Porous Car Park

Porosity	0.30	Slope (1:X)	500.0
Invert Level (m)	17.113	Depression Storage (mm)	5
Width (m)	2.8	Evaporation (mm/day)	3
Length (m)	11.2	Membrane Depth (mm)	0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.0
Membrane Percolation (mm/hr)	1000	Length (m)	17.1
Max Percolation (l/s)	14.3	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	17.163	Membrane Depth (mm)	0

Complex Manhole: S13, DS/PN: S1.014

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	2.8
Membrane Percolation (mm/hr)	1000	Length (m)	31.1
Max Percolation (l/s)	24.2	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	17.062	Membrane Depth (mm)	0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.3
Membrane Percolation (mm/hr)	1000	Length (m)	11.6
Max Percolation (l/s)	10.6	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	17.062	Membrane Depth (mm)	0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.0
Membrane Percolation (mm/hr)	1000	Length (m)	29.7
Max Percolation (l/s)	24.8	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	17.112	Membrane Depth (mm)	0

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NET1.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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	28
Number of Online Controls	2	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 514900 164650 TQ 14900 64650
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	OFF		

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, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	2	+0%	100/60 Winter				17.738
S1.001	S2	15 Winter	2	+0%	100/30 Winter				17.677
S1.002	S3	2880 Winter	2	+0%	30/60 Winter				17.484
S1.003	S4	2880 Winter	2	+0%	30/15 Winter				17.484
S2.000	S4	2880 Winter	2	+0%	100/15 Winter				17.484
S2.001	S5	2880 Winter	2	+0%	100/15 Winter				17.484
S2.002	S20	30 Winter	2	+0%	100/15 Summer				17.485
S2.003	S21	2880 Winter	2	+0%	30/60 Winter				17.484
S2.004	S22	2880 Winter	2	+0%	30/60 Winter				17.484
S2.005	S23	2880 Winter	2	+0%	30/30 Winter				17.484
S2.006	S24	2880 Winter	2	+0%	30/30 Winter				17.484
S1.004	S4	2880 Winter	2	+0%	30/15 Summer				17.484
S1.005	S12	2880 Winter	2	+0%	30/15 Summer				17.484
S1.006	S5	2880 Winter	2	+0%	2/2880 Winter				17.484
S1.007	S6	2880 Winter	2	+0%	2/2160 Summer				17.483
S1.008	S7	2880 Winter	2	+0%	2/240 Winter				17.483

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NET1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.199	0.000	0.03		1.1	OK	
S1.001	S2	-0.190	0.000	0.06		2.1	OK	
S1.002	S3	-0.156	0.000	0.01		0.2	OK	
S1.003	S4	-0.095	0.000	0.01		0.2	OK	
S2.000	S4	-0.219	0.000	0.00		0.0	OK	
S2.001	S5	-0.195	0.000	0.00		0.0	OK	
S2.002	S20	-0.184	0.000	0.05		1.0	OK	
S2.003	S21	-0.144	0.000	0.01		0.2	OK	
S2.004	S22	-0.132	0.000	0.01		0.2	OK	
S2.005	S23	-0.124	0.000	0.02		0.4	OK	
S2.006	S24	-0.103	0.000	0.02		0.5	OK	
S1.004	S4	-0.045	0.000	0.06		1.2	OK	
S1.005	S12	-0.006	0.000	0.07		1.1	OK	
S1.006	S5	0.014	0.000	0.10		1.5	SURCHARGED	
S1.007	S6	0.038	0.000	0.06		1.6	SURCHARGED	
S1.008	S7	0.047	0.000	0.07		1.6	SURCHARGED	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NET1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.009	S8	2880 Winter	2	+0%	2/180 Winter				17.483
S1.010	S9	2880 Winter	2	+0%	2/120 Winter				17.482
S1.011	S10	2880 Winter	2	+0%	2/60 Winter				17.482
S3.000	S16	2880 Winter	2	+0%	30/240 Winter				17.481
S3.001	S30	2880 Winter	2	+0%	30/180 Winter				17.481
S3.002	S20	2880 Winter	2	+0%	2/2160 Summer				17.481
S3.003	S17	2880 Winter	2	+0%	2/120 Winter				17.481
S1.012	S11	2880 Winter	2	+0%	2/60 Summer				17.481
S1.013	S12	2880 Winter	2	+0%	2/30 Winter				17.481
S4.000	S40	2880 Winter	2	+0%	2/2880 Winter				17.480
S4.001	S41	2880 Winter	2	+0%	2/1440 Summer				17.480
S4.002	S26	2880 Winter	2	+0%	2/180 Winter				17.480
S4.003	S25	2880 Winter	2	+0%	2/120 Winter				17.480
S4.004	S26	2880 Winter	2	+0%	2/120 Winter				17.480
S4.005	S42	2880 Winter	2	+0%	2/60 Winter				17.480
S1.014	S13	2880 Winter	2	+0%	30/120 Winter				17.480
S1.015	S14	2880 Winter	2	+0%	30/600 Winter				17.474

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.009	S8	0.059	0.000	0.10		1.6	SURCHARGED	
S1.010	S9	0.087	0.000	0.10		1.7	SURCHARGED	
S1.011	S10	0.118	0.000	0.11		1.9	SURCHARGED	
S3.000	S16	-0.026	0.000	0.00		0.0	OK	
S3.001	S30	-0.006	0.000	0.00		0.1	OK	
S3.002	S20	0.047	0.000	0.03		0.7	SURCHARGED	
S3.003	S17	0.132	0.000	0.05		0.9	SURCHARGED	
S1.012	S11	0.150	0.000	0.05		1.2	SURCHARGED	
S1.013	S12	0.160	0.000	0.07		1.2	SURCHARGED	
S4.000	S40	0.005	0.000	0.00		0.0	SURCHARGED	
S4.001	S41	0.073	0.000	0.02		0.3	SURCHARGED	
S4.002	S26	0.110	0.000	0.02		0.5	SURCHARGED	
S4.003	S25	0.123	0.000	0.02		0.5	SURCHARGED	
S4.004	S26	0.131	0.000	0.04		0.5	SURCHARGED	
S4.005	S42	0.150	0.000	0.03		0.5	SURCHARGED	
S1.014	S13	-0.032	0.000	0.01		1.6	OK	
S1.015	S14	-0.030	0.000	0.02		2.1	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NET1.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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	28
Number of Online Controls	2	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 514900 164650 TQ 14900 64650
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	OFF		

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, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+0%	100/60 Winter				17.754
S1.001	S2	15 Winter	30	+0%	100/30 Winter				17.702
S1.002	S3	120 Winter	30	+0%	30/60 Winter				17.664
S1.003	S4	120 Winter	30	+0%	30/15 Winter				17.661
S2.000	S4	180 Winter	30	+0%	100/15 Winter				17.664
S2.001	S5	180 Winter	30	+0%	100/15 Winter				17.664
S2.002	S20	180 Winter	30	+0%	100/15 Summer				17.664
S2.003	S21	180 Winter	30	+0%	30/60 Winter				17.664
S2.004	S22	180 Winter	30	+0%	30/60 Winter				17.663
S2.005	S23	180 Winter	30	+0%	30/30 Winter				17.662
S2.006	S24	180 Winter	30	+0%	30/30 Winter				17.660
S1.004	S4	120 Winter	30	+0%	30/15 Summer				17.657
S1.005	S12	120 Winter	30	+0%	30/15 Summer				17.644
S1.006	S5	120 Winter	30	+0%	2/2880 Winter				17.636
S1.007	S6	2160 Winter	30	+0%	2/2160 Summer				17.626
S1.008	S7	2160 Winter	30	+0%	2/240 Winter				17.626

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NET1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.183	0.000	0.08		2.7	OK	
S1.001	S2	-0.165	0.000	0.15		5.7	OK	
S1.002	S3	0.024	0.000	0.13		4.4	SURCHARGED	
S1.003	S4	0.082	0.000	0.13		3.4	SURCHARGED	
S2.000	S4	-0.039	0.000	0.01		0.1	OK	
S2.001	S5	-0.015	0.000	0.02		0.5	OK	
S2.002	S20	-0.005	0.000	0.04		0.7	OK	
S2.003	S21	0.036	0.000	0.08		1.9	SURCHARGED	
S2.004	S22	0.047	0.000	0.08		2.1	SURCHARGED	
S2.005	S23	0.054	0.000	0.19		2.9	SURCHARGED	
S2.006	S24	0.073	0.000	0.17		3.6	SURCHARGED	
S1.004	S4	0.128	0.000	0.46		8.7	SURCHARGED	
S1.005	S12	0.154	0.000	0.57		8.3	SURCHARGED	
S1.006	S5	0.166	0.000	0.76		11.8	SURCHARGED	
S1.007	S6	0.181	0.000	0.11		2.7	SURCHARGED	
S1.008	S7	0.190	0.000	0.12		2.7	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NET1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.009	S8	2160 Winter	30	+0%	2/180 Winter				17.625
S1.010	S9	2160 Winter	30	+0%	2/120 Winter				17.624
S1.011	S10	2160 Winter	30	+0%	2/60 Winter				17.623
S3.000	S16	2160 Winter	30	+0%	30/240 Winter				17.621
S3.001	S30	2160 Winter	30	+0%	30/180 Winter				17.622
S3.002	S20	2160 Winter	30	+0%	2/2160 Summer				17.622
S3.003	S17	2160 Winter	30	+0%	2/120 Winter				17.622
S1.012	S11	2160 Winter	30	+0%	2/60 Summer				17.622
S1.013	S12	2160 Winter	30	+0%	2/30 Winter				17.621
S4.000	S40	2160 Winter	30	+0%	2/2880 Winter				17.619
S4.001	S41	2160 Winter	30	+0%	2/1440 Summer				17.619
S4.002	S26	2160 Winter	30	+0%	2/180 Winter				17.619
S4.003	S25	2160 Winter	30	+0%	2/120 Winter				17.619
S4.004	S26	2160 Winter	30	+0%	2/120 Winter				17.619
S4.005	S42	2160 Winter	30	+0%	2/60 Winter				17.619
S1.014	S13	2160 Winter	30	+0%	30/120 Winter				17.619
S1.015	S14	2160 Winter	30	+0%	30/600 Winter				17.600

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.009	S8	0.201	0.000	0.18		2.8	SURCHARGED	
S1.010	S9	0.229	0.000	0.17		2.8	SURCHARGED	
S1.011	S10	0.259	0.000	0.17		3.0	SURCHARGED	
S3.000	S16	0.114	0.000	0.00		0.0	SURCHARGED	
S3.001	S30	0.135	0.000	0.01		0.1	SURCHARGED	
S3.002	S20	0.188	0.000	0.02		0.5	SURCHARGED	
S3.003	S17	0.273	0.000	0.04		0.6	SURCHARGED	
S1.012	S11	0.291	0.000	0.07		1.6	SURCHARGED	
S1.013	S12	0.300	0.000	0.09		1.6	SURCHARGED	
S4.000	S40	0.144	0.000	0.00		0.1	SURCHARGED	
S4.001	S41	0.212	0.000	0.03		0.4	SURCHARGED	
S4.002	S26	0.249	0.000	0.02		0.4	SURCHARGED	
S4.003	S25	0.262	0.000	0.02		0.4	SURCHARGED	
S4.004	S26	0.270	0.000	0.03		0.4	SURCHARGED	
S4.005	S42	0.289	0.000	0.03		0.5	SURCHARGED	
S1.014	S13	0.107	0.000	0.01		1.6	SURCHARGED	
S1.015	S14	0.096	0.000	0.02		2.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NET1.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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	28
Number of Online Controls	2	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 514900 164650 TQ 14900 64650
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	ON
DTS Status	OFF		

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, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	2880 Winter	100	+40%	100/60 Winter				18.055
S1.001	S2	2880 Winter	100	+40%	100/30 Winter				18.055
S1.002	S3	2880 Winter	100	+40%	30/60 Winter				18.055
S1.003	S4	2880 Winter	100	+40%	30/15 Winter				18.055
S2.000	S4	2880 Winter	100	+40%	100/15 Winter				18.055
S2.001	S5	2880 Winter	100	+40%	100/15 Winter				18.055
S2.002	S20	2880 Winter	100	+40%	100/15 Summer				18.055
S2.003	S21	2880 Winter	100	+40%	30/60 Winter				18.055
S2.004	S22	2880 Winter	100	+40%	30/60 Winter				18.055
S2.005	S23	2880 Winter	100	+40%	30/30 Winter				18.055
S2.006	S24	2880 Winter	100	+40%	30/30 Winter				18.055
S1.004	S4	2880 Winter	100	+40%	30/15 Summer				18.055
S1.005	S12	2880 Winter	100	+40%	30/15 Summer				18.054
S1.006	S5	2880 Winter	100	+40%	2/2880 Winter				18.053
S1.007	S6	2880 Winter	100	+40%	2/2160 Summer				18.052
S1.008	S7	2880 Winter	100	+40%	2/240 Winter				18.051

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NET1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.118	0.000	0.00		0.1	SURCHARGED	
S1.001	S2	0.188	0.000	0.01		0.3	SURCHARGED	
S1.002	S3	0.415	0.000	0.02		0.7	SURCHARGED	
S1.003	S4	0.476	0.000	0.02		0.6	SURCHARGED	
S2.000	S4	0.352	0.000	0.00		0.0	SURCHARGED	
S2.001	S5	0.376	0.000	0.00		0.1	SURCHARGED	
S2.002	S20	0.386	0.000	0.01		0.2	SURCHARGED	
S2.003	S21	0.427	0.000	0.02		0.4	SURCHARGED	
S2.004	S22	0.439	0.000	0.02		0.4	SURCHARGED	
S2.005	S23	0.447	0.000	0.04		0.6	SURCHARGED	
S2.006	S24	0.468	0.000	0.04		0.8	SURCHARGED	
S1.004	S4	0.526	0.000	0.12		2.2	SURCHARGED	
S1.005	S12	0.564	0.000	0.13		1.9	SURCHARGED	
S1.006	S5	0.583	0.000	0.21		3.3	SURCHARGED	
S1.007	S6	0.607	0.000	0.14		3.4	SURCHARGED	
S1.008	S7	0.615	0.000	0.15		3.4	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for NET1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.009	S8	2880 Winter	100	+40%	2/180 Winter				18.051
S1.010	S9	2880 Winter	100	+40%	2/120 Winter				18.049
S1.011	S10	2880 Winter	100	+40%	2/60 Winter				18.047
S3.000	S16	2880 Winter	100	+40%	30/240 Winter				18.045
S3.001	S30	2880 Winter	100	+40%	30/180 Winter				18.045
S3.002	S20	2880 Winter	100	+40%	2/2160 Summer				18.045
S3.003	S17	2880 Winter	100	+40%	2/120 Winter				18.045
S1.012	S11	2880 Winter	100	+40%	2/60 Summer				18.045
S1.013	S12	2880 Winter	100	+40%	2/30 Winter				18.044
S4.000	S40	2880 Winter	100	+40%	2/2880 Winter				18.042
S4.001	S41	2880 Winter	100	+40%	2/1440 Summer				18.043
S4.002	S26	2880 Winter	100	+40%	2/180 Winter				18.043
S4.003	S25	2880 Winter	100	+40%	2/120 Winter				18.042
S4.004	S26	2880 Winter	100	+40%	2/120 Winter				18.042
S4.005	S42	2880 Winter	100	+40%	2/60 Winter				18.042
S1.014	S13	2880 Winter	100	+40%	30/120 Winter				18.041
S1.015	S14	2160 Summer	100	+40%	30/600 Winter				17.650

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.009	S8	0.627	0.000	0.22		3.5	FLOOD RISK	
S1.010	S9	0.654	0.000	0.20		3.4	FLOOD RISK	
S1.011	S10	0.683	0.000	0.21		3.6	FLOOD RISK	
S3.000	S16	0.538	0.000	0.00		0.0	SURCHARGED	
S3.001	S30	0.558	0.000	0.01		0.1	SURCHARGED	
S3.002	S20	0.611	0.000	0.06		1.2	SURCHARGED	
S3.003	S17	0.696	0.000	0.12		2.0	FLOOD RISK	
S1.012	S11	0.714	0.000	0.19		4.4	FLOOD RISK	
S1.013	S12	0.723	0.000	0.25		4.5	FLOOD RISK	
S4.000	S40	0.567	0.000	0.00		0.1	SURCHARGED	
S4.001	S41	0.636	0.000	0.06		1.0	FLOOD RISK	
S4.002	S26	0.673	0.000	0.07		1.4	FLOOD RISK	
S4.003	S25	0.685	0.000	0.06		1.5	FLOOD RISK	
S4.004	S26	0.693	0.000	0.11		1.5	FLOOD RISK	
S4.005	S42	0.712	0.000	0.09		1.7	FLOOD RISK	
S1.014	S13	0.529	0.000	0.05		6.4	FLOOD RISK	
S1.015	S14	0.146	0.000	0.04		5.9	SURCHARGED	

Appendix J SCC/EBC Flood Risk Proformas

Elmbridge Borough Council
... bridging the communities ...

Flood Risk Assessment Proforma

Please note: Not all elements of this Profroma will need to be completed for all developments. The level and scope of the FRA will depend on the degree and type of flood risk, scale and nature of the development, its vulnerability classification and whether or not the Sequential and Exceptions Tests are required. Applicants should use Flood Risk SPD to scope out the requirements and are strongly encouraged to use the pre-applications services available (Section 2.1). **The completion of an FRA will not automatically mean that the development is acceptable in flood risk terms.**

1. Site Description

What to Include in the FRA		Source(s) of information	Summary	Reference to Section of FRA
Site address	-	-	Land North of Raleigh Drive, Claygate, Surrey	Title page
Site description	-	-	Redevelopment of recreational land associated with Esher Park Gardens	1.1.1
Location Plan	Including geographical features, street names, catchment areas, watercourses and other bodies of water	SFRA Appendix B	Site location plan provided	Figure 1, 2.1.1
Site plan	Plan of site showing development proposals and any structures which may influence local hydraulics e.g. bridges, pipes/ducts crossing watercourses, culverts, screens, embankments, walls, outfalls and condition of channel	OS Mapping	Outline masterplan provided	Appendix A

2. Proposed Development

What to Include in the FRA		Source(s) of information	Summary	Reference to Section of FRA
Vulnerability Classification	Determine the vulnerability classification of the development. Is the vulnerability classification appropriate within the Flood Zone?	SPD Appendix 1	Flood zone 1, 2 and 3 across the site	5.1.2

3. Assessing Flood Risk

What to Include in the FRA		Source(s) of information	Summary	Reference to Section of FRA
The level of assessment will depend on the degree of flood risk and the scale, nature and location of the proposed development. Refer to Table 7-1 of the SFRA regarding the levels of assessment. Not all of the prompts listed below will be relevant for every application.				
Topography	Include general description of the topography local to the site. Where necessary, site survey may be required to confirm site levels (in relation to Ordnance datum).	Topography	Description provided along with topographical survey	2.2 and Appendix C
Landscape and Vegetation	Include a description of the landscape and existing vegetation on the site.	SPD Section 3.1	Shown on outline Masterplan	Appendix A
Geology	General description of geology local to the site.	SPD Section 3.1	Underlying bedrock is London Clay Formation	2.4 - 2.5
Watercourses	Identify Main Rivers and Ordinary Watercourses local to the site.	SPD Section 3.2	River Rythe and the riparian water course	2.3
Flooding from Rivers	Provide a plan of the site and Flood Zones.	SPD Section 3.2 SFRA Appendix C		

	Identify any historic flooding that has affected the site, including dates and depths where possible. How is the site likely to be affected by climate change? Determine flood levels on the site for the 1% annual probability (1 in 100 chance each year) flood event including an allowance for climate change. Determine flood hazard on the site (in terms of flood depth and velocity). Undertake new hydraulic modelling to determine the flood level, depth, velocity, hazard, rate of onset of flooding on the site.	Environment Agency Products 1-7. New hydraulic model.		Appendix G (EA product 4 data), sections 5, 6, 7 and 8
Flooding from Land	Identify any historic flooding that has affected the site.	SPD Section 3.2 SFRA Appendix D. Topographic survey. Site walkover. New modelling study.		Appendix G (EA product 4 data)
Flooding from Groundwater	Desk based assessment based on high level BGS mapping in the SFRA.	SPD Section 3.2 SFRA Appendix B, Figure B2, B3, B5. Ground Investigation Report Hydrology Report		2.4

Flooding from Sewers	Identify any historic flooding that has affected the site.	SPD Section 3.2 SFRA Appendix B Figures B7 and B8. Where appropriate an asset location survey can be provided by Thames Water Utilities Ltd www.thameswater-propertysearches.co.uk/		Appendix G (EA product 4 data)
Reservoirs, canals and other artificial sources	Identify any historic flooding that has affected the site.	SPD Section 3.2 Risk of Flooding from Reservoirs mapping (EA website).		Appendix G (EA product 4 data)

This form is completed using factual information and can be used as a summary of the Flood Risk Assessment on this site.

Form Completed By Glenn Charles

Qualification of person responsible for signing off this template Managing Director

Company Charles and Associates

On behalf of (Client's details) Claygate House Investments Ltd and MJS Investments Ltd

Date 3rd March 2023

Contact information

tplan@elmbridge.gov.uk
www.elmbridge.gov.uk/planning

View our privacy notice here

Surface Water Drainage Summary Pro-forma

Introduction

Surrey County Council (SCC) as Lead Local Flood Authority (LLFA) recommends this pro-forma is completed in full and should be submitted with any planning application which seeks permission for 'major' development. The information contained in this form will be used by SCC in its role as LLFA as a 'statutory consultee' on Sustainable Drainage Systems (SuDS) for all 'major' planning applications. The pro-forma should be completed in conjunction with the SCC SuDS Design Guidance. The pro-forma will accompany the site-specific Flood Risk Assessment and Drainage Strategy submitted as part of the planning application.

Please complete this pro-forma in full for full applications and the coloured sections for outline applications. This will help us identify what information has been included and will assist in our review process.

All bracketed numbers refer to the relevant note on page 5 of this document.

Site Details

1.0 Site Detail Questions

Question number	Question	Answer (to be completed or delete as applicable)	Required
1.1	Planning application reference (if known)	Not known at this stage	Outline & Full
1.2	Site name	Land North of Raleigh Drive, Claygate, Surrey	Outline & Full
1.3	Total application site area (1) (in hectares)	2.1ha	Outline & Full
1.4	Predevelopment use (4)	recreational land	Outline & Full
1.5	Urban Creep applicable	Yes	Outline & Full
1.6	If Urban Creep required, factor applied (percentage)	10% of building area	Outline & Full
1.7	Proposed design life / planning application life (in years)	100 years	Outline & Full
1.9	Have agreements in principle (where applicable) for discharge been provided	No	Outline & Full

2.0 Method(s) of Discharge (5)

Question number	Question	Answer (delete as applicable)	Required

2.1	Reuse	No	Full
2.2	Infiltration	No	Full
2.3	Hybrid	No	Full
2.4	Watercourse	Yes	Full
2.5	Surface Water Sewer	No	Full
2.6	Combined sewer	No	Full

Calculation Inputs

3.0 Calculation input questions

Question number	Question	Answer (to be completed or delete as applicable)	Required
3.1	Area within proposed site which is drained by SuDS (2) (in hectares)	1.3ha	Outline & Full
3.2	Impermeable area drained predevelopment (3) (in hectares)	0.26ha (although not counted in calculations)	Outline & Full
3.3	Impermeable area drained post development (3) (in hectares)	0.78ha (0.82ha with urban creep)	Outline & Full
3.4	Additional impermeable area (Question 3.3 minus Question 3.2) (in hectares)	Assumed 0.78ha (0.82ha with urban creep) within calcualtions	Outline & Full
3.5	Method for assessing greenfield runoff rate	ICP SUDS	Outline & Full
3.6	Method for assessing brownfield runoff rate (if applicable)	N/A	Outline & Full
3.7	Coefficient of runoff (6) (Cv)	0.75 summer 0.84 winter	Outline & Full
3.8	Source of rainfall data (FEH Preferred)	FEH	Outline & Full
3.9	Climate change factor applied (percentage)	+40%	Full

4.0 Attenuation (positive outlet) (13)

Question number	Question	Answer (to be completed or delete as applicable)	Required
4.1	Drainage outlet at risk of drowning (elevated water levels in watercourse/sewer)	Yes	Full
4.2	Invert level at final outlet (in metres above ordnance datum)	17.000	Full

4.3	Design level used for surcharged water level at outlet (13) (in metres above ordnance datum)	17.65	Full

5.0 Infiltration (Discharge to Ground)

Question number	Question	Answer (to be completed or delete as applicable)	Required
5.1	Have infiltration tests been undertaken	No	Outline & Full
5.2	If yes, which method has been used	N/A	Outline & Full
5.3	Infiltration rate (where applicable) (in metres per second)	N/A	Outline & Full
5.4	Depth to highest known ground water table (in metres above ordnance datum)	Unknown	Full
5.5	Depth of infiltration feature (in metres above ordnance datum)	N/A	Full
5.6	Factor of safety used for sizing infiltration storage	N/A	Full

Calculation Outputs

Section 6.0, 7.0 and 8.0 refer to sites where storage is provided by full attenuation or partial infiltration. For sites where all flows are infiltrated to ground go straight to Section 9.0.

6.0 Greenfield runoff rates

Question number	Question	Answer (to be completed)	Required
6.1	1 in 1 year rainfall (in litres per second)	1.8l/s	Outline & Full
6.2	1 in 30 year rainfall (in litres per second)	4.8l/s	Outline & Full
6.3	1 in 100 year rainfall (in litres per second)	6.7l/s	Outline & Full
6.4	Qbar (in litres per second)	2.1l/s	Outline & Full

7.0 Brownfield runoff rates (if applicable)

Question number	Question	Answer (to be completed)	Required
7.1	1 in 1 year rainfall (in litres per second)	N/A	Outline & Full
7.2	1 in 30 year rainfall (in litres per second)	N/A	Outline & Full
7.3	1 in 100 year rainfall (in litres per second)	N/A	Outline & Full

8.0 Proposed maximum rate of runoff from site (incl. Urban Creep) (7)

Question number	Question	Answer (to be completed)	Required
8.1	1 in 1 year rainfall (in litres per second)	1.8l/s	Outline & Full
8.2	1 in 30 year rainfall (in litres per second)	1.8l/s	Outline & Full
8.3	1 in 100 year rainfall plus climate change allowance (in litres per second)	6.7l/s	Outline & Full

9.0 Attenuation storage to manage flow rates from site (inclusive of Climate Change Allowance and Urban Creep)

Question number	Question	Answer (to be completed)	Required
9.1	Volume of Storage for the 1 in 100 year plus Climate Change Allowance (9) (in metres cubed)	TBC at detailed planning	Full
9.2	50% storage drain down time for 1 in 30 year rainfall (in hours)	N/A	Full

10.0 Volume control provision

Question number	Question	Answer (to be completed)	Required
10.1	Interception losses (11) (in metres cubed)	TBC at detailed planning	Full
10.2	Rain harvesting (in metres cubed)	TBC at detailed planning	Full
10.3	Infiltration (in metres cubed)	None	Full
10.4	Attenuation (in metres cubed)	TBC at detailed planning	Full
10.5	Separate volume designated as long-term storage (12) (in metres cubed)	TBC at detailed planning	Full
10.6	Total volume control (sum of inputs for Questions 10.1 to 10.5) (in metres cubed)	TBC at detailed planning	Full

11.0 Site storage volumes (for sites proposing full infiltration only)

Question number	Question	Answer (to be completed)	Required
11.1	Volume of Storage for the 1 in 30 year (8)	TBC at detailed planning	Full
11.2	Volume of Storage for the 1 in 100 year plus Climate Change Allowance (10)	TBC at detailed planning	Full

Notes

1. All area within the proposed application site boundary to be included.

2. The site area which is positively drained includes all green areas which drain to the SuDS system and area of surface SuDS features. It excludes large open green spaces which do not drain to the SuDS system.

3. Impermeable area should be measured pre and post development. Impermeable surfaces include roofs, pavements, driveways and paths; where runoff is conveyed to the drainage system.

4. Predevelopment use may impact on the allowable discharge rate. The LLFA will seek for reduction in flow rates to greenfield (SCC SuDS Design Guidance).

5. Runoff may be discharged via one or more methods.

6. Sewers for Adoption 7th Edition recommends a Cv of 100% when designing drainage for impermeable area (assumes no loss of runoff from impermeable surfaces) and 0% for permeable areas. Where lower Cv's are used the applicant should justify the selection of Cv.

7. It is Surrey County Council's preference that discharge rates for all events up to the 1 in 100 year rainfall event plus climate change match the greenfield rate for the same rainfall event.

8. Storage for the 1 in 30 year rainfall event must be fully contained within the SuDS components. Note that standing water within SuDS components such as ponds, basins and swales is not classified as flooding. Storage should be calculated for the critical duration rainfall event.

9. Runoff generated from rainfall events up to the 1 in 100 year rainfall event will not be allowed to leave the site in an uncontrolled way. Temporary flooding of designated areas to shallow depths and velocities may be acceptable.

10. Climate change is specified between 10% and 40% increase to rainfall intensity depending upon the design life of the development. Sensitivity testing should be carried out up to the 40% climate change allowance.

11. Where Source Control is provided Interception losses will occur. An allowance of 5mm rainfall depth can be subtracted from the net inflow to the storage calculation where interception losses are demonstrated. The Applicant should demonstrate use of sub-catchments and source control techniques. Further information is available in the SCC SuDS Design Guide.

12. Flows within long term storage areas should be infiltrated to the ground or discharged at low flow rate of maximum 2 l/s/ha.

13. Careful consideration should be used for calculations where flow control / storage is likely to be influenced by surcharged sewer or peak levels within a watercourse. Calculations should demonstrate that risk of drowned outlet has been taken into consideration. Vortex controls require conditions of free discharge to operate as per specification.