

Reduced
Level
(m)

Legend

Depth
(Thick)
(m)

3.25

D

MADE GROUND - turf over topsoil.

Brown slightly silty CLAY with occasional gravel. Gravel is medium to cobble-sized sub-angular to sub-rounded flint.

-0.02

(0.02)

(1.93)

-1.95

1.95

-2.10

(0.15)
2.10

(1.15)

-3.25

3.25

End of Trial Pit 3.25 m
(Thickness of basal layer
not proven)

Remarks:

Logged By:

Checked By:

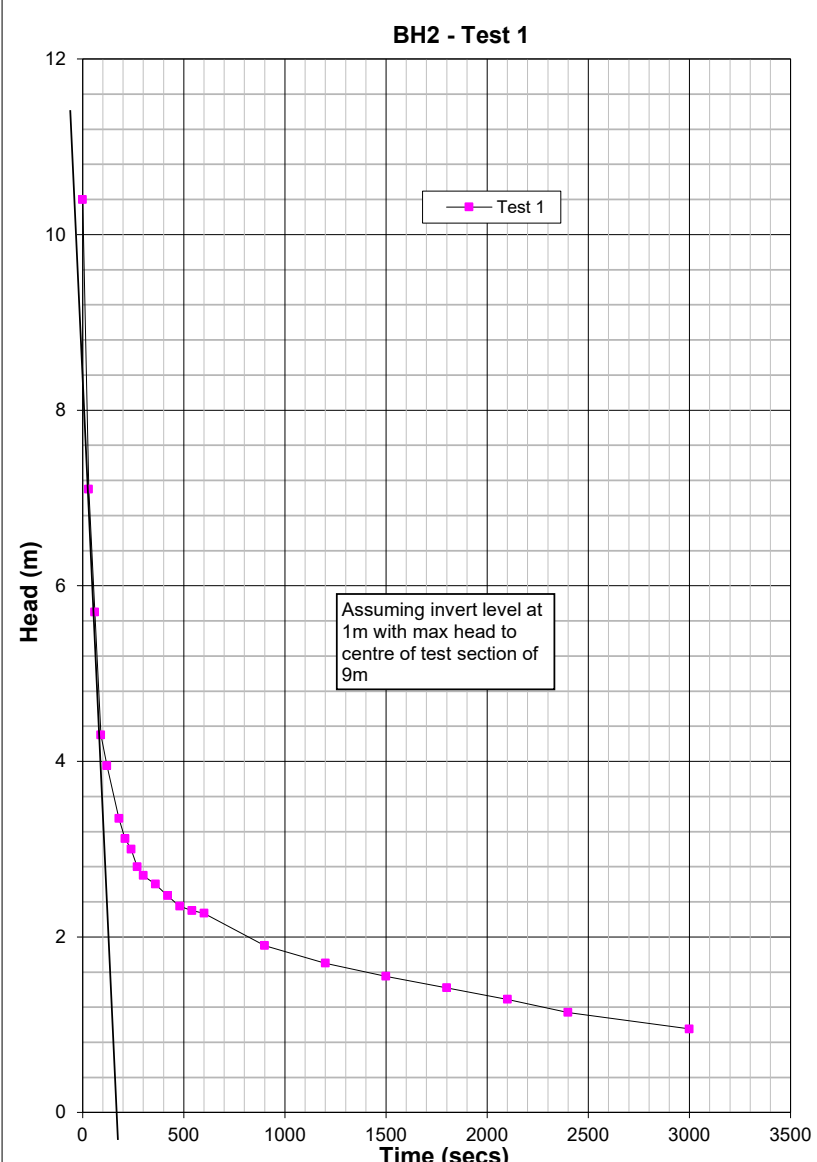
PJ

Scale:
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Approved By:

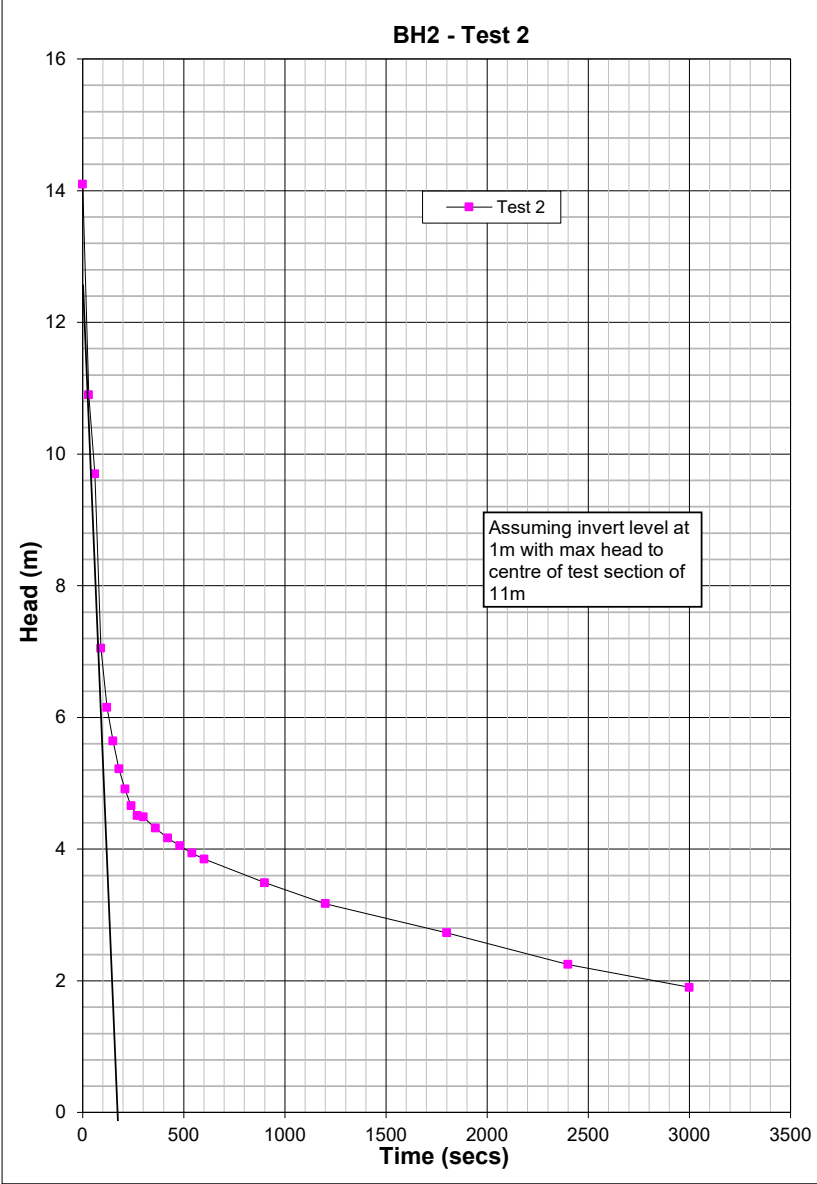
FIG No.

Notes: For explanation of symbols and abbreviations, see Key Sheet.

		New Care Home, Central Avenue, Gravesend				BH2		
Top section Bottom section	9 11	m m	Centre section Diameter of test section	10 0.15	m m	Diameter of Hole Length of test section	0.15 2	m m
Water Level		dry m						
Time (Seconds)	Depth	Head						
0	0.6	10.4						
30	3.9	7.1						
60	5.3	5.7						
90	6.7	4.3						
120	7.05	3.95						
180	7.65	3.35						
210	7.88	3.12						
240	8	3						
270	8.2	2.8						
300	8.3	2.7						
360	8.4	2.6						
420	8.53	2.47						
480	8.65	2.35						
540	8.7	2.3						
600	8.73	2.27						
900	9.1	1.9						
1200	9.3	1.7						
1500	9.45	1.55						
1800	9.58	1.42						
2100	9.71	1.29						
2400	9.86	1.14						
3000	10.05	0.95						
			BH2 - Test 1					
								
			METHODOLOGY IN ACCORDANCE WITH KCC SOAKAWAY DESIGN GUIDE, JULY 2000.					
Soakage Rate:	$250 \cdot H_p \cdot d^2$		H_p	9.2	m		t_h	3 mins
	$D \cdot L \cdot t_h$		Very good Infiltration - 1000L added to borehole in 240 seconds. Constant head at 0.6m for 1 minute 10 seconds. Borehole collapsed to 10.2m during the test					
=	57.50	L/m²/min	After BS5930:1999 $k(\text{approx}) = 1.7 \times 10^{-3} \text{m/s}$ ESTIMATED					

	New Care Home, Central Avenue, Gravesend					BH2		
Top section Bottom section	9 15	m m	Centre section Diameter of test section	12 0.15	m m	Diameter of Hole Length of test section	0.15 6	m m
Water Level		dry m						

Time (Seconds)	Depth	Head
0	0.9	14.1
30	4.1	10.9
60	5.3	9.7
90	7.95	7.05
120	8.85	6.15
150	9.36	5.64
180	9.78	5.22
210	10.09	4.91
240	10.34	4.66
270	10.49	4.51
300	10.51	4.49
360	10.68	4.32
420	10.83	4.17
480	10.95	4.05
540	11.06	3.94
600	11.15	3.85
900	11.51	3.49
1200	11.83	3.17
1800	12.27	2.73
2400	12.75	2.25
3000	13.1	1.9

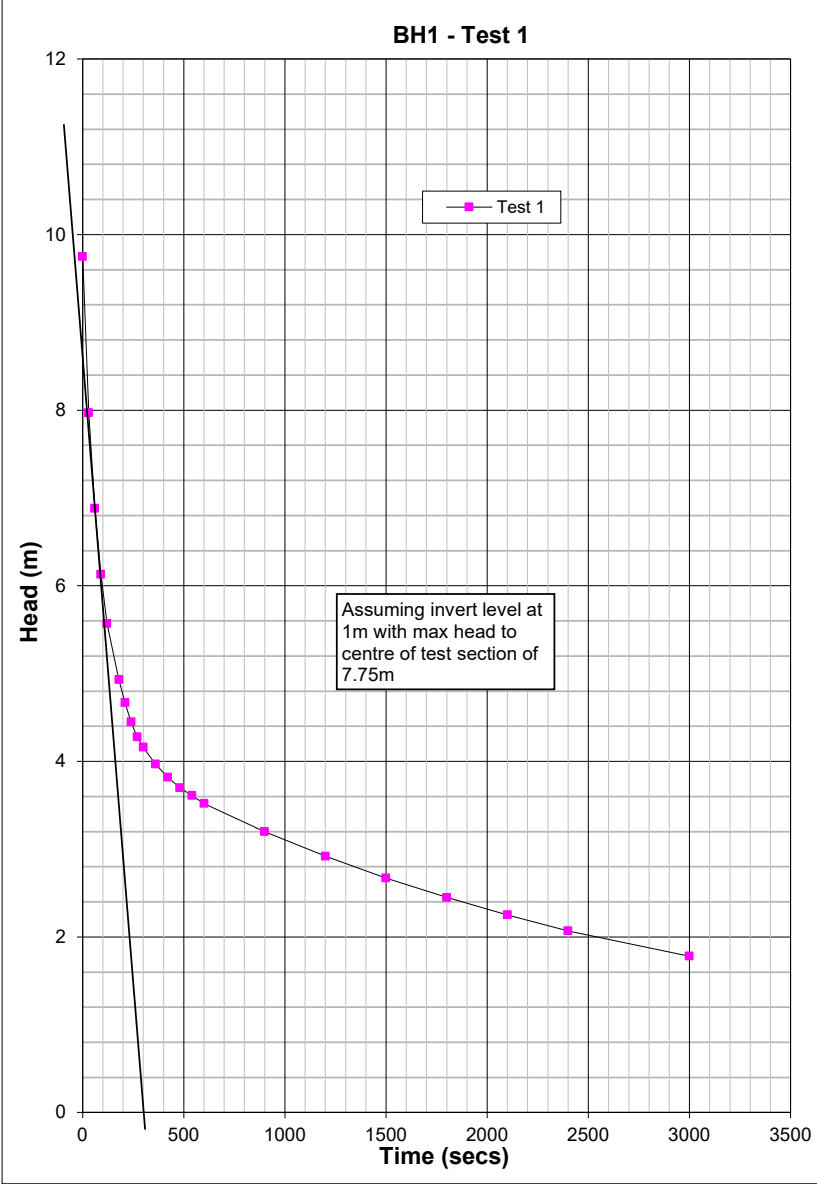


BH2 - Test 2

METHODOLOGY IN ACCORDANCE WITH KCC SOAKAWAY DESIGN GUIDE, JULY 2000.									
Soakage Rate:	250*Hp*d^2	Hp	12	m	th	3.5	mins		
	D*L*th	Very good Infiltration - 1000L added to borehole in 250 seconds. Borehole collapsed to 13.9m during the test							
=	21.43	L/m^2/min	After BS5930:1999 k(approx) = 1.6x10 ⁻³ m/s ESTIMATED						

		New Care Home, Central Avenue, Gravesend				BH1					
Top section		7.5	m	Centre section		8.75	m	Diameter of Hole		0.15	m
Bottom section		10	m	Diameter of test section		0.15	m	Length of test section		2.5	m
Water Level		dry									

Time (Seconds)	Depth	Head
0	0.25	9.75
30	2.03	7.97
60	3.12	6.88
90	3.87	6.13
120	4.43	5.57
180	5.07	4.93
210	5.33	4.67
240	5.55	4.45
270	5.72	4.28
300	5.84	4.16
360	6.03	3.97
420	6.18	3.82
480	6.3	3.7
540	6.39	3.61
600	6.48	3.52
900	6.8	3.2
1200	7.08	2.92
1500	7.33	2.67
1800	7.55	2.45
2100	7.75	2.25
2400	7.93	2.07
3000	8.22	1.78



METHODOLOGY IN ACCORDANCE WITH KCC SOAKAWAY DESIGN GUIDE, JULY 2000.									
Soakage Rate:	$250 \cdot H_p \cdot d^2$	Hp	8.25	m	th	5	mins		
	$D \cdot L \cdot th$	Very good Infiltration - 1000L added to borehole in 280 seconds. Constant head at 0.25m for 40 seconds. Borehole collapsed to 9.35m during the test							
=	24.75	L/m²/min		After BS5930:1999		k(approx) = 4.3 x10⁻⁴m/s		ESTIMATED	



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH1

Sheet: 1 of 3

Equipment & Methods. Dando 150 _Backfill: Arisings					Project Name: New Care Home Project Location: Central Avenue, Gravesend, Kent Client: Jenner (Contractors) Ltd			Job No: 12992		
Co-ordinates: E: N:					Ground Level (m):			Date Started:01/02/2023 Date Completed:07/02/2023		
Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)		
Depth (m)	No.	Type	Result							
0.70		D		3,4/4,5,6,5	MADE GROUND: Grass over silty sandy clayey topsoil with frequent roots	-0.70		(0.70)		
1.00- 1.45		SS	SN=20		Stiff orange brown silty gravelly CLAY. Gravel is fine to coarse flint		0.70			
1.60		D		3,5/5,4,5,5				(1.50)		
2.00- 2.45		SS	SN=19							
2.60		D		4,5/4,5,5,5	Off white and light brown highly weathered CHALK. recovered as fine to coarse chalk gravel in a silt matrix	-2.20		2.20		
3.00- 3.45		SS	SN=19		White partially weathered CHALK. Recovered as fine to coarse chalk gravel in a comminuted silt matrix. Scattered flint throughout	-2.60		(0.40)		
3.70		D		2,4/5,4,4,3				2.60		
4.00- 4.45		SS	SN=15							
4.60		D		3,3/4,3,3,4						
5.00- 5.45		SS	SN=14							
6.00		D		2,4/5,4,4,3						
6.50- 6.95		SS	SN=16							
7.00		D		2,3/3,4,3,5						
8.00		SS	SN=15							
8.00- 8.45		D		2,2/3,4,4,4						
9.00		SS	SN=15							
9.50- 9.95		D		2,3/3,4,5,4						
10.00		SS	SN=16							
11.00		D		3,3/4,5,4,4						
11.00- 11.45		SS	SN=17							
12.00		D						(17.40)		
Remarks:						Logged By:		Checked By:		
						DPR		CSS		
						Scale: 1:60		Approved By:		
Notes: For explanation of symbols and abbreviations, see Key Sheet.						FIG No.		.1		



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH1

Sheet: 2 of 3

Equipment & Methods. Dando 150 _Backfill: Arisings					Project Name: New Care Home Project Location: Central Avenue, Gravesend, Kent Client: Jenner (Contractors) Ltd			Job No: 12992		
Co-ordinates: E: N:					Ground Level (m):			Date Started:01/02/2023 Date Completed:07/02/2023		
Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)		
Depth (m)	No.	Type	Result							
12.00- 12.45		SS								
13.00		D								
14.00		D	SN=32	3,3/5,7,8,12						
14.00- 14.45		SS								
15.00		D								
15.50- 15.95		SS	SN=34	4,4/7,8,9,10						
16.00		D								
17.00		D	SN=35	4,6/6,8,9,12						
17.00- 17.45		SS								
18.00		D								
18.50- 18.95		SS	SN=35	4,7/7,9,9,10						
19.00		D								
20.00		D	SN=36	4,5/8,8,9,11						
20.00- 20.45		SS								
						-20.00	20.00			
						End of Borehole 20.00 m (Thickness of basal layer not proven)				
Remarks:						Logged By:		Checked By:		
						DPR		CSS		
						Scale: 1:60		Approved By:		
Notes: For explanation of symbols and abbreviations, see Key Sheet.						FIG No.		.2		



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH1

Sheet: 3 of 3

Equipment & Methods.

Dando 150
_Backfill: Arisings

Project Name: New Care Home

Project Location: Central Avenue, Gravesend, Kent

Client: Jenner (Contractors) Ltd

Job No:

12992

Co-ordinates:

E:

N:

Ground Level (m):

Date Started:01/02/2023

Date Completed:07/02/2023

Water Level Observations During Boring

Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks
1-2-23	00:00	2.00		dry	end of shift
6-2-23	08:00	2.00		dry	start of shift
6-2-23	15:00	12.00	6.00	dry	end of shift
7-2-23	08:00	12.00	6.00	dry	start of shift
7-2-23	14:00	20.00	6.00	dry	end of borehole

Hole Diameter by Depth Table

Depth of Hole (m)	Diameter of Hole (mm)	Diameter of Casing (mm)	Depth of Casing (m)
20.00	150	150	9.00

Remarks:

Logged By:

DPR

Checked By:

CSS

Scale:
1:60

Approved By:

FIG No.

.3

Notes: For explanation of symbols and abbreviations, see Key Sheet.



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH2

Sheet: 1 of 3

Equipment & Methods. Dando 150 Backfill: Arisings					Project Name: New Care Home Project Location: Central Avenue, Gravesend, Kent Client: Jenner (Contractors) Ltd			Job No: 12992		
Co-ordinates: E: N:					Ground Level (m):			Date Started:30/01/2023 Date Completed:01/02/2023		
Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)		
Depth (m)	No.	Type	Result							
0.50		D			MADE GROUND: Grass over silty sandy clayey topsoil with frequent roots			(0.80)		
1.00- 1.45		SS	SN=29	4,6/7,7,7,8	Off white and light brown highly weathered CHALK. recovered as fine to coarse chalk gravel in a silt matrix	-0.80		0.80		
1.70		D								
2.00- 2.45		SS	SN=24	3,5/5,6,7,6				(2.10)		
2.60		D								
3.00- 3.45		SS	SN=19	4,6/5,4,5,5	...from 2.60 to 2.90 flints	-2.90		2.90		
3.50		D			White partially weathered CHALK. Recovered as fine to coarse chalk gravel in a comminuted silt matrix. Scattered flint throughout					
4.00- 4.45		SS	SN=17	3,4/5,4,4,4						
4.60		D								
5.00- 5.45		SS	SN=19	3,4/4,5,4,6						
6.00		D								
6.50- 6.95		SS	SN=16	3,3/4,3,4,5						
7.00		D								
8.00		D	SN=23	4,5/6,5,6,6						
8.00- 8.45		SS								
9.00		D								
9.50- 9.95		SS	SN=25	4,5/5,6,6,8	...from 9.10 to 9.50 flints					
10.00		D			...from 9.70 to 10.00 flints					
11.00		D	SN=22	3,5/5,6,6,5						
11.00- 11.45		SS						(17.10)		
Remarks:						Logged By:		Checked By:		
						DPR		CSS		
						Scale: 1:60		Approved By:		
Notes: For explanation of symbols and abbreviations, see Key Sheet.						FIG No.		.1		



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
Dencora Way, Ashford,
Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH2

Sheet: 2 of 3

Equipment & Methods. Dando 150 _Backfill: Arisings					Project Name: New Care Home Project Location: Central Avenue, Gravesend, Kent Client: Jenner (Contractors) Ltd			Job No: 12992		
Co-ordinates: E: N:					Ground Level (m):			Date Started:30/01/2023 Date Completed:01/02/2023		
Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)		
Depth (m)	No.	Type	Result							
13.00 13.00- 13.45		D SS	SN=29	3,5/6,7,7,9						
14.00		D								
15.00 15.00- 15.45		D SS	SN=27	4,5/5,6,7,9						
16.00 16.00- 16.45		D SS	SN=46	4,7/7,10,12,17						
17.00		D								
17.50- 17.95		SS	SN=40	5,6/8,9,10,13						
18.00		D								
19.00		D								
19.50- 19.95		SS	SN=37	3,7/8,8,9,12						
						-20.00		20.00		
						End of Borehole 20.00 m (Thickness of basal layer not proven)				
Remarks:							Logged By:		Checked By:	
							DPR		CSS	
							Scale: 1:60		Approved By:	
Notes: For explanation of symbols and abbreviations, see Key Sheet.							FIG No.		.2	



Ground and Environmental Services Limited

Unit 2 Montpelier Business Park,
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Kent TN23 4FG

Tel: 01233 646237

Borehole No. BH2

Sheet: 3 of 3

Equipment & Methods.

Dando 150
_Backfill: Arisings

Project Name: New Care Home

Project Location: Central Avenue, Gravesend, Kent

Client: Jenner (Contractors) Ltd

Job No:

12992

Co-ordinates:

E:

N:

Ground Level (m):

Date Started:30/01/2023

Date Completed:01/02/2023

Water Level Observations During Boring

Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks
30-1-23	00:00	6.50	1.50	dry	end of shift
31-1-23	08:00	6.50	1.50	dry	start of shift
31-1-23	16:00	15.00	9.00	dry	end of shift
1-2-23	09:00	15.00	9.00	dry	start of shift
1-2-23	13:00	20.00	9.00	dry	end of borehole

Hole Diameter by Depth Table

Depth of Hole (m)	Diameter of Hole (mm)	Diameter of Casing (mm)	Depth of Casing (m)
20.00	150	150	9.00

Chiselling Details

From (m)	To (m)	Time Taken (hhmm)	Chiselling Tool Used	Notes
2.60	2.90	00:15		flints
9.10	9.50	00:30		flints
9.70	10.00	00:15		flints

Remarks:

Logged By:

DPR

Checked By:

CSS

Scale:
1:60

Approved By:

FIG No.

.3

Notes: For explanation of symbols and abbreviations, see Key Sheet.