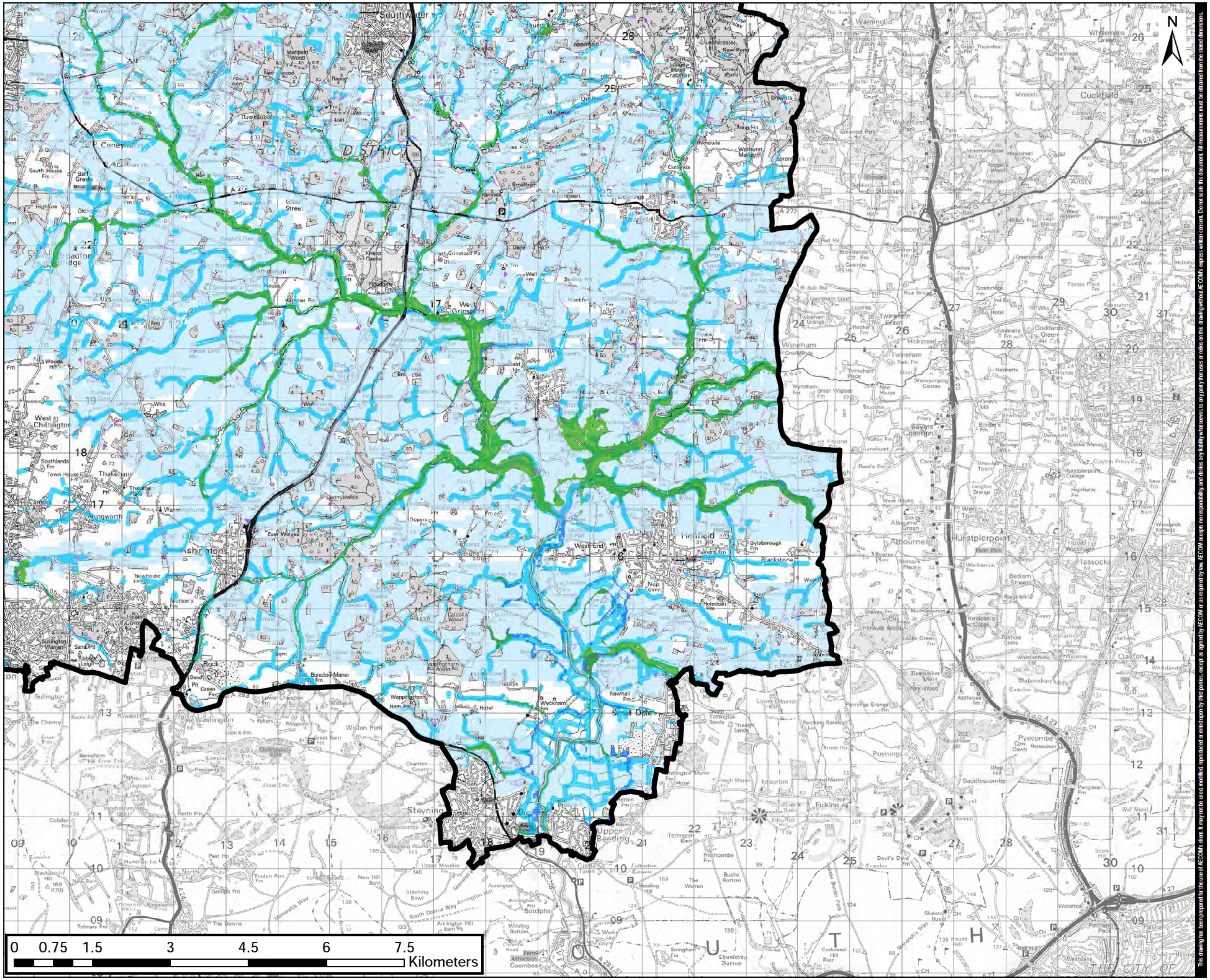
Revision: 1 Drawn: AH Checked: LM/EC Approved: RM Date: 2024-08-05



AECOM

PROJECT

Horsham District Council
Level 1 Strategic Flood Risk Assessment

CLIENT

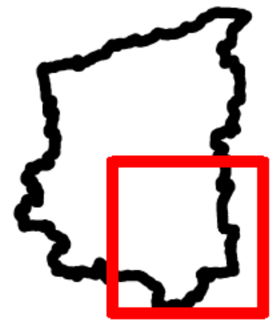
Horsham District Council

CONSULTANT

AECOM Limited
3rd Floor Portwall Place
Portwall Lane
Bristol, United Kingdom
T +44 (0)117 315 0700

LEGEND

- Horsham District Boundary
- Runoff Attenuation Features 1% AEP
- Runoff Attenuation Features 3.33% AEP
- Floodplain Woodland Potential
- Floodplain Reconnection Potential
- Riparian Woodland Potential
- Wider Catchment Woodland Potential



NOTES

1: These datasets have been produced as part of the Mapping Potential for Working with Natural Processes (WWNP) research project. The project created a toolbox of mapped data and methods which enable operational staff in England to identify potential locations. WWNPs involves implementing measures that help to protect, restore and emulate the natural functions of catchments, floodplains, rivers and the coast. The WWNP datasets were downloaded from the DEFRA data services platform: https://environment.data.gov.uk/.

ISSUE PURPOSE

FINAL

PROJECT NUMBER

60730513

FIGURE TITLE

Opportunities to Reduce the Causes and Impacts of Flooding

FIGURE NUMBER

Figure A12-D

APPENDIX F: PROPOSED SURFACE WATER DRAINAGE

F.1 Existing Impermeable Areas Plan (25087-SWD-DP-02 C01)

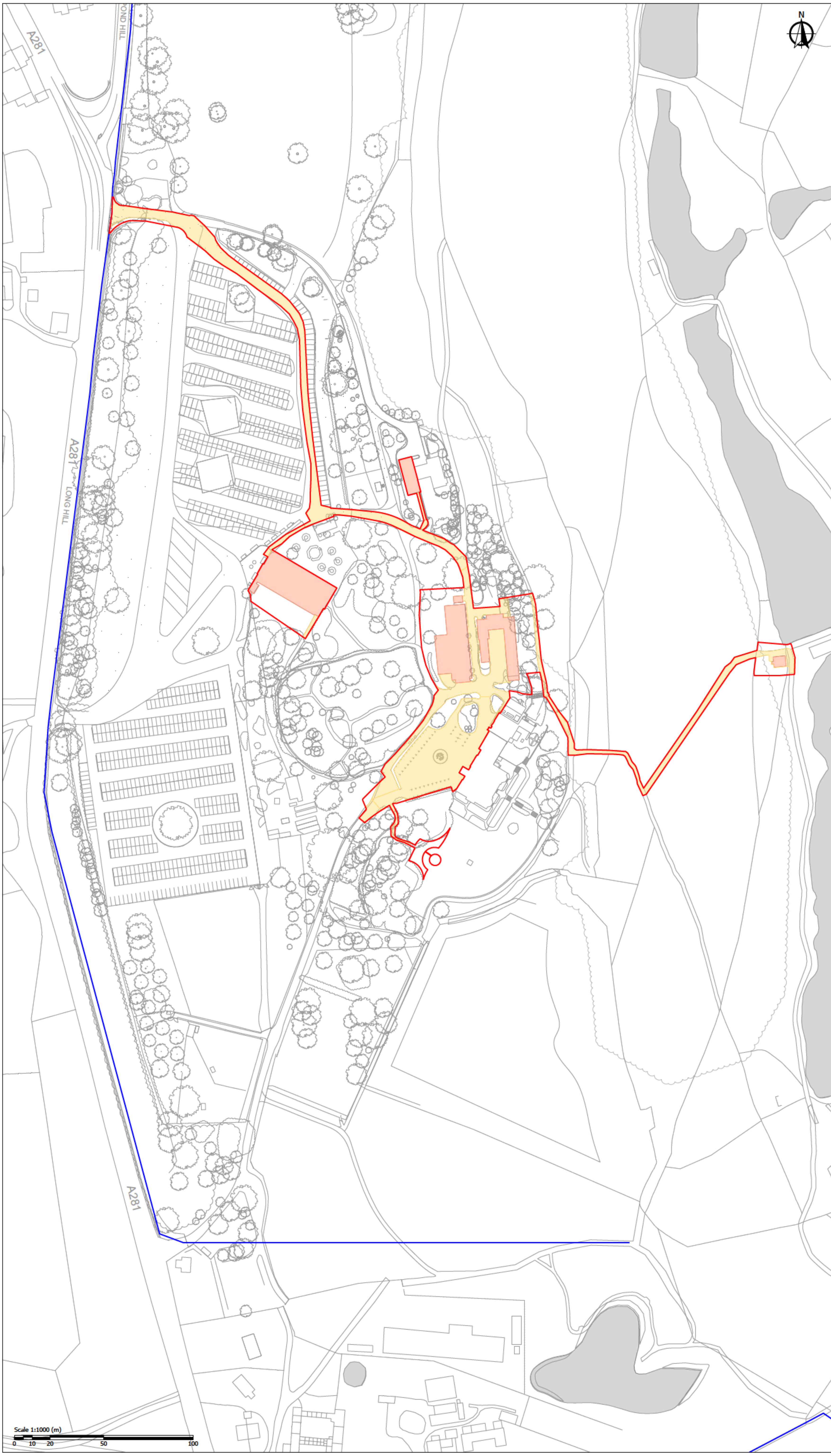
F.2 Proposed Impermeable Areas Plan (25087-SWD-DP-03 C01)

F.3 Proposed Surface Water Drainage Plan (25087-SWD-DP-01 C01)

F.4 Proposed Surface Water Drainage Calculations (25087-SWD-MH-01-P02)

F.5 Exceedance Flow Plan (25087-SWD-DP-04 C01)

F.6 Horsham District Council Surface Water Drainage Statement: Pro-Forma



NOTES

1. Dimensions in metres and levels in m AOD unless otherwise stated. Do not scale.
2. Existing site layout based on Purcell UK drawing 242769-PUR-00-SL-M2-A-1001 P03.
3. Please refer to Water Environment Proposed Impermeable Areas Plan (ref: 25087-SWD-DP-03) for details of proposed impermeable areas.

	Area (ha)
Roads/Car Parking/Footpaths	0.580
Buildings	0.214
Soft Landscaping	0.286
Total Site Area	1.079

LEGEND

- Site Boundary
- Ownership Boundary
- Impermeable Area - Access Roads, Car Parking and Footpaths
- Impermeable Area - Buildings

FOR PLANNING

REV	DATE	AMENDMENTS	DRAW	APPR
C01	17/12/2025	Issued for planning	JA	GL
P02	12/12/2025	Revised to suit updated red line boundary	JA	GL

WATER | ENVIRONMENT
6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

CLIENT: Purcell UK

PROJECT: Leonardslee Lakes & Gardens

DRAWING: Existing Impermeable Areas Plan

DRAWING NUMBER: 25087-SWD-DP-02

REVISION: C01

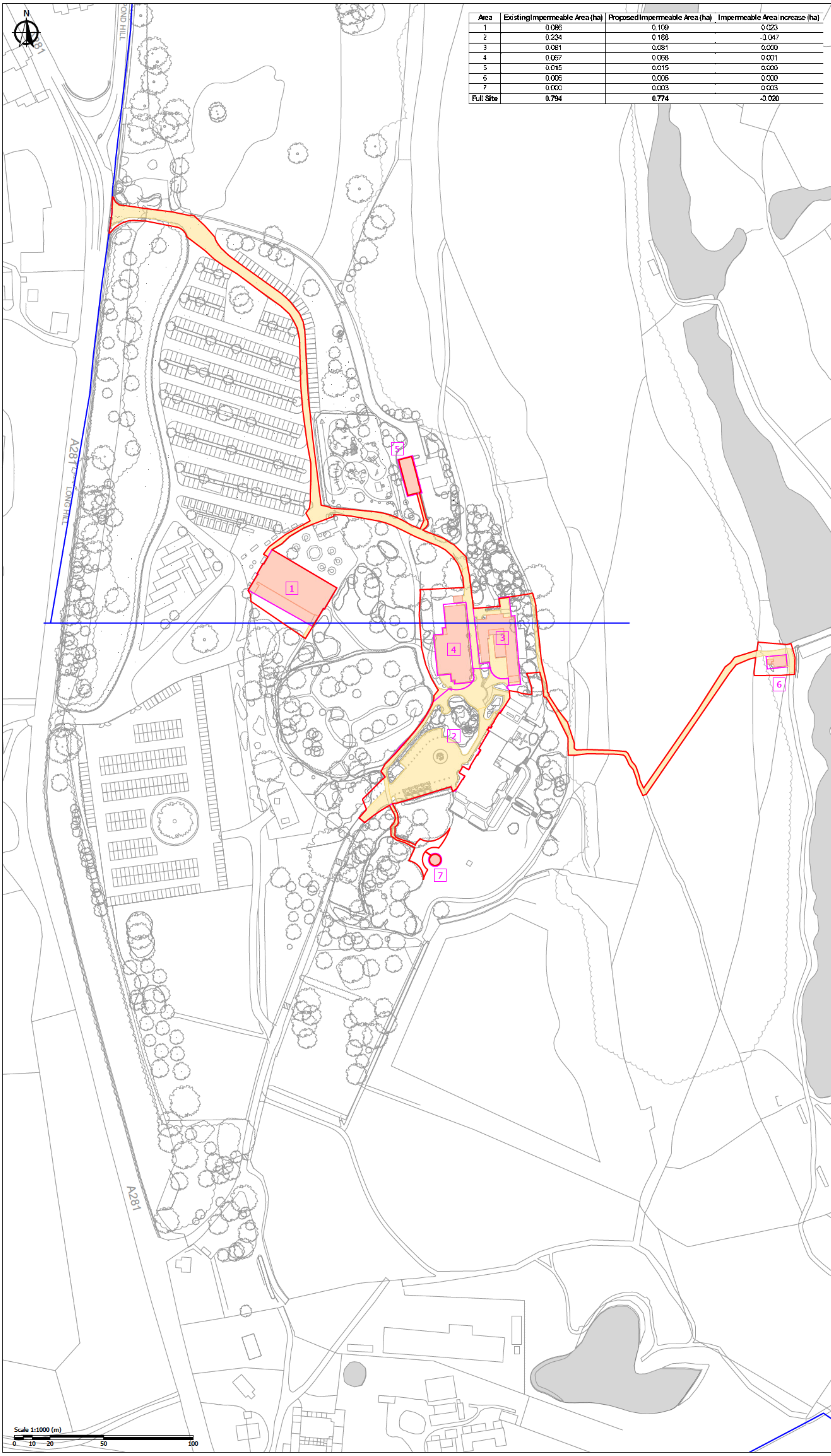
SCALE @A1: 1:1000

DATE: 28/11/2025

DRAWN BY: JA

CHECKED BY: GL

APPROVED BY: GL



Area	Existing Impermeable Area (ha)	Proposed Impermeable Area (ha)	Impermeable Area Increase (ha)
1	0.086	0.109	0.023
2	0.234	0.188	-0.047
3	0.081	0.081	0.000
4	0.067	0.068	0.001
5	0.015	0.015	0.000
6	0.006	0.006	0.000
7	0.000	0.003	0.003
Full Site	**0.794**	**0.774**	**-0.020**

NOTES

1. Dimensions in metres and levels in m AOD unless otherwise stated. Do not scale.
2. Proposed site layout based on Purcell UK drawing 242769-PUR-00-SL-M2-A-2001 P03.
3. Please refer to Water Environment Existing Impermeable Areas Plan (ref: 25087-SWD-DP-02) for full details of existing impermeable areas.
4. Areas of proposed development divided as per Section 4.4 of the Purcell UK Design and Access Statement.

	Area (ha)
Roads/Car Parking/Footpaths	0.521
Buildings	0.253
Soft Landscaping	0.305
Total Site Area	**1.079**

LEGEND

- Site Boundary
- Ownership Boundary
- Impermeable Area - Access Roads, Car Parking and Footpaths
- Impermeable Area - Buildings

FOR PLANNING

REV	DATE	AMENDMENTS	DRAW	APPR
C01	17/12/2025	Issued for planning	JA	GL
P02	12/12/2025	Revised to suit updated red line boundary	JA	GL

WATER | ENVIRONMENT
6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

CLIENT: Purcell UK

PROJECT: Leonardslee Lakes & Gardens

DRAWING: Proposed Impermeable Areas Plan

DRAWING NUMBER: 25087-SWD-DP-03

REVISION: C01

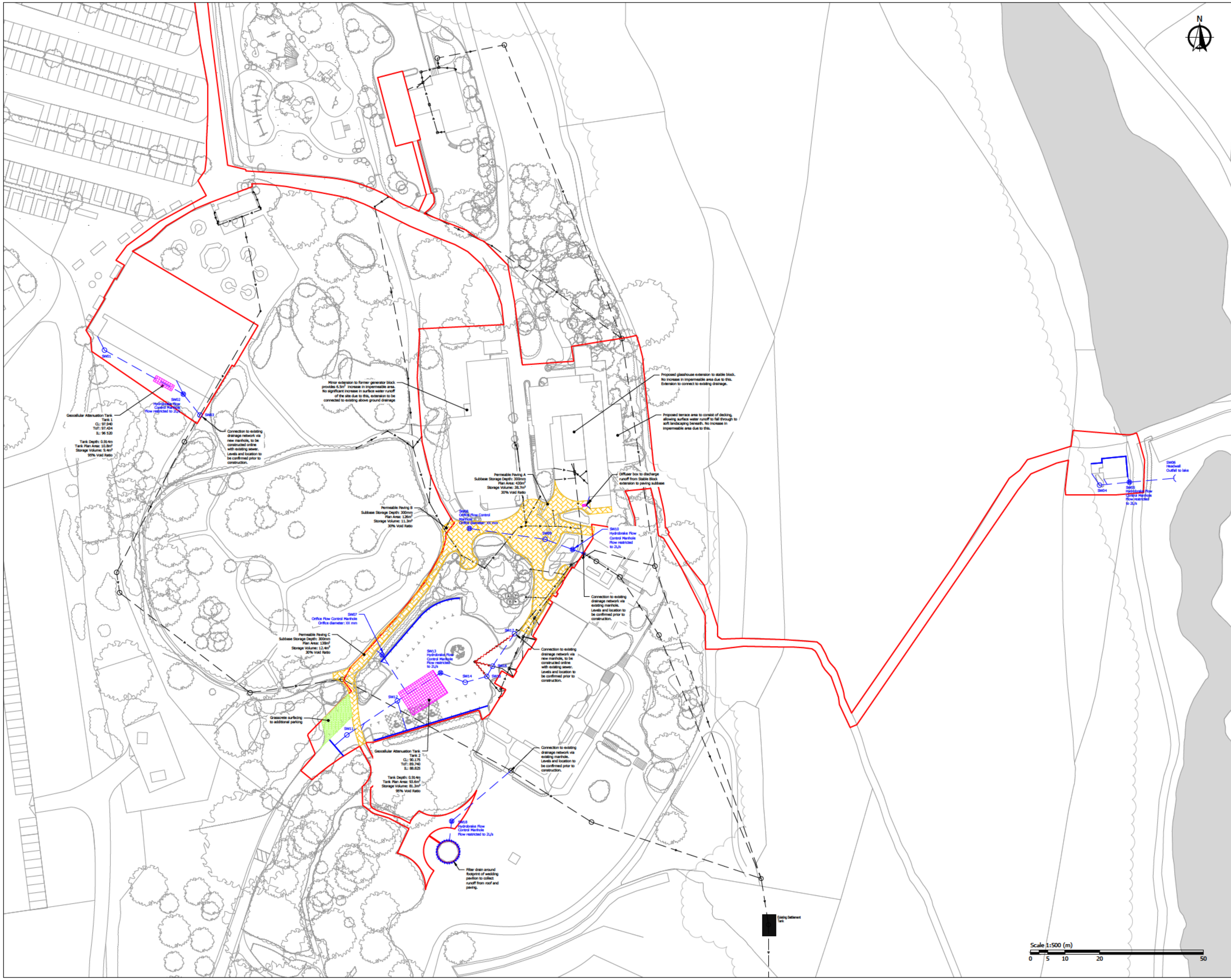
SCALE @A1: 1:1000

DATE: 28/11/2025

DRAWN BY: JA

CHECKED BY: GL

APPROVED BY: GL



NOTES

1. Dimensions in metres and levels in m AOD unless otherwise stated. Do not scale.

LEGEND

- Site Boundary
- Proposed Surface Water Sewer/Drain
- Proposed Surface Water Chamber
- Proposed Surface Water Chamber - Flow Control
- Proposed Geocellular Attenuation Tank
- Proposed Permeable Paving
- Proposed Grasscrete
- Proposed Channel Drain
- Proposed Headwall
- Existing Site Drainage
- Existing Drainage to be Abandoned/Removed

FOR PLANNING

REV	DATE	AMENDMENTS	DRAW	APPR
C01	17/12/2025	Issued for planning	JA	GL

WATER | ENVIRONMENT

6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

CLIENT: Purcell UK

PROJECT: Leonardslee Lakes & Gardens

DRAWING: Proposed Surface Water Drainage Plan

DRAWING NUMBER:	REVISION:
25087-SWD-DP-01	C01

SCALE @A1:	DATE:
1:500	12/12/2025

DRAWN BY:	CHECKED BY:	APPROVED BY:
JA	GL	GL

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
ExMH8 CW2		5.00	98.600	500	1.010
SW01	0.024	5.00	97.782	1350	1.000
SW02			97.938	1350	1.417
SW03			97.609	1350	1.184
ExS115			97.380	1350	1.253
ExS114			96.290	1350	1.178

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	ExMH8 CW2	SW03	34.806	0.600	97.590	96.425	1.165	29.9	100	5.00	52.7
2.000	SW01	SW02	26.095	0.600	96.782	96.521	0.261	100.0	150	5.00	52.7
2.001	SW02	SW03	7.734	0.600	96.521	96.425	0.096	80.6	100	5.00	52.7
1.001	SW03	ExS115	8.919	0.600	96.425	96.127	0.298	29.9	100	5.00	52.7
1.002	ExS115	ExS114	42.545	0.600	96.127	95.112	1.015	41.9	100	5.00	52.7

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	1.417	11.1	0.0	0.910	1.084	0.000	0.0	0	0.000
2.000	1.005	17.8	4.6	0.850	1.267	0.024	0.0	52	0.843
2.001	0.858	6.7	4.6	1.317	1.084	0.024	0.0	61	0.922
1.001	1.415	11.1	4.6	1.084	1.153	0.024	0.0	45	1.350
1.002	1.194	9.4	4.6	1.153	1.078	0.024	0.0	50	1.190

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	60	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	45	0	0
30	40	0	0				

Node SW02 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	96.521	Product Number	CTL-SHE-0068-2000-0914-2000
Design Depth (m)	0.914	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node SW02 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	96.521
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	47

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	10.8	0.0	0.914	10.8	0.0	0.915	0.0	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	ExMH8 CW2	1	97.590	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SW01	10	96.832	0.050	4.2	0.0718	0.0000	OK
60 minute summer	SW02	39	96.631	0.110	2.9	1.2883	0.0000	SURCHARGED
60 minute summer	SW03	40	96.449	0.024	1.4	0.0349	0.0000	OK
60 minute summer	ExS115	40	96.153	0.026	1.4	0.0379	0.0000	OK
60 minute summer	ExS114	40	95.138	0.026	1.4	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	ExMH8 CW2	1.000	SW03	0.0	0.000	0.000	0.0231	
15 minute summer	SW01	2.000	SW02	4.2	0.910	0.239	0.1942	
60 minute summer	SW02	2.001	SW03	1.4	0.763	0.211	0.0145	
60 minute summer	SW03	1.001	ExS115	1.4	0.908	0.128	0.0140	
60 minute summer	ExS115	1.002	ExS114	1.4	0.859	0.151	0.0702	2.8

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 97.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ExMH8 CW2	1	97.590	0.000	0.0	0.0000	0.0000	OK
60 minute summer	SW01	45	97.033	0.251	10.6	0.3597	0.0000	SURCHARGED
60 minute summer	SW02	46	97.030	0.509	9.7	5.9497	0.0000	SURCHARGED
15 minute winter	SW03	13	96.454	0.029	2.0	0.0418	0.0000	OK
120 minute summer	ExS115	116	96.159	0.032	2.0	0.0453	0.0000	OK
120 minute summer	ExS114	116	95.143	0.031	2.0	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	ExMH8 CW2	1.000	SW03	0.0	0.000	0.000	0.0330	
60 minute summer	SW01	2.000	SW02	9.7	0.834	0.548	0.4594	
60 minute summer	SW02	2.001	SW03	2.0	0.836	0.297	0.0186	
15 minute winter	SW03	1.001	ExS115	2.0	1.042	0.180	0.0179	
120 minute summer	ExS115	1.002	ExS114	2.0	0.947	0.214	0.0900	13.1

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 97.57%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	ExMH8 CW2	1	97.590	0.000	0.0	0.0000	0.0000	OK
60 minute summer	SW01	51	97.281	0.499	14.1	0.7144	0.0000	SURCHARGED
60 minute summer	SW02	52	97.278	0.757	12.7	8.8526	0.0000	SURCHARGED
15 minute summer	SW03	11	96.454	0.029	2.0	0.0418	0.0000	OK
480 minute summer	ExS115	296	96.159	0.032	2.0	0.0453	0.0000	OK
480 minute summer	ExS114	296	95.143	0.031	2.0	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	ExMH8 CW2	1.000	SW03	0.0	0.000	0.000	0.0331	
60 minute summer	SW01	2.000	SW02	12.7	0.876	0.718	0.4594	
60 minute summer	SW02	2.001	SW03	2.0	0.836	0.297	0.0186	
15 minute summer	SW03	1.001	ExS115	2.0	1.038	0.180	0.0179	
480 minute summer	ExS115	1.002	ExS114	2.0	0.947	0.214	0.0900	24.8

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SW11	0.005	5.00	90.788	1350	1.350
SW12	0.109	5.00	90.687	1350	1.425
SW13			90.174	1350	1.350
SW14			89.964	1350	1.350
SW15			89.927	1350	1.377
SW16			89.924	1350	1.408
SW17			89.899	1350	1.464
ExS9			89.819	100	1.439
ExS16			89.268	100	1.288
ExS35			89.043	100	1.333
ExMH5 SW			88.720	1350	1.130
SW07	0.014	5.00	91.292	1200	1.300

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	SW11	SW12	17.613	0.600	89.438	89.262	0.176	100.1	225	5.00	52.7
1.001	SW12	SW13	14.870	0.600	89.262	88.824	0.438	33.9	225	5.00	52.7
1.002	SW13	SW14	7.651	0.600	88.824	88.614	0.210	36.4	150	5.00	52.7
1.003	SW14	SW15	6.475	0.600	88.614	88.550	0.064	101.2	150	5.00	52.7
1.004	SW15	SW16	3.393	0.600	88.550	88.516	0.034	99.8	150	5.00	52.7

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	1.307	52.0	1.0	1.125	1.200	0.005	0.0	22	0.512
1.001	2.253	89.6	21.7	1.200	1.125	0.114	0.0	75	1.864
1.002	1.673	29.6	24.4	1.200	1.200	0.128	0.0	104	1.864
1.003	0.999	17.6	24.4	1.200	1.227	0.128	0.0	150	1.017
1.004	1.006	17.8	24.4	1.227	1.258	0.128	0.0	150	1.025

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)
1.005	SW16	SW17	11.331	0.600	88.516	88.435	0.081	139.9	150	5.00	52.7
1.006	SW17	ExS9	1.662	0.600	88.435	88.380	0.055	30.2	150	5.00	52.7
1.007	ExS9	ExS16	12.156	0.600	88.380	87.980	0.400	30.4	150	5.00	52.7
1.008	ExS16	ExS35	8.609	0.600	87.980	87.710	0.270	31.9	150	5.00	52.7
1.009	ExS35	ExMH5 SW	3.420	0.600	87.710	87.590	0.120	28.5	150	5.00	52.7
2.000	SW07	SW13	19.761	0.600	89.992	88.874	1.118	17.7	100	5.00	5.0

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)
1.005	0.847	15.0	24.4	1.258	1.314	0.128	0.0	150	0.863
1.006	1.838	32.5	24.4	1.314	1.289	0.128	0.0	97	2.012
1.007	1.833	32.4	24.4	1.289	1.138	0.128	0.0	98	2.010
1.008	1.789	31.6	24.4	1.138	1.183	0.128	0.0	99	1.971
1.009	1.893	33.4	24.4	1.183	0.980	0.128	0.0	95	2.062
2.000	1.846	14.5	0.3	1.200	1.200	0.014	0.0	9	0.673

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	60	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	40	0	0
100	45	0	0

Node SW13 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	88.824	Product Number	CTL-SHE-0068-2000-0914-2000
Design Depth (m)	0.914	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node SW07 Online Orifice Control

Flap Valve	x	Invert Level (m)	89.992	Design Flow (l/s)	2.0	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Depth (m)	1.170	Diameter (m)	0.020		

Node SW13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	88.824
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	93.6	0.0	0.914	93.6	0.0	0.915	0.0	0.0

Node SW07 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	10.000	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	90.162	Length (m)	13.700	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	50	Slope (1:X)	500.0		

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	SW11	10	89.458	0.020	0.9	0.0286	0.0000	OK
15 minute summer	SW12	9	89.346	0.084	19.9	0.1197	0.0000	OK
240 minute summer	SW13	164	89.001	0.177	7.3	16.0028	0.0000	SURCHARGED
240 minute summer	SW14	164	88.649	0.035	1.9	0.0498	0.0000	OK
240 minute summer	SW15	164	88.586	0.036	1.9	0.0519	0.0000	OK
240 minute summer	SW16	164	88.554	0.038	1.9	0.0546	0.0000	OK
240 minute summer	SW17	168	88.463	0.028	1.9	0.0398	0.0000	OK
240 minute summer	ExS9	168	88.405	0.025	1.9	0.0002	0.0000	OK
240 minute summer	ExS16	168	88.006	0.026	1.9	0.0002	0.0000	OK
240 minute summer	ExS35	168	87.736	0.026	1.9	0.0002	0.0000	OK
240 minute summer	ExMH5 SW	168	87.615	0.025	1.9	0.0000	0.0000	OK
120 minute summer	SW07	80	90.194	0.202	1.2	0.9655	0.0000	SURCHARGED

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	SW11	1.000	SW12	0.8	0.144	0.016	0.1318	
15 minute summer	SW12	1.001	SW13	20.0	2.338	0.224	0.1494	
240 minute summer	SW13	Hydro-Brake®	SW14	1.9				
240 minute summer	SW14	1.003	SW15	1.9	0.607	0.109	0.0206	
240 minute summer	SW15	1.004	SW16	1.9	0.569	0.109	0.0115	
240 minute summer	SW16	1.005	SW17	1.9	0.675	0.129	0.0327	
240 minute summer	SW17	1.006	ExS9	1.9	0.923	0.059	0.0035	
240 minute summer	ExS9	1.007	ExS16	1.9	0.978	0.060	0.0240	
240 minute summer	ExS16	1.008	ExS35	1.9	0.955	0.061	0.0174	
240 minute summer	ExS35	1.009	ExMH5 SW	1.9	0.988	0.058	0.0067	22.6
120 minute summer	SW07	Orifice	SW13	0.4				

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	SW11	360	89.493	0.055	0.7	0.0788	0.0000	OK
360 minute summer	SW12	360	89.493	0.231	15.5	0.3306	0.0000	SURCHARGED
360 minute summer	SW13	360	89.493	0.669	15.8	60.4375	0.0000	SURCHARGED
180 minute winter	SW14	88	88.650	0.036	2.0	0.0508	0.0000	OK
15 minute summer	SW15	62	88.587	0.037	2.0	0.0529	0.0000	OK
15 minute summer	SW16	62	88.555	0.039	2.0	0.0556	0.0000	OK
15 minute summer	SW17	62	88.463	0.028	2.0	0.0406	0.0000	OK
15 minute summer	ExS9	63	88.406	0.026	2.0	0.0002	0.0000	OK
15 minute summer	ExS16	63	88.006	0.026	2.0	0.0002	0.0000	OK
15 minute summer	ExS35	63	87.737	0.027	2.0	0.0002	0.0000	OK
15 minute summer	ExMH5 SW	63	87.615	0.025	2.0	0.0000	0.0000	OK
120 minute winter	SW07	112	90.297	0.304	2.7	5.2590	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute summer	SW11	1.000	SW12	0.7	0.143	0.013	0.4163	
360 minute summer	SW12	1.001	SW13	15.4	1.262	0.172	0.5914	
360 minute summer	SW13	Hydro-Brake®	SW14	2.0				
180 minute winter	SW14	1.003	SW15	2.0	0.612	0.113	0.0212	
15 minute summer	SW15	1.004	SW16	2.0	0.628	0.113	0.0118	
15 minute summer	SW16	1.005	SW17	2.0	0.681	0.134	0.0336	
15 minute summer	SW17	1.006	ExS9	2.0	0.931	0.062	0.0036	
15 minute summer	ExS9	1.007	ExS16	2.0	0.988	0.062	0.0247	
15 minute summer	ExS16	1.008	ExS35	2.0	0.964	0.063	0.0179	
15 minute summer	ExS35	1.009	ExMH5 SW	2.0	0.998	0.060	0.0069	7.8
120 minute winter	SW07	Orifice	SW13	0.5				

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
360 minute winter	SW11	352	89.732	0.294	0.6	0.4214	0.0000	SURCHARGED
360 minute winter	SW12	352	89.732	0.470	13.0	0.6732	0.0000	SURCHARGED
360 minute winter	SW13	352	89.732	0.908	13.4	82.0701	0.0000	SURCHARGED
60 minute winter	SW14	30	88.650	0.036	2.0	0.0508	0.0000	OK
720 minute winter	SW15	315	88.587	0.037	2.0	0.0529	0.0000	OK
720 minute winter	SW16	315	88.555	0.039	2.0	0.0556	0.0000	OK
960 minute summer	SW17	450	88.463	0.028	2.0	0.0406	0.0000	OK
480 minute winter	ExS9	208	88.406	0.026	2.0	0.0002	0.0000	OK
480 minute winter	ExS16	208	88.006	0.026	2.0	0.0002	0.0000	OK
480 minute winter	ExS35	208	87.737	0.027	2.0	0.0002	0.0000	OK
480 minute winter	ExMH5 SW	208	87.615	0.025	2.0	0.0000	0.0000	OK
120 minute winter	SW07	116	90.350	0.358	3.6	7.4870	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
360 minute winter	SW11	1.000	SW12	0.6	0.140	0.012	0.7005	
360 minute winter	SW12	1.001	SW13	13.0	1.310	0.145	0.5914	
360 minute winter	SW13	Hydro-Brake®	SW14	2.0				
60 minute winter	SW14	1.003	SW15	2.0	0.612	0.113	0.0212	
720 minute winter	SW15	1.004	SW16	2.0	0.574	0.113	0.0118	
720 minute winter	SW16	1.005	SW17	2.0	0.681	0.134	0.0336	
960 minute summer	SW17	1.006	ExS9	2.0	0.931	0.062	0.0036	
480 minute winter	ExS9	1.007	ExS16	2.0	0.988	0.062	0.0247	
480 minute winter	ExS16	1.008	ExS35	2.0	0.964	0.063	0.0179	
480 minute winter	ExS35	1.009	ExMH5 SW	2.0	0.998	0.060	0.0069	53.1
120 minute winter	SW07	Orifice	SW13	0.5				

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SW08	0.013	5.00	90.465	1350	1.300
SW09	0.045	5.00	89.242	1350	1.300
SW10			88.353	1350	1.300
ExS6			87.994	1350	1.344

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	SW08	SW09	22.120	0.600	89.165	87.942	1.223	18.1	100	5.00	52.7
1.001	SW09	SW10	8.466	0.600	87.942	87.053	0.889	9.5	100	5.00	52.7
1.002	SW10	ExS6	3.369	0.600	87.053	86.650	0.403	8.4	100	5.00	52.7

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	1.824	14.3	2.4	1.200	1.200	0.013	0.0	28	1.356
1.001	2.519	19.8	11.0	1.200	1.200	0.058	0.0	54	2.589
1.002	2.690	21.1	11.0	1.200	1.244	0.058	0.0	51	2.716

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	60	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m^3/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	45	0	0
30	40	0	0				

Node SW08 Online Orifice Control

Flap Valve	x	Invert Level (m)	89.165	Design Flow (l/s)	2.0	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Depth (m)	1.170	Diameter (m)	0.029		

Node SW09 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	87.942	Product Number	CTL-SHE-0065-2000-1170-2000
Design Depth (m)	1.170	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node SW08 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	10.000	Depth (m)	0.250
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	90.085	Length (m)	12.500	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	25	Slope (1:X)	500.0		

Node SW09 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	10.000	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	88.812	Length (m)	43.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	500.0		

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
30 minute summer	SW08	21	89.504	0.339	2.0	0.4847	0.0000	SURCHARGED
120 minute summer	SW09	80	88.859	0.917	4.8	2.9961	0.0000	SURCHARGED
240 minute winter	SW10	116	87.074	0.021	1.8	0.0298	0.0000	OK
240 minute winter	ExS6	116	86.670	0.020	1.8	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)
30 minute summer	SW08	Orifice	SW09	1.0				
120 minute summer	SW09	Hydro-Brake®	SW10	1.8				
240 minute winter	SW10	1.002	ExS6	1.8	1.582	0.085	0.0038	13.5

Results for 30 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
30 minute summer	SW08	24	90.131	0.966	7.3	2.6323	0.0000	SURCHARGED
120 minute winter	SW09	116	88.999	1.057	10.4	20.1488	0.0000	FLOOD RISK
120 minute winter	SW10	116	87.075	0.022	1.9	0.0308	0.0000	OK
120 minute winter	ExS6	116	86.670	0.020	1.9	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)
30 minute summer	SW08	Orifice	SW09	1.7				
120 minute winter	SW09	Hydro-Brake®	SW10	1.9				
120 minute winter	SW10	1.002	ExS6	1.9	1.609	0.091	0.0040	19.1

Results for 100 year +45% 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
60 minute summer	SW08	43	90.166	1.001	7.4	3.9840	0.0000	FLOOD RISK
120 minute winter	SW09	120	89.070	1.128	13.3	29.3103	0.0000	FLOOD RISK
120 minute winter	SW10	120	87.075	0.022	2.0	0.0313	0.0000	OK
120 minute winter	ExS6	120	86.671	0.021	2.0	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)
60 minute summer	SW08	Orifice	SW09	1.7				
120 minute winter	SW09	Hydro-Brake®	SW10	2.0				
120 minute winter	SW10	1.002	ExS6	2.0	1.622	0.093	0.0041	19.6

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SW04	0.008	5.00	51.325	1350	1.000
SW05			50.046	1350	1.000
SW06			46.390	1350	0.570

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	SW04	SW05	8.668	0.600	50.325	49.046	1.279	6.8	150	5.00	52.7
1.001	SW05	SW06	12.906	0.600	49.046	45.820	3.226	4.0	100	5.00	52.7

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	3.895	68.8	1.5	0.850	0.850	0.008	0.0	16	1.597
1.001	3.894	30.6	1.5	0.900	0.470	0.008	0.0	15	2.021

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	60	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	45	0	0
30	40	0	0				

Node SW05 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	49.046	Product Number	CTL-SHE-0068-2000-0950-2000
Design Depth (m)	0.950	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

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	SW04	10	50.340	0.015	1.4	0.0212	0.0000	OK
15 minute summer	SW05	12	49.125	0.079	1.4	0.1134	0.0000	OK
15 minute summer	SW06	12	45.834	0.014	1.2	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	SW04	1.000	SW05	1.4	1.081	0.020	0.0443	
15 minute summer	SW05	1.001	SW06	1.2	1.877	0.039	0.0082	0.6

Results for 30 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	SW04	10	50.352	0.027	5.0	0.0391	0.0000	OK
30 minute summer	SW05	22	49.622	0.576	4.6	0.8238	0.0000	SURCHARGED
15 minute summer	SW06	20	45.837	0.017	2.0	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	SW04	1.000	SW05	5.0	1.245	0.072	0.0858	
30 minute summer	SW05	1.001	SW06	2.0	2.182	0.065	0.0118	2.9

Results for 100 year +45% 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	SW04	10	50.356	0.031	6.6	0.0448	0.0000	OK
30 minute summer	SW05	23	49.992	0.946	6.1	1.3534	0.0000	FLOOD RISK
15 minute winter	SW06	26	45.837	0.017	2.0	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	SW04	1.000	SW05	6.6	1.381	0.095	0.0878	
30 minute summer	SW05	1.001	SW06	2.0	2.181	0.065	0.0118	3.9

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SW18	0.003	5.00	90.045	1350	1.300
ExS110			89.780	1350	1.239
ExS109			87.960	1350	1.342

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	SW18	ExS110	29.043	0.600	88.745	88.541	0.204	142.4	100	5.00	52.7
1.001	ExS110	ExS109	27.631	0.600	88.541	86.618	1.923	14.4	100	5.00	52.7

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	0.642	5.0	0.6	1.200	1.139	0.003	0.0	23	0.426
1.001	2.048	16.1	0.6	1.139	1.242	0.003	0.0	13	0.952

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	60	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	45	0	0
30	40	0	0				

Node SW18 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	✓	Design Depth (m)	0.950	Diameter (m)	0.048
Downstream Link	1.000	Invert Level (m)	88.745	Design Flow (l/s)	2.0	Discharge Coefficient	0.600

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	SW18	11	88.780	0.035	0.5	0.0507	0.0000	OK
15 minute summer	ExS110	12	88.553	0.012	0.5	0.0169	0.0000	OK
15 minute summer	ExS109	12	86.630	0.012	0.5	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	SW18	Orifice	ExS110	0.5				
15 minute summer	ExS110	1.001	ExS109	0.5	0.902	0.029	0.0143	0.2

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

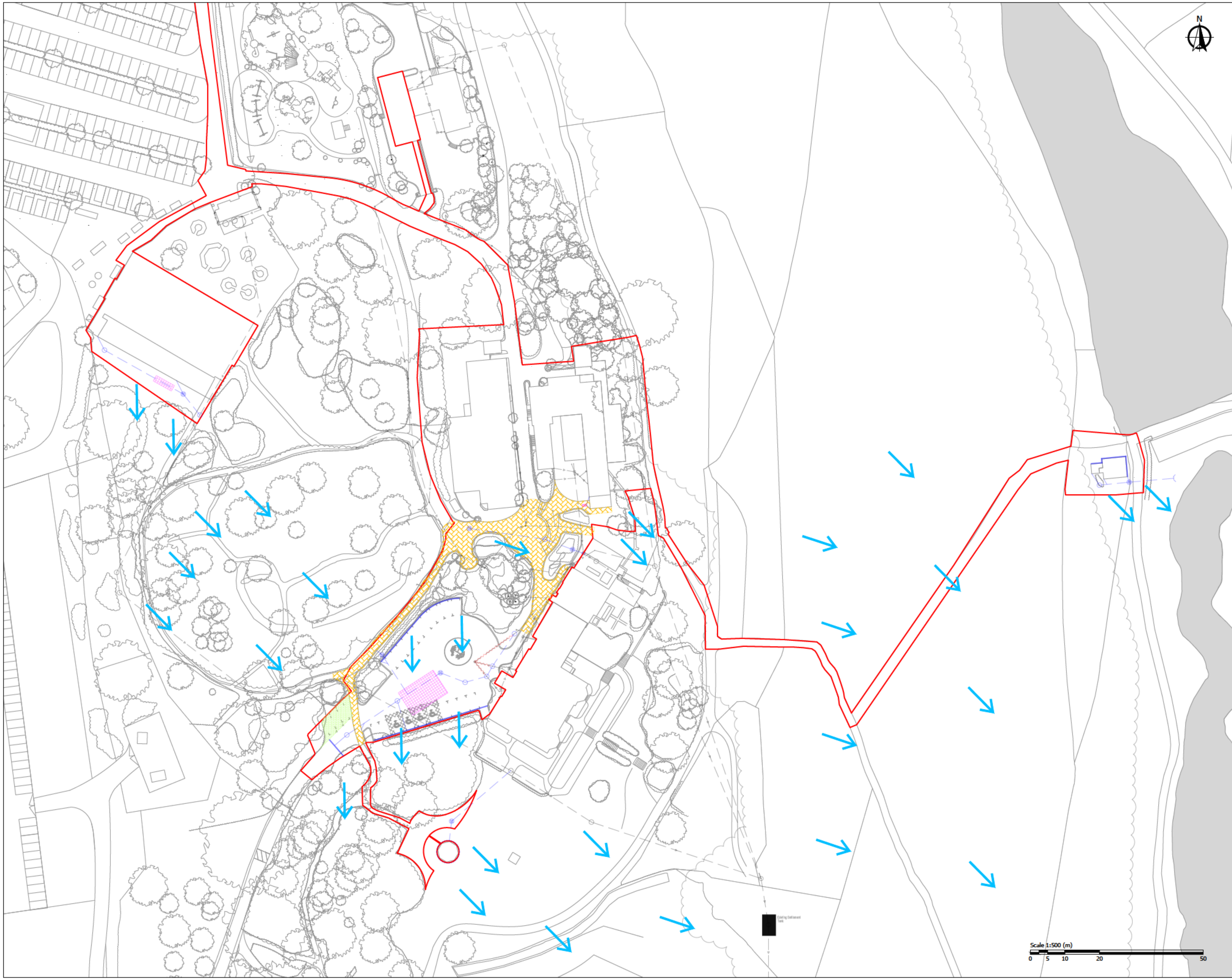
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW18	12	88.881	0.136	2.0	0.1949	0.0000	SURCHARGED
15 minute summer	ExS110	12	88.563	0.022	1.6	0.0309	0.0000	OK
15 minute summer	ExS109	12	86.639	0.021	1.6	0.0000	0.0000	OK

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	SW18	Orifice	ExS110	1.6				
15 minute summer	ExS110	1.001	ExS109	1.6	1.303	0.100	0.0342	0.8

Results for 100 year +45% 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	SW18	12	88.944	0.199	2.6	0.2845	0.0000	SURCHARGED
15 minute summer	ExS110	12	88.565	0.024	2.0	0.0346	0.0000	OK
15 minute summer	ExS109	12	86.642	0.024	2.0	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	SW18	Orifice	ExS110	2.0				
15 minute summer	ExS110	1.001	ExS109	2.0	1.387	0.124	0.0399	1.1



NOTES

1. Dimensions in metres and levels in m AOD unless otherwise stated. Do not scale.

LEGEND

- Site Boundary
- Exceedance Flow Route
- Proposed Surface Water Sewer/Drain
- Proposed Surface Water Chamber
- Proposed Surface Water Chamber - Flow Control
- Proposed Geocellular Attenuation Tank
- Proposed Permeable Paving
- Proposed Grasscrete
- Proposed Channel Drain
- Proposed Headwall
- Existing Site Drainage
- Existing Drainage to be Abandoned/Removed

FOR PLANNING

REV	DATE	AMENDMENTS	DRAW	APPR

WATER | ENVIRONMENT
6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE
Tel: 020 8545 9720
Email: contact@waterenvironment.co.uk
Web: www.waterenvironment.co.uk

CLIENT: Purcell UK

PROJECT: Leonardslee Lakes & Gardens

DRAWING: Exceedance Flow Plan

DRAWING NUMBER: 25087-SWD-DP-04	REVISION: C01
SCALE @A1: 1:500	DATE: 17/12/2025

DRAWN BY: JA	CHECKED BY: GL	APPROVED BY: GL

Surface Water Drainage Statement

In order to provide the required information on surface water drainage from the proposed development this pro-forma must be completed in full and be submitted with any planning application which seeks permission for 'major' development. This information contained in this form will be used by West Sussex County Council in its role as Lead Local Flood Authority and 'statutory consultee' on SuDs for all 'major' planning applications. The pro-forma is supported by the Defra/EA Guidance on Rainfall Runoff Management and can be completed using freely available tools including SuDS Tools. The pro-forma should be considered alongside other supporting SuDS Guidance, but focuses on ensuring flood risk is not made worse elsewhere. The SuDS solution must operate effectively for as long as the development exists. This pro-forma is based upon current industry standard practice.

1. Site Details

Site	Leonardslee Lakes & Gardens
Address & post code or LPA reference	DC/25/1146
Grid reference	522125E, 125952N
Is the existing site developed or Greenfield?	Developed
Total Site Area served by drainage system (excluding open space) (Ha)*	0.221
Topographical survey plan showing existing site layout, site levels and drainage system	MK Surveys 24451_R1. Contained in Appendix A

* The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers & Local Authorities
Impermeable area (ha) **(areas to be shown on a plan)**	0.794	0.774	-0.020	If the proposed amount of impermeable surface is greater, then runoff rates and volumes will increase. Section 6 must be filled in. If proposed permeability is equal or less than existing, then section 6 can be skipped & section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)	Private sewer, discharge to watercourse	As existing	N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

PPG Paragraph 080

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers & Local Authorities
Existing and proposed micro-drainage calculations	**X**		**Appendices A & F**	Please provide micro-drainage calculations of existing and proposed run-off rates and volumes in accordance with a recognised methodology or the results of a full infiltration test (see line below) if infiltration is proposed.
Infiltration		X		e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse	X		Discharge to existing private sewer network, which ultimately discharges to man-made lakes within wider estate	e.g. Is there a watercourse nearby? Please provide details of any watercourse to which the site drains including cross-sections of any adjacent water courses for appropriate distance upstream and downstream of the discharge point (as agreed with the LLFA and/or EA)
To surface water sewer	X		Discharge to existing private sewer network, which ultimately discharges to man-made lakes within wider estate	Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above		X		e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.
Has the drainage proposal had regard to the SuDS hierarchy?	X		Section 5	Evidence must be provided to demonstrate that the proposed Sustainable Drainage proposal has had regard to the SuDS hierarchy.
Layout plan showing where the sustainable drainage infrastructure will be	X		Appendix F (25087-SWD-DP-01 P01)	Please provide plan reference numbers showing the details of the site layout showing where the sustainable drainage infrastructure will be located on the site. If the development is to be constructed in phases this should be shown on a separate plan and confirmation should be provided that the sustainable drainage proposal for each phase can be

located on site.				constructed and can operate independently and is not reliant on any later phase of development.

Technical Standards S2 and S3

4. Peak Discharge Rates – This is the maximum flow rate at which surface water runoff leaves the site during a particular storm event.

	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	Notes for developers & Local Authorities
Greenfield QBAR	4.1	N/A	N/A	Mean annual Greenfield peak flow - QBAR is approx. 1 in 2 storm events. Use that figure in Section 7a.
1 in 1	38.4	32.9	-5.5	Proposed discharge rates (with mitigation) should be no greater than existing rates for all corresponding storm events. e.g. discharging all flow from site at the existing 1 in 100 event increases flood risk during smaller events.
1 in 30	76.5	62.8	-13.7	
1in 100	95.4	76.4	-19.0	
1 in 100 plus climate change	N/A	76.4	N/A	To mitigate for climate change the proposed 1 in 100 +CC must be no greater than the existing 1 in 100 runoff rate. If not, flood risk increases under climate change should be added to the peak rainfall intensity. EA Guidance - Flood Risk Assessments: Climate Change Allowances (Published Feb 2016) https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Technical Standards S4 to S9

5. Calculate discharge volumes –The total volume of water leaving the development site for a particular rainfall event. Introducing new impermeable surfaces increases surface water runoff and may increase flood risk outside the development.

	Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3) (Proposed-Existing)	Notes for developers & Local Authorities
1 in 1	213.1	200.5	-12.6	Proposed discharge volumes (without mitigation) should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30	424.2	384.4	-139.8	
1in 100	528.4	480.7	-47.7	
1 in 100 plus climate change	N/A	480.7	N/A	To mitigate for climate change the volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

6. Calculate attenuation storage – In order to minimise the negative impact on flood risk resulting from increased volumes runoff from the proposed development, storage must be provided.

		Notes for developers & Local Authorities
Storage volume required to retain discharge rates as existing (m^3)	Please see Section 5 and Appendix F	Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing
Where will the storage be provided on site?	Please see Section 5 and Appendix F	

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The intention is to not discharge that volume into the watercourses so as not to increase flood risk elsewhere.

			Notes for developers & Local Authorities
Infiltration	**State the Site's Geology/drift material overlaying)**	Upper Tunbridge Wells Sand – Sandstone and Mudstone	Avoid infiltrating in made ground.
	Does the site have a high ground water table? Yes/No?	No	If yes, please provide details of the site's hydrology.
	Is the site within a known Source Protection Zones (SPZ)? Yes/No?	No	Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?	No	Infiltration rates should be no lower than $1x10^{-6}$ m/s.
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	No	Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
	State the distance between a proposed infiltration device base and the ground water (GW) level	N/A	Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.
	Were infiltration rates obtained by desk study or infiltration test?	No	Infiltration rates can be estimated from desk studies at most stages of the planning system if a back-up attenuation scheme is provided.
Is infiltration feasible?	**Yes/No?**	No	If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.

7a. Storage requirements

Where infiltration is not possible, then the developer must confirm that either of the two options below will be implemented for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at **QBAR**. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers & Local Authorities
Please confirm what option has been chosen and how much storage is required on site.	Option 1	The developer at this stage should understand the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

8. Additional Consideration to comply with the Technical Standards and PPG

		Notes for developers & Local Authorities
Which Drainage Systems measures have been used?	Please see Section 5 and Appendix F	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C753.
How will exceedance events be catered on site without increasing flood risks (both on site and outside the development)?	Please see Section 5 and Appendix F	**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths
How are rates being restricted?	Please see Section 5 and Appendix F	Hydrobrakes to be used where rates are between 2l/s to 5l/s. Orifices not be used below 5l/s as the pipes may block. Pipes with flows < 2l/s are prone to blockage.
Drainage during construction period	Please see Section 5 and Appendix F	Provide details of how drainage will be managed during the construction period including any necessary connections, impacts, diversions and erosion control.
Key Drainage components / Features	Please see Section 5 and Appendix F	Which component if blocked (even partial) will lead to flooding?

<u>**Technical Standards S10 to S12**</u>

9. Management and Maintenance of SuDs

Details are required to be provided of the management and maintenance plan for the SUD, including for the individual plots in perpetuity.

How is the entire drainage system to be maintained in perpetuity?	Please see Section 5	Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided to show that all parts of SuDs are effective and robust. Provide a management plan to describe the SUDS scheme and set out the management objectives for the site. It should consider how the SuDs will perform and develop over time anticipating any additional maintenance tasks to ensure the system continues to perform as designed. — Specification notes that describe how work is to be undertaken and the materials to be used. — A maintenance schedule describes what work is to be done and when it is to be done using frequency and performance requirements as appropriate. — A site plan showing maintenance areas, control points and outfalls. Responsibility for the management and maintenance of each element of the SUDS scheme will also need to be detailed within the Management Plan. Where open water is involved please provide a health and safety plan within the management plan.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	Leonardslee Lakes & Gardens	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma. Please give details of each feature and how it will be managed in accordance with the details in the management plan.
Please provide details demonstrating that any third party agreements required using land outside the application site have been secured.	N/A	

The above form should be completed using evidence from information which should be appended to this form. The information being submitted should be proportionate to the site conditions, flood risks and magnitude of development. It should serve as a summary of the drainage proposals and should clearly show that the proposed discharge rate and volume as a result of development will not be increasing. Where there is an increase in discharge rate or volume, then the relevant section of this form must be completed with clear evidence demonstrating how the requirements will be met.

This form is completed using factual information and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By…Jonathan Adams……………………………………………………………………………………......................

Qualification of person responsible for signing off this pro-forma ...MEng..

Company…Water Environment………………………………………………………………………,..

On behalf of (Client's details) ...Leonardslee Lakes & Gardens..

Date:…05/01/2026……………………………..........................

APPENDIX G: FOUL WATER DRAINAGE

G.1 Existing Foul Water Drainage Report – Moody Sewage Ltd

G.2 Review of Engine House STP (PC1121-02) - Dirk Daude Wastewater Consultancy Services

G.3 General Binding Rules Compliance Report (PC1121) - Dirk Daude Wastewater Consultancy Services

POUND HILL, POUND LANE, UCKFIELD, FRAMFIELD
EAST SUSSEX, TN22 5RR
T 01825 890294 F 01825 890498

THE SEWAGE FACILITIES AT

Leonardslee Gardens

Brighton Road

Lower Beeding

Horsham

RH13 6PP

Contents

1) CLIENT BRIEF

a) To carry out a survey with recommendations on the sewage facilities at Leonardslee Gardens, Brighton Road, Lower Beeding, Horsham, RH13 6PP.

2) SITE AND SYSTEM

a) The site consists of an 200 acre estate with multiple buildings. The estate is going to be used for used for public attendance and recreation together with private functions.

b) The existing properties producing waste are:-

i) Main House, Stable Block and Main House annexe and Restaurant Block.

(1) The sewage management facilities consist of the following parts:-

(a) A septic tank located to the south east of the estate.

(i) The size of the tank is 3.3 metres deep with a radius of 1.0 metre.

(ii) The volume of the tank is 10,300 litres.

(b) A discharge pipe from the septic tank running into ground.

(c) A final point of discharge onto ground running down the bank.

ii) Lower Lodge

(1) The sewage management facilities consist of the following parts:-

(a) A Titan Biotec sewage treatment plant located to the south of the property.

(i) The volume of the tank is 800 litres.

(b) A discharge pipe from the sewage plant into the ditch.

iii) The Red House

(1) The sewage management facilities consist of the following parts:-

(a) A septic tank located to the north of the property.

(i) The volume of the tank is estimated at 4,500 litres.

(b) A discharge pipe from the septic tank running into the surface water system outside the boundary of the property.

(c) A final point of discharge into and onto ground down the bank.

iv) Main Toilet Block

(1) The sewage management facilities consist of the following parts:-

(a) A septic tank located to the south west of the toilet block, beyond the glass houses.

(i) The tank measures 2.5 metres diameter by 7.0 metres long.

(ii) The volume of the tank is estimated at 35,000 litres.

(b) A discharge pipe from the septic tank running into ground.

v) The Round House

(1) The sewage management facilities consist of the following parts:-

(a) A septic tank located to the north east of the property.

(i) The tank measures 0.7 metres wide by 1.7 metres long by 1.4 metres deep.

(ii) The volume of the tank is estimated at 1,700 litres.

(b) A discharge pipe from the septic tank running into the ground.

(c) A final point of discharge likely to be onto ground in the ditch area.

c) The site is to be developed as follows:-

i) The Main House is to be developed and will have a new kitchen and bar area. The house will be used for wedding venues. There is to be a butchery in the lower rooms.

ii) The Main House Annexe will become a single flat.

iii) The Stable Block is to become a 19 bedroom hotel with dining and kitchen facilities.

iv) The Restaurant block is being refurbished.

v) The Red House is being renovated and will become an 8 bedroom private dwelling.

vi) The Engine House by the ponds will become a cafe.

vii) There is a proposal to develop a winery on site.

3) FLOW AND LOADINGS

a) It has been disclosed that the sewage make from this location is classified as domestic.

b) Using the Moody Sewage Ltd, British Waterways and Environment Agency flow models and the information provided by the client the projected flow rates are as follows:-

i) Maximum visitors to the site will be 2500 per day.

(1) The following is based on one use of a W.C. per visitor. This generates:-

(2) 25,000 litres of sewage per day, containing:-

(a) 30,000 grams of Biochemical Oxygen Demand (BOD) per day.

(b) 6,250 grams Ammonia per day.

ii) The Population Equivalent flow in terms of sewage flow rate is 139.

iii) The Population Equivalent flow in terms of sewage strength is 428.

iv) Main House

(1) The following is based on 30 covers per day and 100 high tees per day. This generates:-

(2) 3,900 litres of sewage per day, containing:-

(a) 4,940 grams of Biochemical Oxygen Demand (BOD) per day.

(b) 520 grams Ammonia per day.

v) The Population Equivalent flow in terms of sewage flow rate is 22.

vi) The Population Equivalent flow in terms of sewage strength is 70.

vii) Main House Annexe

(1) The following is based on 2 people in full time residency. This generates:-

(2) 360 litres of sewage per day, containing:-

(a) 140 grams of Biochemical Oxygen Demand (BOD) per day.

(b) 16 grams Ammonia per day.

viii) The Population Equivalent flow in terms of sewage flow rate is 2.

ix) The Population Equivalent flow in terms of sewage strength is 2.

x) Stable Block

(1) The following is based on 19 hotel rooms with an average occupancy of 2 people and 300 covers per day from the restaurant. This generates:-

(2) 18,500 litres of sewage per day, containing:-

(a) 14,972 grams of Biochemical Oxygen Demand (BOD) per day.

(b) 1,580 grams Ammonia per day.

xi) The Population Equivalent flow in terms of sewage flow rate is 103.

xii) The Population Equivalent flow in terms of sewage strength is 213

xiii)Restaurant Block

(1) The following is based on a maximum of 1000 covers per day for bar snack / simple style food. This generates:-

(2) 15,000 litres of sewage per day, containing:-
(a) 19,000 grams of Biochemical Oxygen Demand (BOD) per day.

(b) 2,500 grams Ammonia per day.

xiv)The Population Equivalent flow in terms of sewage flow rate is 83.

xv) The Population Equivalent flow in terms of sewage strength is 271.

xvi)The Red House

(1) The following is based on a maximum of 12 people in full time residency. This generates:-

(2) 2,160 litres of sewage per day, containing:-

(a) 840 grams of Biochemical Oxygen Demand (BOD) per day.

(b) 96 grams Ammonia per day.

xvii)The Population Equivalent flow in terms of sewage flow rate is 12.

xviii)The Population Equivalent flow in terms of sewage strength is 12.

xix)The Round House

(1) The following is based on a maximum of 6 people in full time residency. This generates:-

(2) 1,080 litres of sewage per day, containing:-

(a) 420grams of Biochemical Oxygen Demand (BOD) per day.

(b) 48 grams Ammonia per day.

xx) The Population Equivalent flow in terms of sewage flow rate is 6.

xxi) The Population Equivalent flow in terms of sewage strength is 6.

xxii)The Winery flow rates are to be determined.

c) Surface water enters the foul sewers.

i) It is recommended that all surface water is diverted from the sewers.

d) For the purposes of any design it is recommended that the following combined flow rates are used for the Visitors, Main House, Main House Annexe, Stable Block and Restaurant Block:-

i) 62,760 litres of sewage per day, containing:-

(1) 69,052 grams of Biochemical Oxygen Demand (BOD) per day.

(2) 10,866 grams Ammonia per day.

ii) The Population Equivalent flow in terms of sewage flow rate is 349.

iii) The Population Equivalent flow in terms of sewage strength is 986.

e) The Round House and The Red House flow rates will remain as projected above and kept separate at this stage.

4) ENVIRONMENTAL PERMIT AND REGULATIONS

a) Waste water, sewage management and discharges are governed by the Environmental Permitting Regulations 2014 and are enforced by the Environment Agency.

b) You require by Law an Environmental Permit for the discharge of sewage or treated effluent from a septic tank or sewage treatment plant.

c) There are exceptions to point 4.b as defined by the General Binding Rules for small sewage discharges, effective from 1st January 2015. This is applicable to everyone who has a septic tank or sewage treatment plant.

d) The binding rules are categorised into ground or into surface water discharges:-

i) Small sewage discharges into ground before 1st January 2015

(1) The discharge must be 2000 litres per day or less.

(2) The sewage must only be domestic.

(3) The discharge must not cause pollution to surface water or groundwater.

(4) The sewage must receive treatment from a septic tank and infiltration system (drainage field) or a sewage treatment plant and infiltration system.

(5) The discharge must not be within a groundwater Source Protection Zone 1 or within 50 metres from any well, spring or borehole that is used to supply water for domestic or food production purposes.

(6) All works and equipment used for the treatment of sewage effluent and its discharge must comply with the relevant design and manufacturing standards i.e. the British Standard that was in force at the time of the installation, and guidance issued by the appropriate authority on the capacity and installation of the equipment.

(7) The system must be installed and operated in accordance with the manufacturer's specification.

(8) Maintenance must be undertaken by someone who is competent.

(9) Waste sludge from the system must be safely disposed of by an authorised person.

(10) If a property is sold, the operator must give the new operator a written notice stating that a small sewage discharge is being carried out, and giving a description of the waste water system and its maintenance requirements.

(11) The operator must ensure the system is appropriately decommissioned where it ceases to be in operation so that there is no risk of pollutants or polluting matter entering groundwater, inland fresh waters or coastal waters.

(12) New sewage discharges into ground after 1st January 2015 are also subject to the following rules:-

(a) New discharges must not be within an acceptable distance to a foul sewer.

(b) For new discharges the operator must ensure that the necessary planning and building control approvals for systems are in place if necessary.

(c) New discharges must not be in or within 50 metres of:-

(i) A Special Area of Conservation.

(ii) Special Protection Area.

(iii) Ramsar Site.

(iv) Biological site of Special Scientific Interest.

(v) Must not be in an Ancient Woodland.

ii) Small sewage discharges into surface water before 1st January 2015

(1) The discharge must be 5000 litres per day or less.

(2) The sewage must only be domestic.

(3) The discharge must not cause pollution to surface water or groundwater.

(4) The sewage must receive treatment from a sewage treatment plant.

(5) For discharges into tidal waters the discharge outlet must be below the mean spring low water mark.

(6) All works and equipment used for the treatment of sewage effluent and its discharge must comply with the relevant design and manufacturing standards ie the British Standard that was in force at the time of the installation, and guidance issued by the appropriate authority on the capacity and installation of the equipment.

(7) The system must be installed and operated in accordance with the manufacturer's specification.

(8) Maintenance must be undertaken by someone who is competent.

(9) Waste sludge from the system must be safely disposed of by an authorised person.

(10) If a property is sold, the operator must give the new operator a written notice stating that a small sewage discharge is being carried out, and giving a description of the waste water system and its maintenance requirements.

(11) The operator must ensure the system is appropriately decommissioned where it ceases to be in operation so that there is no risk of pollutants or polluting matter entering groundwater, inland fresh waters or coastal waters.

(12) New sewage discharges into surface water after 1st January 2015 are also subject to:-

(a) New discharges must not be within an acceptable distance to a foul sewer.

(b) For new discharges the operator must ensure that the necessary planning and building control approvals for systems are in place if necessary.

(c) New discharges must not be in or within 500 metres of:-

(i) A Special Area of Conservation.
(ii) Special Protection Area.
(iii) Ramsar Site.
(iv) Biological site of Special Scientific Interest.
(v) Freshwater pearl mussel population.
(vi) Designated bathing water.
(vii) Protected shellfish water.

(d) New discharges must not be in or within 200 metres of an aquatic local nature reserve.

(e) New discharges must not be in or within 50 metres of a chalk river or aquatic local wildlife site.

(f) New discharges must be made to a watercourse that is normally has flow throughout the year.

(g) For new discharges, any partial drainage field must be installed within 10 metres of the bank side of the watercourse.

(h) New discharges must not be made to an enclosed lake or pond.

e) Discharges that do not meet the above requirement will require the application of an Environmental Permit.

5) CURRENT SITE STATUS

a) There are some historical permits held for this site:-

i) Mr R Loder - SO/P07947/001 for a single domestic property and farm, Revoked on 20/12/2012.

ii) The permit was reinstated on 21/12/2012.

(1) The discharge location for this is very near to the main toilet block tank.

(2) The discharge appears to be into ground.

(3) The volume of the discharge is not determined.

b) There are also active permits for the South Lodge Hotel, The Crabtree Inn and the Peppersgate Farm development.

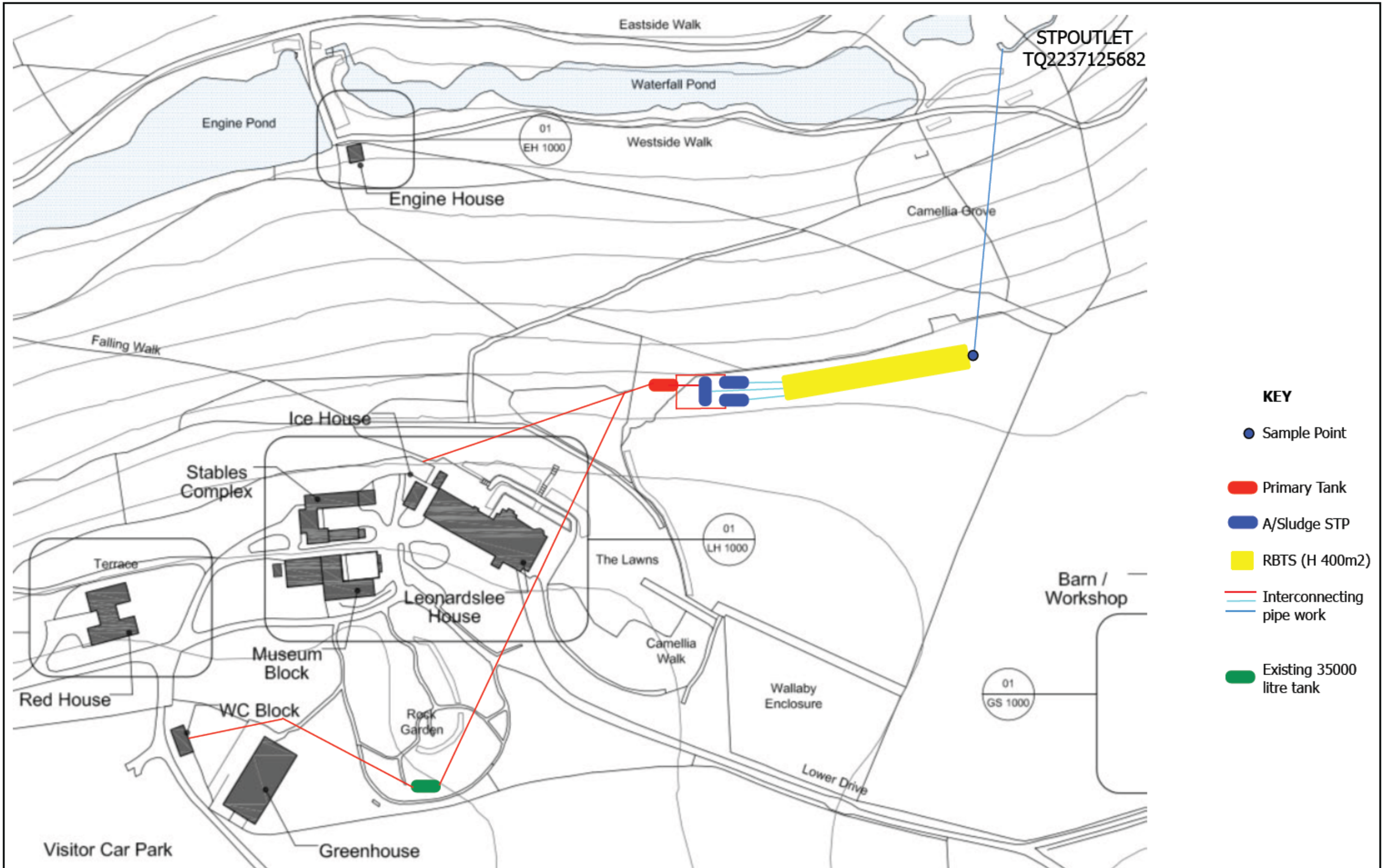
c) The systems are in breach of the General Binding Rules and Environmental Laws due to the direct discharge of settled sewage onto land.

i) The management of sewage in this way can be a prosecutable offence, enforced by the Environment Agency, with hefty fines if not resolved correctly.
ii) Maximum fines are £50,000.00 with /and or custodial sentences if persistent.

d) The existing discharge points are not reusable.

6) SAMPLE HISTORY

a) There is no sample history for this site.



Site Layout Diagram (NTS) **Plan1 - Leonardslee Gardens**

MOODY SEWAGE LTD
Pound Hill, Pound Lane, Framfield, TN22 5RR
T: 01825 890294

Review of Engine House STP

Dirk Daude Wastewater Consultancy Services t: +44 (0) 7903 296772 e: dirk@dirkdaude.com

Project and Client Details			
Project Name:	Engine House STP, Leonardslee Lakes & Gardens	Project Ref.:	PC1121-02
Client:	Leonardslee Lakes & Gardens	Date:	18 April 2024

Project Details:

Review of influent loadings and assistance with sizing a new sewage treatment plant (STP) for the Engine House at Leonardslee Lakes & Gardens

General Introduction and Overview

Leonardslee Lakes & Gardens (LLG) are planning to add a single WC and extend the outdoor seating area of the Engine House Café located down in the valley of the gardens. At the moment, there is no existing foul drainage on the valley and the nearest drains are approx. 150m away near the main house and visitor toilets.

The aim of this report is to assess potential influent loadings from the Café/Toilet, assist in sizing a suitable small package sewage treatment plant and check if the overall proposal would comply with EA General Binding Rules for Small Sewage Discharges (EA GBR).

Influent Design Loadings

The following design loadings are calculated based on the information provided by the client and using British Water Code of Practice, Flow and Loads 4, 2013 (BW F&L, see appendix A). Note, conversions to population equivalent (pe) references are based on 150 l/d, 60 gBOD/d and 8 gNH_4-N/d.

A new single WC will be installed next to the cafe to serve both visitors and staff. In addition, the new deck extension will increase the outdoor seating area to accommodate approx. 10x tables and 40x seats. The café will be attended by part-time staff during garden opening hours.

Due to the limitation of only a single WC, the following maximum number of users are assumed:

Application	No.	Hydraulic Load [l/d]			Organic Load [$gBOD_5$/d]			Ammonia Load [gNH_3/d]		
		per Head	Total		per Head	Total		per Head	Total	
Café users (simple café food & drinks)	80	12	960		12	960		2.5	200	
Additional toilet users	40	10	400		12	480		2.5	100	
Staff (part-time)	4	45	180		25	100		3	12	
Summary Loadings:			**1,540**	l/d		**1,540**	$gBOD_5$/d		**312**	gNH_3/d
			10	pe		**26**	pe		**39**	pe
						1,000	mg/l		**203**	mg/l

Notes:

1) The above maximum number of users is restricted due to the fact that the café site only has a single WC available to all guests and staff.
2) The café will only serve kiosk-style food/cakes & drinks (coffee/tea) and does not have any cooking facilities.

Treatment and Discharge Options for the Engine House Cafe

In theory, there are four treatment/discharge options available for the toilet facility at the Engine House Café. However, due to the location of the café at the bottom of the valley, the established gardens/trees surrounding the café and the close proximity to the lake, the feasibility of some of these four options is severely limited.

1) ***Pumping Station (PS)*** – pumping raw sewage to the main sewage treatment plant at the top of the hill is NOT a viable option due to the location of the café at the bottom of the hill. Any PS would need to overcome nearly 50m of height difference, thus requiring large macerating type pumps. In addition, any rising main would have to be laid through the existing and long established gardens/trees to reach the main sewage treatment plant at the top of the hill.

2) ***Cesspool*** – a cesspool/holding tank would require frequent emptying, which again is NOT a viable option due to the steep slopes and restricted vehicle access to the Engine House Café. In addition, cesspools are the least favourable options when it comes to "off-mains" treatment options by the EA, and would also be the most expensive option to operate due to the frequent tankering visits.

3) ***Septic Tank & Drainage Field*** – although a septic tank and drainage field would be a theoretical option due to the low anticipated flow rates of less than 2m3 per day (thereby conforming to EA GBR), the close proximity of the lake would NOT allow a drainage field within the area near the Engine House Café. Furthermore, the established gardens/trees surrounding the area of the café do NOT allow a viable area for a suitable drainage field nearby. Finally, the anticipated high effluent Ammonia levels discharging from the septic tank into a drainage field would provide a high risk to the nearby plant and/or aquatic life.

4) ***Sewage Treatment Plant (STP)*** – as a result of these constraints, a small STP which then discharges fully treated final effluent into the nearby lake provides the only viable discharge option for the Engine House Café.

Sizing and Selection Notes for new STP

Due to the close proximity to the established gardens and surrounding trees, the best location for the STP is the deck extension/outside seating area of the café. As such, a compromise must be found to allow access for the operation and maintenance of the plant on the one hand, and "hiding" the STP from the café guest on the other hand. The latter includes keeping noise and odour nuisance to an absolute minimum, which can be achieved by taking particular attention to the location and type of the air blower, and installing an extraction fan into the soil vent pipe.

In addition, any new STP must have been tested in accordance with BS EN 12566-3 in order to comply with the EA General Binding Rules for small sewage discharges (EA GBR).

As a result, the general specification for a new STP for the Engine House is as follows:

a) ***Sizing*** – the STP has to have a minimum treatment capacity of **40pe** in order to meet the calculated design loadings.

b) ***Certification*** – the STP has to be certified/tested to BS EN 12566-3.

c) ***Type*** – due to the access limitations and direct discharge into the lake, the STP should use a "fixed-film" biological treatment process. This includes all STPs that use some form of media for the biological microorganism to grow upon. The preferable option would be a SAF type (submerged aerated filter) STP.

d) ***Installation*** – with the STP located underneath the seating area of the café, the underground tank must be suitable for a complete below ground installation (incl. any access covers) and should be as shallow as possible.

The above limits the number of suitable STPs for the Engine House Café, and in particular excludes the selection of a Klargester BioDisc (RBC type plant) due to the large access lid.

However, there are a small number of manufacturers that do offer STPs which meet the above specification, including (but not limited to):

1) PremierTech – Rewatec SAF40 N20 (Ø1.8m x 5.9m long; note, the overall depth will be approx. 2.1m due to access turrets)

2) Marsh Industries – Ensign 40 (Ø1.9m x 5.2m long; note, the overall depth will be approx. 2.2m due to access turrets)

3) Matrix – CLF6 (2.1m wide x 2.2m deep x 5.1m long)

Based on past experience and overall plant features, I recommend the Rewatec SAF40 N20 for this application.

Report provided by

[redacted] (Dr Dirk Daude)

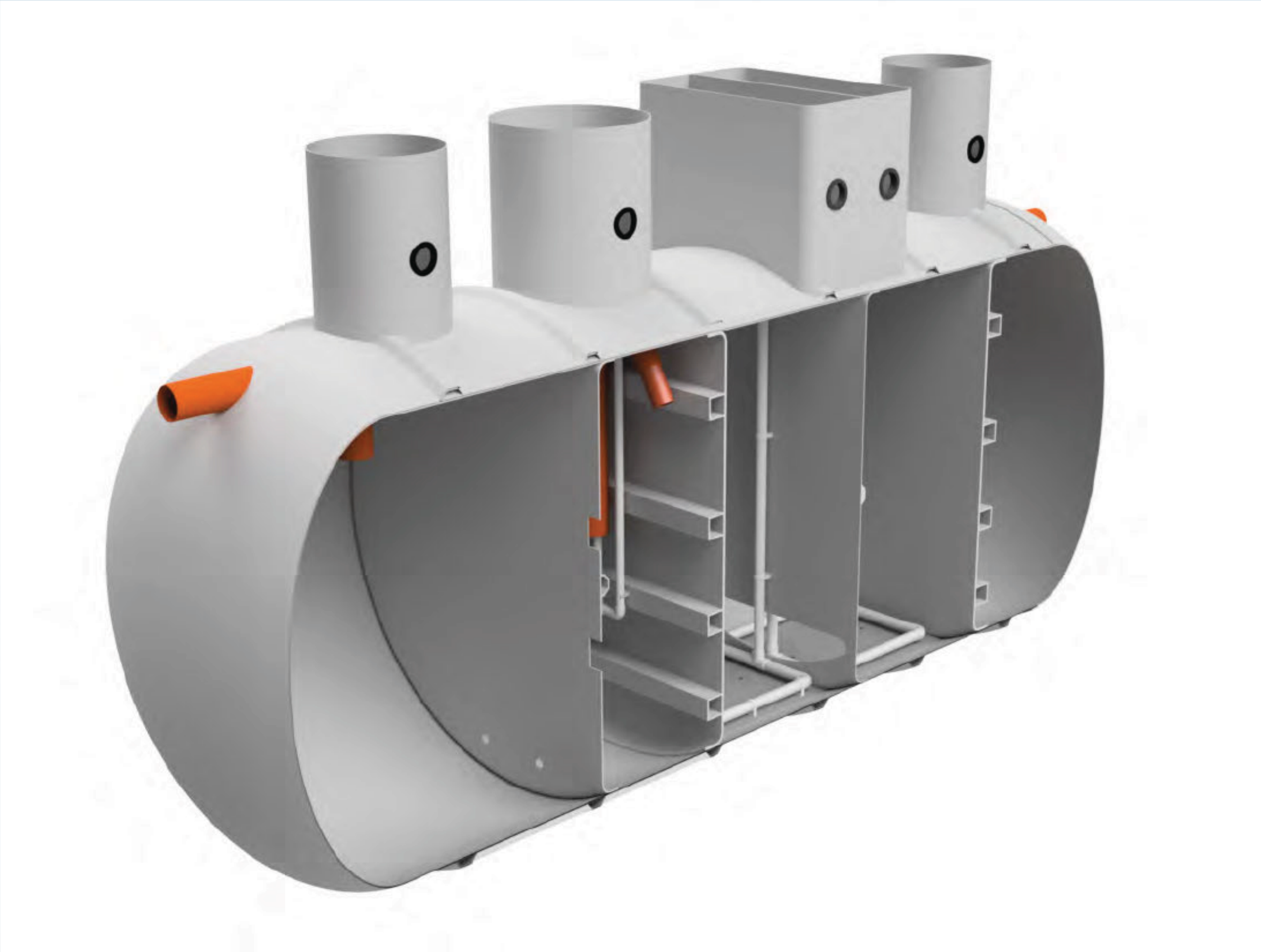
Appendix A – STP Information from Manufacturers

PREMIER TECH

Energy efficient wastewater treatment plants

REWATEC®

Submerged Aerated Filter (SAF)



Marked to CE standard EN 12566-3

UK CA

Highly efficient wastewater treatment

The Premier Tech range of Rewatec SAF sewage treatment plants, combine energy efficiency with an exceptionally high final effluent quality. Uniquely engineered to cater for a population range of 25 to 600 people equivalent (PE) (larger options are available in bespoke setups), the Rewatec SAF fully meets UK environmental discharge standards and is the perfect solution for both small and large scale projects where access to the main drainage system is unavailable, or if wastewater pre-treatment is required.

The Rewatec SAF range is designed, manufactured and tested in accordance with EN12566-3 for plants below 50PE, EN12255 for plants above 50PE and the British Water Code of Practice for Flows and Loads. It comprises of a primary settlement tank, a biozone-aeration chamber and a final settlement tank, with a range of customisable options in between to meet specific requirements. Flow through all the treatment stages occurs via gravity, integral airlifts or via pumps.

By using biological treatment within the SAF, strict effluent standards and consent from a range of on-site applications can be achieved. This includes a final effluent quality of 20mg/L BOD, 30 mg/L SS and up to 5 mg/L NH4-N. It can also achieve up to 62% TN removal and up to 50% TP removal. For applications where additional nitrogen (TN) and/or phosphorus (TP) removal is required, a Rewatec Denitrifying Submerged Aerated Filter (DSAF) can be provided. Dosing options are also available to improve both TN and TP removal.

ENERGY OPTIMISATION

An optional probe can be installed to regulate the air supply in the biozone chamber based upon the incoming wastewater loading. If the occupancy is reduced, the probe will detect the oxygen surplus and the blower will automatically adjust to reduce the air supply.

This provides major benefits in terms of maximising energy efficiency, reducing cost and improving the overall carbon footprint of the plant.

Depending on the site's specific effluent requirements and population requirements, Premier Tech can offer*:

- Single tanks: 25 – 300 PE
- Two tank modular systems: 350 – 500 PE
- Three tank modular systems: 600 PE
- Multi-stream tanks: bespoke designs to meet particular application parameters and larger PE requirements

*all based on N20 effluent discharge consent.

How does the Rewatec SAF work?

Step 1 – In typical installations, wastewater first flows into the primary settlement tank. The purpose of this tank is simple; to balance the flow when subjected to variation and to separate solids from liquids (and store such matter until it is removed via periodic desludging).

Step 2 – Wastewater flow passes from the primary settlement tank to the biozone chamber. The biozone is designed with two course bubble aeration arrangements to prevent blockages from floating biomass and to increase the efficiency of oxygen being supplied to the chamber. Above each of these legs, plastic bio-media - each shaped with a large surface area to encourage biomass growth, treats the wastewater and minimises the size of the reactor.

Step 3 – A blower, housed in an external kiosk, delivers air to the bottom of the biozone to provide oxygen for the biomass, further stimulating growth to support the oxidation process. The air stream promotes the efficient mixing of wastewater effluent with the bio-media present in the tank.

Step 4 – After treatment, wastewater flows into the final settlement tank. Settled sludge (dead biomass) accumulates at the bottom of the tank before being redirected to the primary settling area via re-circulation (enabling partial nutrients (TN, TP) removal).

Step 5 – The treated wastewater (final effluent) is subsequently discharged from the SAF via the outlet pipe. This can either be via gravity displacement or via an external pump station, depending on the water table and site requirements.

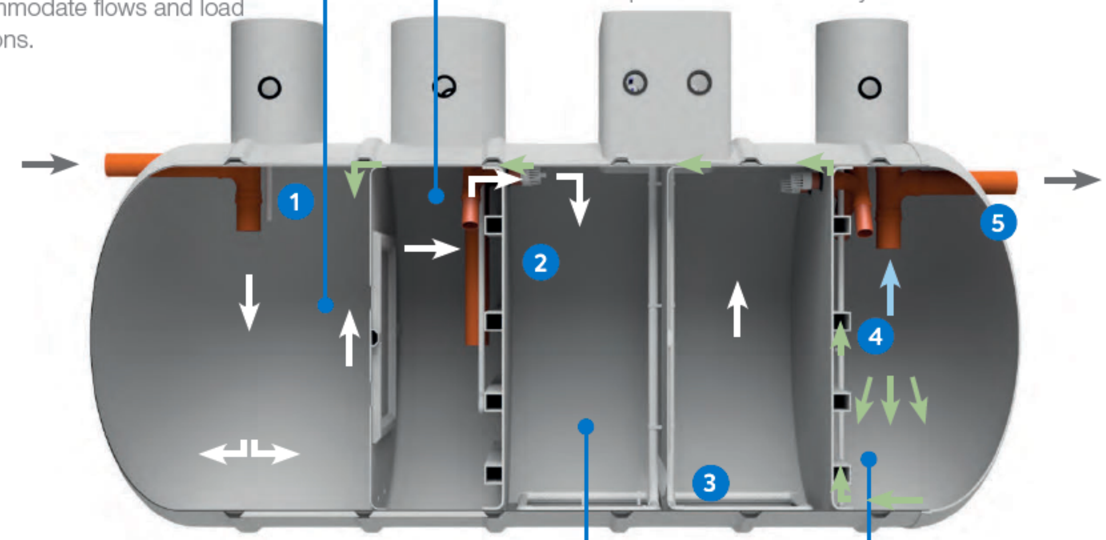
DSAF – The Rewatec DSAF incorporates the same working principles as the Rewatec SAF however it also incorporates pumps in both the primary and final settlement tank. This is to regulate the circulation of the nutrients transformed in the process and to ensure contact between nutrients and microorganisms. At the end of the process, nutrients are converted to inert gases (N_2) or inert solids (Phosphorus-based) and leave the plant as emissions or as sludge.

Primary settlement tank

to accommodate flows and load fluctuations.

Flow monitoring

to verify the volumes of wastewater entering the plant and to confirm hydraulic consent.



Biozone chamber

to promote bacterial growth and treatment using plastic media (bio-carriers), so pollutants like organic matter and ammonia can be reduced.

Final settlement tank

to allow solids to settle and then be redirected back to the primary settlement tank.