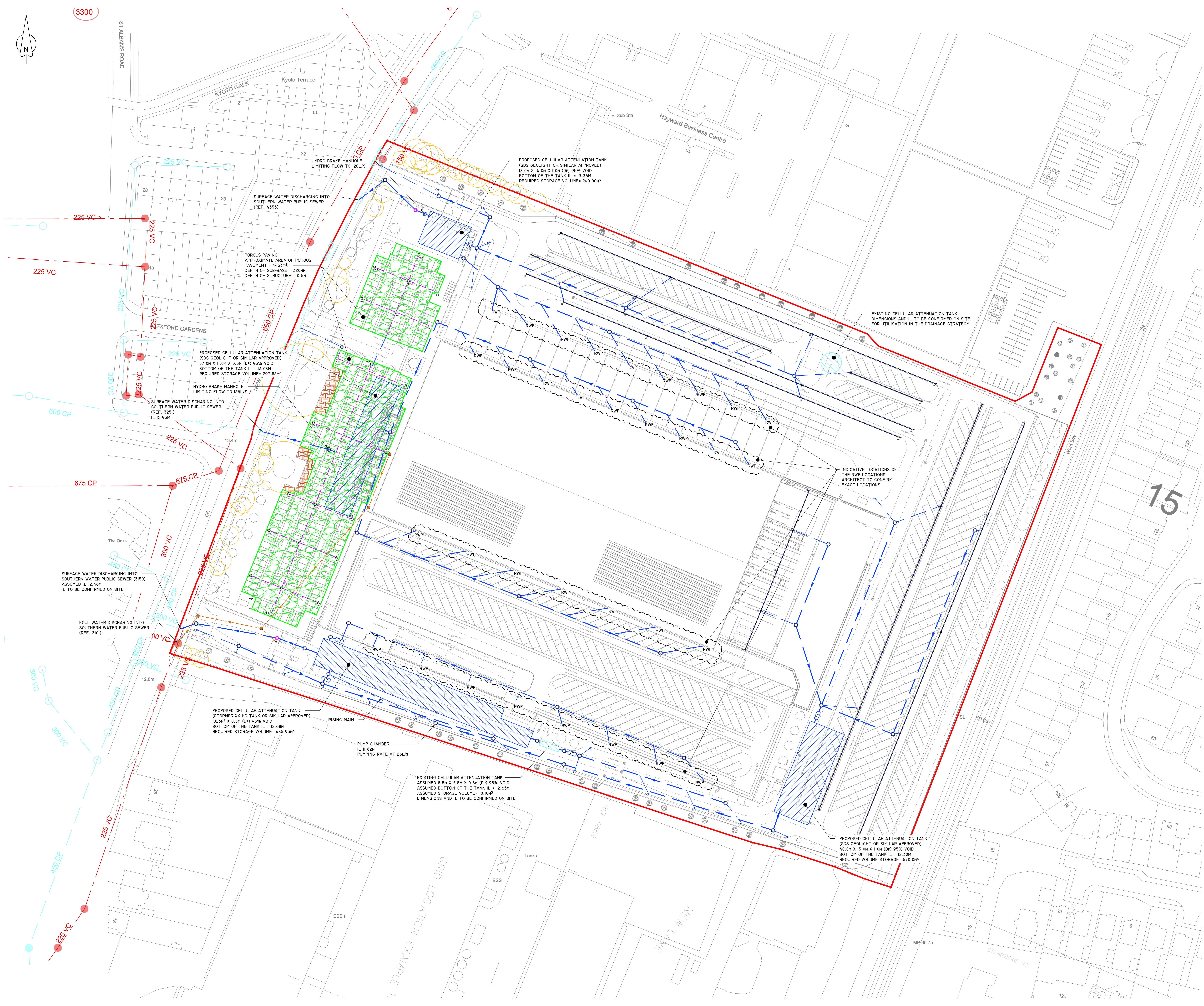


Appendix G – Drainage Strategy



- GENERAL NOTES**
- DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
 - FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
 - ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

- LEGEND**
- SITE BOUNDARY
 - PROPOSED PRIVATE SURFACE WATER SEWER
 - PROPOSED PRIVATE FOUL SEWER
 - EXISTING PUBLIC SURFACE SEWER
 - EXISTING PUBLIC FOUL SEWER
 - PERFORATED PIPE
 - PROPOSED PRIVATE SURFACE WATER RISING MAIN
 - PROPOSED SURFACE WATER DRAINAGE CHANNEL
 - PROPOSED ATTENUATION TANK
 - EXISTING ATTENUATION TANK
 - PROPOSED QUADRACEPTOR
 - PROPOSED PRETROL INTERCEPTOR
 - PROPOSED GULLY
 - PROPOSED OUT BOX / SUMP UNIT
 - PROPOSED ACCESS BOX
 - PROPOSED RAINWATER PIPE
 - PROPOSED POLYPROPYLENE INSPECTION CHAMBER
 - PROPOSED POROUS PAVING
 - EXISTING PUBLIC SURFACE WATER MANHOLE
 - EXISTING PUBLIC FOUL WATER MANHOLE
 - TREE PRESERVATION ORDERS (TPO) AREA
 - NO DIG CONSTRUCTION AREA

POS	UPDATED SITE LAYOUT	SC	SG	09/02/21
P04	UPDATED SITE LAYOUT	SC	SG	09/02/21
P01	REVISED DRAINAGE LAYOUT	SC	SG	29/01/21
P02	UPDATED CLIENT NAME	IL	SG	22/12/20
P03	FIRST ISSUE	IL	SG	21/01/21
REV	DESCRIPTION	BY	CHK	DATE

CLIENT
HAVANT PROPERTY INVESTMENT LLP

PROJECT
**HAVANT
32 NEW LANE**

DRAWING TITLE
DRAINAGE STRATEGY

PINNACLE
CONSULTING ENGINEERS

ALCHEMY,
BESSIERER ROAD,
WELWYN GARDEN CITY,
HERTS.
ALT THE: TELEPHONE: 01707 527 630
NORWICH | LONDON | DUBLIN | THE HAGUE

DRAWING STATUS				INFORMATION			
SCALE	1:500	DATE	JAN '21	DRAWN BY	IL	CHECKED	SG
DRG NO	C200810-PIN-XX-XX-DR-C-205	REVISION	P05				

COPYRIGHT PINNACLE

Appendix H – MicroDrainage Source Control Calculations

Alchemy

Page 1

Bessemer Road
Welwyn Garden City
Hertfordshire AL7 1HE

Havant
Storage calculations
for catchment A

Date 04/02/2021 20:32
File Catchment A.SRCX

Designed by Sudeep Chongbang
Checked by Som Raj Gurung

XP Solutions

Source Control 2017.1.2

Micro
Drainage

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 175 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	12.806	0.506	0.0	26.0	26.0	288.3	O K
30 min Summer	12.913	0.613	0.0	26.0	26.0	349.4	O K
60 min Summer	13.018	0.718	0.0	26.0	26.0	409.3	O K
120 min Summer	13.090	0.790	0.0	26.0	26.0	450.5	O K
180 min Summer	13.098	0.798	0.0	26.0	26.0	454.9	O K
240 min Summer	13.099	0.799	0.0	26.0	26.0	455.6	O K
360 min Summer	13.095	0.795	0.0	26.0	26.0	452.9	O K
480 min Summer	13.081	0.781	0.0	26.0	26.0	445.4	O K
600 min Summer	13.062	0.762	0.0	26.0	26.0	434.2	O K
720 min Summer	13.038	0.738	0.0	26.0	26.0	420.7	O K
960 min Summer	12.922	0.622	0.0	26.0	26.0	354.8	O K
1440 min Summer	12.723	0.423	0.0	26.0	26.0	241.0	O K
15 min Winter	12.875	0.575	0.0	26.0	26.0	327.6	O K
30 min Winter	13.000	0.700	0.0	26.0	26.0	399.1	O K
60 min Winter	13.129	0.829	0.0	26.0	26.0	472.5	O K
120 min Winter	13.233	0.933	0.0	26.0	26.0	532.1	O K
180 min Winter	13.261	0.961	0.0	26.0	26.0	547.5	O K
240 min Winter	13.254	0.954	0.0	26.0	26.0	543.9	O K
360 min Winter	13.237	0.937	0.0	26.0	26.0	534.4	O K
480 min Winter	13.211	0.911	0.0	26.0	26.0	519.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	121.275	0.0	326.4	25
30 min Summer	75.885	0.0	407.9	38
60 min Summer	47.483	0.0	511.2	66
120 min Summer	29.711	0.0	639.2	122
180 min Summer	22.584	0.0	728.7	164
240 min Summer	18.591	0.0	801.3	196
360 min Summer	14.132	0.0	911.8	262
480 min Summer	11.633	0.0	1000.7	332
600 min Summer	10.003	0.0	1078.2	402
720 min Summer	8.842	0.0	1142.6	472
960 min Summer	6.947	0.0	1196.5	604
1440 min Summer	4.945	0.0	1278.3	858
15 min Winter	121.275	0.0	365.3	25
30 min Winter	75.885	0.0	457.4	38
60 min Winter	47.483	0.0	572.7	66
120 min Winter	29.711	0.0	717.8	122
180 min Winter	22.584	0.0	816.6	176
240 min Winter	18.591	0.0	895.7	226
360 min Winter	14.132	0.0	1022.6	284
480 min Winter	11.633	0.0	1120.7	362

©1982-2017 XP Solutions

Alchemy		Page 2
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment A	
Date 04/02/2021 20:32 File Catchment A.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions	Source Control 2017.1.2	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
600 min Winter	13.173	0.873	0.0	26.0	26.0	497.5	O K
720 min Winter	13.128	0.828	0.0	26.0	26.0	472.2	O K
960 min Winter	12.954	0.654	0.0	26.0	26.0	373.0	O K
1440 min Winter	12.659	0.359	0.0	26.0	26.0	204.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	10.003	0.0	1204.8	438
720 min Winter	8.842	0.0	1279.0	514
960 min Winter	6.947	0.0	1340.3	654
1440 min Winter	4.945	0.0	1431.2	908

Alchemy		Page 3
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment A	
Date 04/02/2021 20:32 File Catchment A.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions	Source Control 2017.1.2	

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 472400 107400 SU 72400 07400
C (1km)	-0.029
D1 (1km)	0.457
D2 (1km)	0.295
D3 (1km)	0.387
E (1km)	0.310
F (1km)	2.252
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	1440
Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.436

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
0	4	4	8	8	12
0.479	0.479	0.479	0.479	0.479	0.479

Alchemy		Page 4
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment A	
Date 04/02/2021 20:32 File Catchment A.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions		Source Control 2017.1.2

Model Details

Storage is Online Cover Level (m) 14.800

Cellular Storage Structure

Invert Level (m) 12.300 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	600.0	600.0	1.001	0.0	710.0
1.000	600.0	710.0			

Pump Outflow Control

Invert Level (m) 11.620

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	26.0000	1.200	26.0000	3.000	26.0000	7.000	26.0000
0.200	26.0000	1.400	26.0000	3.500	26.0000	7.500	26.0000
0.300	26.0000	1.600	26.0000	4.000	26.0000	8.000	26.0000
0.400	26.0000	1.800	26.0000	4.500	26.0000	8.500	26.0000
0.500	26.0000	2.000	26.0000	5.000	26.0000	9.000	26.0000
0.600	26.0000	2.200	26.0000	5.500	26.0000	9.500	26.0000
0.800	26.0000	2.400	26.0000	6.000	26.0000		
1.000	26.0000	2.600	26.0000	6.500	26.0000		

Alchemy		Page 1
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Cascade calculation for A, B and F	
Date 05/02/2021 09:45 File A B & F.CASX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions	Source Control 2017.1.2	

Source Control 2017.1.2

Cascade Summary of Results for Catchment B.SRCX

Upstream Outflow To Overflow To
Structures

Catchment A.SRCX (None) (None)
Catchment F.SRCX

Half Drain Time : 64 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	12.960	0.280	0.0	58.3	58.3	275.3	O K
30 min Summer	13.016	0.336	0.0	68.3	68.3	329.9	O K
60 min Summer	13.071	0.391	0.0	74.4	74.4	384.1	O K
120 min Summer	13.121	0.441	0.0	79.5	79.5	433.9	O K
180 min Summer	13.144	0.464	0.0	81.7	81.7	455.9	O K
240 min Summer	13.150	0.470	0.0	82.3	82.3	462.2	O K
360 min Summer	13.143	0.463	0.0	81.7	81.7	455.4	O K
480 min Summer	13.127	0.447	0.0	80.1	80.1	439.7	O K
600 min Summer	13.110	0.430	0.0	78.4	78.4	422.5	O K
720 min Summer	13.093	0.413	0.0	76.7	76.7	405.8	O K
960 min Summer	13.049	0.369	0.0	72.0	72.0	362.5	O K
1440 min Summer	12.993	0.313	0.0	65.6	65.6	307.3	O K
15 min Winter	12.989	0.309	0.0	65.2	65.2	303.5	O K
30 min Winter	13.052	0.372	0.0	72.3	72.3	365.5	O K
60 min Winter	13.113	0.433	0.0	78.7	78.7	425.5	O K
120 min Winter	13.159	0.479	0.0	83.1	83.1	470.8	O K
180 min Winter	13.174	0.494	0.0	84.5	84.5	485.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	121.275	0.0	604.0	24
30 min Summer	75.885	0.0	755.4	36
60 min Summer	47.483	0.0	946.2	58
120 min Summer	29.711	0.0	1183.7	90
180 min Summer	22.584	0.0	1349.6	124
240 min Summer	18.591	0.0	1482.9	158
360 min Summer	14.132	0.0	1689.1	224
480 min Summer	11.633	0.0	1853.8	288
600 min Summer	10.003	0.0	1995.2	352
720 min Summer	8.842	0.0	2115.4	414
960 min Summer	6.947	0.0	2215.6	536
1440 min Summer	4.945	0.0	2366.5	770
15 min Winter	121.275	0.0	676.3	24
30 min Winter	75.885	0.0	846.7	36
60 min Winter	47.483	0.0	1060.0	60
120 min Winter	29.711	0.0	1327.8	96
180 min Winter	22.584	0.0	1512.1	132

Alchemy		Page 2
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Cascade calculation for A, B and F	
Date 05/02/2021 09:45 File A B & F.CASX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions		Source Control 2017.1.2

Cascade Summary of Results for Catchment B.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	13.173	0.493	0.0	84.5	84.5	484.7	O K
360 min Winter	13.152	0.472	0.0	82.5	82.5	463.7	O K
480 min Winter	13.123	0.443	0.0	79.7	79.7	436.0	O K
600 min Winter	13.096	0.416	0.0	77.0	77.0	409.1	O K
720 min Winter	13.071	0.391	0.0	74.4	74.4	384.8	O K
960 min Winter	13.017	0.337	0.0	68.5	68.5	331.7	O K
1440 min Winter	12.965	0.285	0.0	59.9	59.9	280.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	18.591	0.0	1659.1	168
360 min Winter	14.132	0.0	1893.2	238
480 min Winter	11.633	0.0	2076.3	304
600 min Winter	10.003	0.0	2231.9	368
720 min Winter	8.842	0.0	2368.6	432
960 min Winter	6.947	0.0	2481.8	550
1440 min Winter	4.945	0.0	2650.0	772

Alchemy		Page 3
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Cascade calculation for A, B and F	
Date 05/02/2021 09:45 File A B & F.CASX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions	Source Control 2017.1.2	

Cascade Rainfall Details for Catchment B.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 472400 107400 SU 72400 07400
C (1km)	-0.029
D1 (1km)	0.457
D2 (1km)	0.295
D3 (1km)	0.387
E (1km)	0.310
F (1km)	2.252
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	1440
Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.115

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
0	4	4	8	8	12
0.372	0.372	0.372	0.372	0.372	0.372

Alchemy		Page 4
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Cascade calculation for A, B and F	
Date 05/02/2021 09:45 File A B & F.CASX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions Source Control 2017.1.2		

Cascade Model Details for Catchment B.SRCX

Storage is Online Cover Level (m) 14.000

Cellular Storage Structure

Invert Level (m) 12.680 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	1035.0	1035.0	0.501	0.0	1136.5
0.500	1035.0	1136.5			

Pipe Outflow Control

Diameter (m) 0.300 Entry Loss Coefficient 0.500
Slope (1:X) 245.0 Coefficient of Contraction 0.600
Length (m) 60.000 Upstream Invert Level (m) 12.660
Roughness k (mm) 0.600

©1982-2017 XP Solutions

Alchemy

Bessemer Road

Welwyn Garden City

Hertfordshire AL7 1HE

Date 04/02/2021 20:39

File Catchment C.SRCX

XP Solutions

Havant

Storage calculations for catchment C

Designed by Sudeep Chongbang

Checked by Som Raj Gurung

Source Control 2017.1.2

Page 1



Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 96 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
15 min Summer	14.706	0.206	0.0	16.2	16.2	106.3	Flood Risk
30 min Summer	14.730	0.230	0.0	18.0	18.0	132.6	Flood Risk
60 min Summer	14.751	0.251	0.0	19.3	19.3	157.7	Flood Risk
120 min Summer	14.765	0.265	0.0	20.3	20.3	176.6	Flood Risk
180 min Summer	14.772	0.272	0.0	20.6	20.6	185.4	Flood Risk
240 min Summer	14.775	0.275	0.0	20.8	20.8	189.0	Flood Risk
360 min Summer	14.774	0.274	0.0	20.8	20.8	188.6	Flood Risk
480 min Summer	14.771	0.271	0.0	20.6	20.6	183.6	Flood Risk
600 min Summer	14.766	0.266	0.0	20.3	20.3	176.7	Flood Risk
720 min Summer	14.760	0.260	0.0	19.9	19.9	169.2	Flood Risk
960 min Summer	14.740	0.240	0.0	18.7	18.7	144.8	Flood Risk
1440 min Summer	14.710	0.210	0.0	16.5	16.5	110.8	Flood Risk
15 min Winter	14.721	0.221	0.0	17.3	17.3	122.1	Flood Risk
30 min Winter	14.746	0.246	0.0	19.0	19.0	152.1	Flood Risk
60 min Winter	14.769	0.269	0.0	20.5	20.5	181.2	Flood Risk
120 min Winter	14.784	0.284	0.0	21.4	21.4	201.2	Flood Risk
180 min Winter	14.789	0.289	0.0	21.7	21.7	208.5	Flood Risk
240 min Winter	14.790	0.290	0.0	21.7	21.7	209.6	Flood Risk
360 min Winter	14.785	0.285	0.0	21.4	21.4	203.2	Flood Risk
480 min Winter	14.777	0.277	0.0	21.0	21.0	192.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	121.275	0.0	117.8	24
30 min Summer	75.885	0.0	152.9	36
60 min Summer	47.483	0.0	196.8	62
120 min Summer	29.711	0.0	251.5	96
180 min Summer	22.584	0.0	289.5	130
240 min Summer	18.591	0.0	319.5	164
360 min Summer	14.132	0.0	366.7	234
480 min Summer	11.633	0.0	403.8	300
600 min Summer	10.003	0.0	435.0	366
720 min Summer	8.842	0.0	462.0	432
960 min Summer	6.947	0.0	483.1	558
1440 min Summer	4.945	0.0	513.5	798
15 min Winter	121.275	0.0	134.6	24
30 min Winter	75.885	0.0	174.0	36
60 min Winter	47.483	0.0	223.2	62
120 min Winter	29.711	0.0	284.5	102
180 min Winter	22.584	0.0	327.1	140
240 min Winter	18.591	0.0	360.8	178
360 min Winter	14.132	0.0	413.8	252
480 min Winter	11.633	0.0	455.5	322

©1982-2017 XP Solutions

Alchemy		Page 2
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment C	
Date 04/02/2021 20:39 File Catchment C.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions		Source Control 2017.1.2

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
600 min Winter	14.768	0.268	0.0	20.4	20.4	179.9	Flood Risk
720 min Winter	14.759	0.259	0.0	19.8	19.8	167.6	Flood Risk
960 min Winter	14.732	0.232	0.0	18.1	18.1	135.4	Flood Risk
1440 min Winter	14.694	0.194	0.0	15.3	15.3	94.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	10.003	0.0	490.5	390
720 min Winter	8.842	0.0	520.9	456
960 min Winter	6.947	0.0	544.9	582
1440 min Winter	4.945	0.0	579.5	818

Alchemy		Page 3
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment C	
Date 04/02/2021 20:39 File Catchment C.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions Source Control 2017.1.2		

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 472400 107400 SU 72400 07400
C (1km)	-0.029
D1 (1km)	0.457
D2 (1km)	0.295
D3 (1km)	0.387
E (1km)	0.310
F (1km)	2.252
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	1440
Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.617

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
0	4 0.206	4	8 0.206	8	12 0.206

©1982-2017 XP Solutions

Alchemy		Page 4																																								
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment C																																									
Date 04/02/2021 20:39 File Catchment C.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung																																									
XP Solutions	Source Control 2017.1.2																																									
Model Details Storage is Online Cover Level (m) 15.000 Porous Car Park Structure <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>55.7</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>80.0</td></tr><tr><td>Max Percolation (l/s)</td><td>1237.8</td><td>Slope (1:X)</td><td>300.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>14.500</td><td>Membrane Depth (m)</td><td>0</td></tr></table> Pipe Outflow Control <table><tr><td>Diameter (m)</td><td>0.150</td><td>Entry Loss Coefficient</td><td>0.500</td></tr><tr><td>Slope (1:X)</td><td>100.0</td><td>Coefficient of Contraction</td><td>0.600</td></tr><tr><td>Length (m)</td><td>5.000</td><td>Upstream Invert Level (m)</td><td>14.500</td></tr><tr><td>Roughness k (mm)</td><td>0.600</td><td></td><td></td></tr></table>			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	55.7	Membrane Percolation (mm/hr)	1000	Length (m)	80.0	Max Percolation (l/s)	1237.8	Slope (1:X)	300.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	14.500	Membrane Depth (m)	0	Diameter (m)	0.150	Entry Loss Coefficient	0.500	Slope (1:X)	100.0	Coefficient of Contraction	0.600	Length (m)	5.000	Upstream Invert Level (m)	14.500	Roughness k (mm)	0.600		
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	55.7																																							
Membrane Percolation (mm/hr)	1000	Length (m)	80.0																																							
Max Percolation (l/s)	1237.8	Slope (1:X)	300.0																																							
Safety Factor	2.0	Depression Storage (mm)	5																																							
Porosity	0.30	Evaporation (mm/day)	3																																							
Invert Level (m)	14.500	Membrane Depth (m)	0																																							
Diameter (m)	0.150	Entry Loss Coefficient	0.500																																							
Slope (1:X)	100.0	Coefficient of Contraction	0.600																																							
Length (m)	5.000	Upstream Invert Level (m)	14.500																																							
Roughness k (mm)	0.600																																									
©1982-2017 XP Solutions																																										

Alchemy

Page 1

Bessemer Road
Welwyn Garden City
Hertfordshire AL7 1HE

Havant
Storage calculation for
catchment D

Date 04/02/2021 20:43
File Catchment D.SRCX

Designed by Sudeep Chongbang
Checked by Som Raj Gurung

XP Solutions

Source Control 2017.1.2

Micro
Drainage

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 26 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	13.428	0.348	0.0	116.8	116.8	207.4	O K
30 min Summer	13.469	0.389	0.0	130.4	130.4	231.6	O K
60 min Summer	13.490	0.410	0.0	131.6	131.6	244.2	O K
120 min Summer	13.480	0.400	0.0	131.1	131.1	238.4	O K
180 min Summer	13.455	0.375	0.0	127.6	127.6	223.6	O K
240 min Summer	13.433	0.353	0.0	118.7	118.7	210.2	O K
360 min Summer	13.397	0.317	0.0	103.1	103.1	189.0	O K
480 min Summer	13.371	0.291	0.0	91.1	91.1	173.2	O K
600 min Summer	13.351	0.271	0.0	82.1	82.1	161.1	O K
720 min Summer	13.334	0.254	0.0	74.7	74.7	151.5	O K
960 min Summer	13.303	0.223	0.0	61.0	61.0	132.9	O K
1440 min Summer	13.265	0.185	0.0	45.2	45.2	109.9	O K
15 min Winter	13.465	0.385	0.0	130.2	130.2	229.5	O K
30 min Winter	13.513	0.433	0.0	132.6	132.6	257.7	O K
60 min Winter	13.524	0.444	0.0	133.1	133.1	264.7	O K
120 min Winter	13.484	0.404	0.0	131.3	131.3	240.5	O K
180 min Winter	13.442	0.362	0.0	122.5	122.5	215.6	O K
240 min Winter	13.411	0.331	0.0	109.5	109.5	197.2	O K
360 min Winter	13.367	0.287	0.0	89.6	89.6	171.2	O K
480 min Winter	13.338	0.258	0.0	76.5	76.5	153.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	121.275	0.0	271.4	20
30 min Summer	75.885	0.0	339.8	29
60 min Summer	47.483	0.0	425.3	46
120 min Summer	29.711	0.0	532.3	78
180 min Summer	22.584	0.0	607.0	108
240 min Summer	18.591	0.0	666.2	138
360 min Summer	14.132	0.0	759.6	200
480 min Summer	11.633	0.0	833.8	260
600 min Summer	10.003	0.0	896.3	320
720 min Summer	8.842	0.0	950.7	382
960 min Summer	6.947	0.0	996.0	502
1440 min Summer	4.945	0.0	1063.4	744
15 min Winter	121.275	0.0	304.0	21
30 min Winter	75.885	0.0	380.6	30
60 min Winter	47.483	0.0	476.4	48
120 min Winter	29.711	0.0	596.2	82
180 min Winter	22.584	0.0	679.8	112
240 min Winter	18.591	0.0	746.2	142
360 min Winter	14.132	0.0	850.8	204
480 min Winter	11.633	0.0	933.9	264

©1982-2017 XP Solutions

Alchemy		Page 2
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculation for catchment D	
Date 04/02/2021 20:43 File Catchment D.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions		Source Control 2017.1.2

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
600 min Winter	13.317	0.237	0.0	66.9	66.9	141.1	O K
720 min Winter	13.300	0.220	0.0	59.8	59.8	131.3	O K
960 min Winter	13.271	0.191	0.0	47.5	47.5	113.7	O K
1440 min Winter	13.236	0.156	0.0	34.3	34.3	92.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	10.003	0.0	1003.8	326
720 min Winter	8.842	0.0	1064.8	386
960 min Winter	6.947	0.0	1115.5	508
1440 min Winter	4.945	0.0	1191.1	750

Alchemy		Page 3																																																										
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculation for catchment D																																																											
Date 04/02/2021 20:43 File Catchment D.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung																																																											
XP Solutions	Source Control 2017.1.2																																																											
Rainfall Details <table><tr><td>Rainfall Model</td><td>FEH</td></tr><tr><td>Return Period (years)</td><td>100</td></tr><tr><td>FEH Rainfall Version</td><td>1999</td></tr><tr><td>Site Location</td><td>GB 472400 107400 SU 72400 07400</td></tr><tr><td>C (1km)</td><td>-0.029</td></tr><tr><td>D1 (1km)</td><td>0.457</td></tr><tr><td>D2 (1km)</td><td>0.295</td></tr><tr><td>D3 (1km)</td><td>0.387</td></tr><tr><td>E (1km)</td><td>0.310</td></tr><tr><td>F (1km)</td><td>2.252</td></tr><tr><td>Summer Storms</td><td>Yes</td></tr><tr><td>Winter Storms</td><td>Yes</td></tr><tr><td>Cv (Summer)</td><td>0.750</td></tr><tr><td>Cv (Winter)</td><td>0.840</td></tr><tr><td>Shortest Storm (mins)</td><td>15</td></tr><tr><td>Longest Storm (mins)</td><td>1440</td></tr><tr><td>Climate Change %</td><td>+20</td></tr></table> Time Area Diagram Total Area (ha) 1.195 <table><tr><td>Time (mins)</td><td>Area</td><td>Time (mins)</td><td>Area</td><td>Time (mins)</td><td>Area</td></tr><tr><td>From:</td><td>To:</td><td>From:</td><td>To:</td><td>From:</td><td>To:</td></tr><tr><td></td><td>(ha)</td><td></td><td>(ha)</td><td></td><td>(ha)</td></tr><tr><td>0</td><td>4 0.398</td><td>4</td><td>8 0.398</td><td>8</td><td>12 0.398</td></tr></table>			Rainfall Model	FEH	Return Period (years)	100	FEH Rainfall Version	1999	Site Location	GB 472400 107400 SU 72400 07400	C (1km)	-0.029	D1 (1km)	0.457	D2 (1km)	0.295	D3 (1km)	0.387	E (1km)	0.310	F (1km)	2.252	Summer Storms	Yes	Winter Storms	Yes	Cv (Summer)	0.750	Cv (Winter)	0.840	Shortest Storm (mins)	15	Longest Storm (mins)	1440	Climate Change %	+20	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	From:	To:	From:	To:	From:	To:		(ha)		(ha)		(ha)	0	4 0.398	4	8 0.398	8	12 0.398
Rainfall Model	FEH																																																											
Return Period (years)	100																																																											
FEH Rainfall Version	1999																																																											
Site Location	GB 472400 107400 SU 72400 07400																																																											
C (1km)	-0.029																																																											
D1 (1km)	0.457																																																											
D2 (1km)	0.295																																																											
D3 (1km)	0.387																																																											
E (1km)	0.310																																																											
F (1km)	2.252																																																											
Summer Storms	Yes																																																											
Winter Storms	Yes																																																											
Cv (Summer)	0.750																																																											
Cv (Winter)	0.840																																																											
Shortest Storm (mins)	15																																																											
Longest Storm (mins)	1440																																																											
Climate Change %	+20																																																											
Time (mins)	Area	Time (mins)	Area	Time (mins)	Area																																																							
From:	To:	From:	To:	From:	To:																																																							
	(ha)		(ha)		(ha)																																																							
0	4 0.398	4	8 0.398	8	12 0.398																																																							
©1982-2017 XP Solutions																																																												

Alchemy		Page 4
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculation for catchment D	
Date 04/02/2021 20:43 File Catchment D.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions Source Control 2017.1.2		

Model Details

Storage is Online Cover Level (m) 14.950

Cellular Storage Structure

Invert Level (m) 13.080 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	627.0	627.0	0.501	0.0	695.0
0.500	627.0	695.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0455-1350-0700-1350
Design Head (m)	0.700
Design Flow (l/s)	135.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	455
Invert Level (m)	13.060
Minimum Outlet Pipe Diameter (mm)	500
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	135.0
Flush-Flo™	0.570	134.9
Kick-Flo®	0.680	133.1
Mean Flow over Head Range	-	86.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	11.9	1.200	175.5	3.000	274.9	7.000	417.0
0.200	43.3	1.400	189.3	3.500	296.5	7.500	425.2
0.300	86.3	1.600	202.0	4.000	316.6	8.000	439.5
0.400	129.4	1.800	214.0	4.500	335.5	8.500	453.4
0.500	134.1	2.000	225.3	5.000	353.3	9.000	466.9
0.600	134.8	2.200	236.1	5.500	370.3	9.500	480.1
0.800	144.0	2.400	246.4	6.000	386.5		
1.000	160.6	2.600	256.3	6.500	402.1		

©1982-2017 XP Solutions

Alchemy

Bessemer Road
Welwyn Garden City
Hertfordshire AL7 1HE

Havant
Storage calculations
for catchment E

Page 1

Date 04/02/2021 20:46
File Catchment E.SRCX

Designed by Sudeep Chongbang
Checked by Som Raj Gurung

XP SolutionsSource Control 2017.1.2

Summary of Results for 100 year Return Period (+20%)								
Half Drain Time : 17 minutes.								
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	
15 min Summer	14.092	0.732	0.0	119.9	119.9	175.3	O	K
30 min Summer	14.194	0.834	0.0	119.9	119.9	199.7	O	K
60 min Summer	14.205	0.845	0.0	119.8	119.8	202.3	O	K
120 min Summer	14.098	0.738	0.0	119.9	119.9	176.7	O	K
180 min Summer	13.973	0.613	0.0	119.9	119.9	146.8	O	K
240 min Summer	13.873	0.513	0.0	119.5	119.5	122.8	O	K
360 min Summer	13.749	0.389	0.0	115.6	115.6	93.1	O	K
480 min Summer	13.701	0.341	0.0	101.6	101.6	81.7	O	K
600 min Summer	13.671	0.311	0.0	89.8	89.8	74.5	O	K
720 min Summer	13.649	0.289	0.0	80.5	80.5	69.1	O	K
960 min Summer	13.610	0.250	0.0	64.5	64.5	59.8	O	K
1440 min Summer	13.565	0.205	0.0	46.8	46.8	49.0	O	K
15 min Winter	14.206	0.846	0.0	119.9	119.9	202.5	O	K
30 min Winter	14.317	0.957	0.0	119.9	119.9	229.0	O	K
60 min Winter	14.292	0.932	0.0	119.8	119.8	223.1	O	K
120 min Winter	14.082	0.722	0.0	119.9	119.9	172.9	O	K
180 min Winter	13.884	0.524	0.0	119.6	119.6	125.5	O	K
240 min Winter	13.760	0.400	0.0	116.2	116.2	95.8	O	K
360 min Winter	13.683	0.323	0.0	94.7	94.7	77.3	O	K
480 min Winter	13.645	0.285	0.0	78.9	78.9	68.1	O	K
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	121.275		0.0	266.4	20			
30 min Summer	75.885		0.0	333.4	30			
60 min Summer	47.483		0.0	417.3	46			
120 min Summer	29.711		0.0	522.2	78			
180 min Summer	22.584		0.0	595.4	108			
240 min Summer	18.591		0.0	653.7	138			
360 min Summer	14.132		0.0	745.2	194			
480 min Summer	11.633		0.0	817.9	254			
600 min Summer	10.003		0.0	879.2	314			
720 min Summer	8.842		0.0	932.6	374			
960 min Summer	6.947		0.0	977.0	494			
1440 min Summer	4.945		0.0	1043.1	736			
15 min Winter	121.275		0.0	298.4	21			
30 min Winter	75.885		0.0	373.4	31			
60 min Winter	47.483		0.0	467.3	50			
120 min Winter	29.711		0.0	585.0	82			
180 min Winter	22.584		0.0	667.0	112			
240 min Winter	18.591		0.0	732.1	138			
360 min Winter	14.132		0.0	834.6	194			
480 min Winter	11.633		0.0	916.0	254			

©1982-2017 XP Solutions

Alchemy		Page 2
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment E	
Date 04/02/2021 20:46 File Catchment E.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions		Source Control 2017.1.2

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
600 min Winter	13.619	0.259	0.0	68.2	68.2	62.0	O K
720 min Winter	13.600	0.240	0.0	60.5	60.5	57.4	O K
960 min Winter	13.567	0.207	0.0	47.7	47.7	49.6	O K
1440 min Winter	13.530	0.170	0.0	34.1	34.1	40.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	10.003	0.0	984.7	314
720 min Winter	8.842	0.0	1044.5	376
960 min Winter	6.947	0.0	1094.2	496
1440 min Winter	4.945	0.0	1168.3	736

Alchemy		Page 3
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment E	
Date 04/02/2021 20:46 File Catchment E.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions	Source Control 2017.1.2	

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 472400 107400 SU 72400 07400
C (1km)	-0.029
D1 (1km)	0.457
D2 (1km)	0.295
D3 (1km)	0.387
E (1km)	0.310
F (1km)	2.252
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	1440
Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.172

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
0	4	0.391	4	8	0.391
				8	12
					0.391

Alchemy		Page 4
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment E	
Date 04/02/2021 20:46 File Catchment E.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions Source Control 2017.1.2		

Model Details

Storage is Online Cover Level (m) 14.900

Cellular Storage Structure

Invert Level (m) 13.360 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	252.0	252.0	1.001	0.0	316.0
1.000	252.0	316.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0426-1200-1010-1200
Design Head (m)	1.010
Design Flow (l/s)	120.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	426
Invert Level (m)	13.350
Minimum Outlet Pipe Diameter (mm)	450
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.010	120.0
Flush-Flo™	0.581	119.9
Kick-Flo®	0.870	111.6
Mean Flow over Head Range	-	89.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	11.4	1.200	130.5	3.000	204.1	7.000	309.3
0.200	41.3	1.400	140.7	3.500	220.1	7.500	320.0
0.300	81.0	1.600	150.1	4.000	235.0	8.000	330.3
0.400	115.7	1.800	159.0	4.500	248.9	8.500	340.3
0.500	119.1	2.000	167.4	5.000	262.2	9.000	350.0
0.600	119.8	2.200	175.4	5.500	274.7	9.500	359.4
0.800	115.2	2.400	183.0	6.000	286.7		
1.000	119.4	2.600	190.3	6.500	298.2		

©1982-2017 XP Solutions

Alchemy

Page 1

Bessemer Road
Welwyn Garden City
Hertfordshire AL7 1HE

Havant
Storage calculations
for catchment F

Date 04/02/2021 20:50
File Catchment F.SRCX

Designed by Sudeep Chongbang
Checked by Som Raj Gurung

XP Solutions

Source Control 2017.1.2

Micro Drainage

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 2 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	12.887	0.237	0.0	31.0	31.0	4.8	O K
30 min Summer	12.887	0.237	0.0	31.0	31.0	4.8	O K
60 min Summer	12.873	0.223	0.0	28.0	28.0	4.5	O K
120 min Summer	12.841	0.191	0.0	21.8	21.8	3.9	O K
180 min Summer	12.817	0.167	0.0	17.6	17.6	3.4	O K
240 min Summer	12.799	0.149	0.0	15.1	15.1	3.0	O K
360 min Summer	12.779	0.129	0.0	11.9	11.9	2.6	O K
480 min Summer	12.769	0.119	0.0	10.0	10.0	2.4	O K
600 min Summer	12.762	0.112	0.0	8.8	8.8	2.3	O K
720 min Summer	12.757	0.107	0.0	7.8	7.8	2.2	O K
960 min Summer	12.744	0.094	0.0	6.1	6.1	1.9	O K
1440 min Summer	12.728	0.078	0.0	4.4	4.4	1.6	O K
15 min Winter	12.906	0.256	0.0	34.7	34.7	5.2	O K
30 min Winter	12.899	0.249	0.0	33.3	33.3	5.0	O K
60 min Winter	12.865	0.215	0.0	26.4	26.4	4.3	O K
120 min Winter	12.820	0.170	0.0	18.0	18.0	3.4	O K
180 min Winter	12.792	0.142	0.0	14.0	14.0	2.9	O K
240 min Winter	12.777	0.127	0.0	11.7	11.7	2.6	O K
360 min Winter	12.763	0.113	0.0	9.0	9.0	2.3	O K
480 min Winter	12.755	0.105	0.0	7.4	7.4	2.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	121.275	0.0	24.5	16
30 min Summer	75.885	0.0	30.7	23
60 min Summer	47.483	0.0	38.5	38
120 min Summer	29.711	0.0	48.1	68
180 min Summer	22.584	0.0	54.9	98
240 min Summer	18.591	0.0	60.2	128
360 min Summer	14.132	0.0	68.7	188
480 min Summer	11.633	0.0	75.4	248
600 min Summer	10.003	0.0	81.0	308
720 min Summer	8.842	0.0	85.9	368
960 min Summer	6.947	0.0	90.0	490
1440 min Summer	4.945	0.0	96.1	734
15 min Winter	121.275	0.0	27.5	15
30 min Winter	75.885	0.0	34.4	23
60 min Winter	47.483	0.0	43.1	38
120 min Winter	29.711	0.0	53.9	68
180 min Winter	22.584	0.0	61.5	98
240 min Winter	18.591	0.0	67.5	128
360 min Winter	14.132	0.0	76.9	188
480 min Winter	11.633	0.0	84.4	250

©1982-2017 XP Solutions

Alchemy		Page 2
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment F	
Date 04/02/2021 20:50 File Catchment F.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions		Source Control 2017.1.2

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
600 min Winter	12.746	0.096	0.0	6.4	6.4	1.9	O K
720 min Winter	12.740	0.090	0.0	5.6	5.6	1.8	O K
960 min Winter	12.729	0.079	0.0	4.5	4.5	1.6	O K
1440 min Winter	12.717	0.067	0.0	3.2	3.2	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	10.003	0.0	90.7	308
720 min Winter	8.842	0.0	96.3	372
960 min Winter	6.947	0.0	100.8	488
1440 min Winter	4.945	0.0	107.7	736

Alchemy		Page 3
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment F	
Date 04/02/2021 20:50 File Catchment F.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions Source Control 2017.1.2		

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 472400 107400 SU 72400 07400
C (1km)	-0.029
D1 (1km)	0.457
D2 (1km)	0.295
D3 (1km)	0.387
E (1km)	0.310
F (1km)	2.252
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	1440
Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.108

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
0	4	0.036	4	8	0.036
				8	12
					0.036

©1982-2017 XP Solutions

Alchemy		Page 4
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculations for catchment F	
Date 04/02/2021 20:50 File Catchment F.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions Source Control 2017.1.2		

Model Details

Storage is Online Cover Level (m) 14.700

Cellular Storage Structure

Invert Level (m) 12.650 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	21.3	21.3	0.501	0.0	32.3
0.500	21.3	32.3			

Pipe Outflow Control

Diameter (m) 0.225 Entry Loss Coefficient 0.500
Slope (1:X) 170.0 Coefficient of Contraction 0.600
Length (m) 20.000 Upstream Invert Level (m) 12.650
Roughness k (mm) 0.600

©1982-2017 XP Solutions

Alchemy

Bessemer Road
Welwyn Garden City
Hertfordshire AL7 1HE

Havant
Storage calculation for
B

Date 05/02/2021 09:43
File Catchment B.SRCX

Designed by Sudeep Chongbang
Checked by Som Raj Gurung

XP Solutions

Source Control 2017.1.2

Page 1



Summary of Results for 100 year Return Period (+20%)								
Half Drain Time : 58 minutes.								
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	
15 min Summer	12.910	0.230	0.0	43.2	43.2	226.5	O	K
30 min Summer	12.950	0.270	0.0	55.2	55.2	265.3	O	K
60 min Summer	12.979	0.299	0.0	63.9	63.9	293.9	O	K
120 min Summer	13.002	0.322	0.0	66.8	66.8	316.6	O	K
180 min Summer	13.007	0.327	0.0	67.3	67.3	321.5	O	K
240 min Summer	13.004	0.324	0.0	67.0	67.0	318.7	O	K
360 min Summer	12.990	0.310	0.0	65.3	65.3	305.1	O	K
480 min Summer	12.975	0.295	0.0	63.2	63.2	290.2	O	K
600 min Summer	12.962	0.282	0.0	59.1	59.1	277.5	O	K
720 min Summer	12.951	0.271	0.0	55.5	55.5	266.1	O	K
960 min Summer	12.922	0.242	0.0	46.9	46.9	238.3	O	K
1440 min Summer	12.883	0.203	0.0	36.3	36.3	199.6	O	K
15 min Winter	12.937	0.257	0.0	51.3	51.3	252.5	O	K
30 min Winter	12.981	0.301	0.0	64.2	64.2	295.6	O	K
60 min Winter	13.014	0.334	0.0	68.1	68.1	328.2	O	K
120 min Winter	13.031	0.351	0.0	70.0	70.0	344.8	O	K
180 min Winter	13.026	0.346	0.0	69.5	69.5	340.2	O	K
240 min Winter	13.014	0.334	0.0	68.2	68.2	328.5	O	K
360 min Winter	12.986	0.306	0.0	64.9	64.9	301.2	O	K
480 min Winter	12.964	0.284	0.0	59.7	59.7	279.7	O	K
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	121.275		0.0	253.0	23			
30 min Summer	75.885		0.0	316.8	33			
60 min Summer	47.483		0.0	396.6	50			
120 min Summer	29.711		0.0	496.4	84			
180 min Summer	22.584		0.0	566.1	118			
240 min Summer	18.591		0.0	621.4	152			
360 min Summer	14.132		0.0	708.5	214			
480 min Summer	11.633		0.0	777.7	276			
600 min Summer	10.003		0.0	836.0	338			
720 min Summer	8.842		0.0	886.9	400			
960 min Summer	6.947		0.0	929.1	522			
1440 min Summer	4.945		0.0	992.0	768			
15 min Winter	121.275		0.0	283.5	23			
30 min Winter	75.885		0.0	354.9	33			
60 min Winter	47.483		0.0	444.2	54			
120 min Winter	29.711		0.0	556.1	90			
180 min Winter	22.584		0.0	634.1	126			
240 min Winter	18.591		0.0	696.0	160			
360 min Winter	14.132		0.0	793.6	224			
480 min Winter	11.633		0.0	871.1	286			

©1982-2017 XP Solutions

Alchemy		Page 2
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculation for B	
Date 05/02/2021 09:43 File Catchment B.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions	Source Control 2017.1.2	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
600 min Winter	12.947	0.267	0.0	54.3	54.3	262.3	O K
720 min Winter	12.932	0.252	0.0	49.7	49.7	247.7	O K
960 min Winter	12.901	0.221	0.0	40.3	40.3	217.1	O K
1440 min Winter	12.857	0.177	0.0	30.4	30.4	173.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
600 min Winter	10.003	0.0	936.4	350
720 min Winter	8.842	0.0	993.3	412
960 min Winter	6.947	0.0	1040.6	540
1440 min Winter	4.945	0.0	1111.1	782

Alchemy		Page 3
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculation for B	
Date 05/02/2021 09:43 File Catchment B.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions	Source Control 2017.1.2	

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 472400 107400 SU 72400 07400
C (1km)	-0.029
D1 (1km)	0.457
D2 (1km)	0.295
D3 (1km)	0.387
E (1km)	0.310
F (1km)	2.252
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	1440
Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.115

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
	(ha)		(ha)		(ha)
0	4 0.372	4	8 0.372	8	12 0.372

Alchemy		Page 4
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Storage calculation for B	
Date 05/02/2021 09:43 File Catchment B.SRCX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions Source Control 2017.1.2		

Model Details

Storage is Online Cover Level (m) 14.000

Cellular Storage Structure

Invert Level (m) 12.680 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	1035.0	1035.0	0.501	0.0	1136.5
0.500	1035.0	1136.5			

Pipe Outflow Control

Diameter (m) 0.300 Entry Loss Coefficient 0.500
Slope (1:X) 245.0 Coefficient of Contraction 0.600
Length (m) 60.000 Upstream Invert Level (m) 12.660
Roughness k (mm) 0.600

©1982-2017 XP Solutions

Alchemy		Page 1
Bessemer Road	Havant	
Welwyn Garden City	Cascade calculation for	
Hertfordshire AL7 1HE	catchment C and D	
Date 04/02/2021 21:22	Designed by Sudeep Chongbang	
File C & D.CASX	Checked by Som Raj Gurung	
XP Solutions	Source Control 2017.1.2	

Cascade Summary of Results for Catchment D.SRCX

Upstream	Outflow To	Overflow To
Structures		

Catchment C.SRCX	(None)	(None)
------------------	--------	--------

Half Drain Time : 29 minutes.

Storm Event			Max Level	Max Depth	Max Infiltration	Max Control	Max Σ Outflow	Max Volume	Status
			(m)	(m)	(l/s)	(l/s)	(l/s)	(m³)	
15 min Summer	15 min Summer	13.438	0.358	0.0	120.9	120.9	213.4	O K	
	30 min Summer	13.484	0.404	0.0	131.3	131.3	240.6	O K	
	60 min Summer	13.512	0.432	0.0	132.6	132.6	257.4	O K	
	120 min Summer	13.513	0.433	0.0	132.6	132.6	257.8	O K	
	180 min Summer	13.491	0.411	0.0	131.6	131.6	245.0	O K	
	240 min Summer	13.467	0.387	0.0	130.3	130.3	230.5	O K	
	360 min Summer	13.433	0.353	0.0	118.7	118.7	210.0	O K	
	480 min Summer	13.407	0.327	0.0	107.7	107.7	194.9	O K	
	600 min Summer	13.387	0.307	0.0	98.6	98.6	183.1	O K	
	720 min Summer	13.372	0.292	0.0	91.6	91.6	173.7	O K	
1440 min Summer	960 min Summer	13.340	0.260	0.0	77.1	77.1	154.7	O K	
	1440 min Summer	13.300	0.220	0.0	59.8	59.8	131.2	O K	
	15 min Winter	13.477	0.397	0.0	130.9	130.9	236.7	O K	
	30 min Winter	13.533	0.453	0.0	133.3	133.3	269.6	O K	
	60 min Winter	13.555	0.475	0.0	134.0	134.0	282.7	O K	
	120 min Winter	13.528	0.448	0.0	133.2	133.2	266.8	O K	
	180 min Winter	13.482	0.402	0.0	131.2	131.2	239.5	O K	

	Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
	15 min Summer	121.275	0.0	389.2	21
	30 min Summer	75.885	0.0	492.7	30
	60 min Summer	47.483	0.0	622.1	46
	120 min Summer	29.711	0.0	783.8	80
	180 min Summer	22.584	0.0	896.4	110
	240 min Summer	18.591	0.0	985.7	140
	360 min Summer	14.132	0.0	1126.3	202
	480 min Summer	11.633	0.0	1237.6	262
	600 min Summer	10.003	0.0	1331.2	322
	720 min Summer	8.842	0.0	1412.7	384
	960 min Summer	6.947	0.0	1479.1	504
	1440 min Summer	4.945	0.0	1576.9	748
	15 min Winter	121.275	0.0	438.7	21
	30 min Winter	75.885	0.0	554.6	31
	60 min Winter	47.483	0.0	699.5	50
	120 min Winter	29.711	0.0	880.7	84
	180 min Winter	22.584	0.0	1006.9	116

Alchemy		Page 3
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Cascade calculation for catchment C and D	
Date 04/02/2021 21:22 File C & D.CASX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions	Source Control 2017.1.2	

Cascade Rainfall Details for Catchment D.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 472400 107400 SU 72400 07400
C (1km)	-0.029
D1 (1km)	0.457
D2 (1km)	0.295
D3 (1km)	0.387
E (1km)	0.310
F (1km)	2.252
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	1440
Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.195

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
0	4	4	8	8	12
0.398	0.398	0.398	0.398	0.398	0.398

Alchemy		Page 4
Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Cascade calculation for catchment C and D	
Date 04/02/2021 21:22 File C & D.CASX	Designed by Sudeep Chongbang Checked by Som Raj Gurung	
XP Solutions	Source Control 2017.1.2	

Cascade Model Details for Catchment D.SRCX

Storage is Online Cover Level (m) 14.950

Cellular Storage Structure

Invert Level (m) 13.080 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	627.0	627.0	0.501	0.0	695.0
0.500	627.0	695.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0455-1350-0700-1350
Design Head (m)	0.700
Design Flow (l/s)	135.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	455
Invert Level (m)	13.060
Minimum Outlet Pipe Diameter (mm)	500
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	135.0
Flush-Flo™	0.570	134.9
Kick-Flo®	0.680	133.1
Mean Flow over Head Range	-	86.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	11.9	1.200	175.5	3.000	274.9	7.000	417.0
0.200	43.3	1.400	189.3	3.500	296.5	7.500	425.2
0.300	86.3	1.600	202.0	4.000	316.6	8.000	439.5
0.400	129.4	1.800	214.0	4.500	335.5	8.500	453.4
0.500	134.1	2.000	225.3	5.000	353.3	9.000	466.9
0.600	134.8	2.200	236.1	5.500	370.3	9.500	480.1
0.800	144.0	2.400	246.4	6.000	386.5		
1.000	160.6	2.600	256.3	6.500	402.1		

Appendix I – Responses from the Pre-application Submission

Registered Office:
Portsmouth Water Ltd
PO Box 8
Havant
Hampshire PO9 1LG

Tel: 023 9249 9888
Fax: 023 9245 3632
Web: www.portsmouthwater.co.uk

**CONSULTATION UNDER THE TOWN AND COUNTRY PLANNING
(DEVELOPMENT MANAGEMENT PROCEDURE ENGLAND) ORDER 2015**

Applicant:	Kingsbridge Estates Ltd
Planning Application Reference:	GEN/20/00451
Proposal:	Redevelopment of industrial land for the erection of a distribution warehouse building and a vehicle storage deck (Use Class B8), construction of an additional access, car parking and associated works.
Location:	32 New Lane, Havant, PO9 2NG
Date:	20 July 2020

Portsmouth Water have reviewed the pre-application (GEN/20/00451) and have the following comments.

Portsmouth Water's Position

Portsmouth Water do not object to the proposed development in principle, however recommend the following conditions on full planning permission in order to reduce the potential risks posed to groundwater and our resource as a result of the proposed development. Without these conditions we would object to the development due to the risk to groundwater quality and the local public water supply.

The site is located within the Source Protection Zone 1c (SPZ1c) for an essential Public Water Supply Source. The SPZ1c relates to subsurface activity only, where the Chalk aquifer is confined and may be impacted by deep drilling activities. Subterranean activities such as deep drainage solutions and/or piling may pose a risk to groundwater quality at the local public water supply source. The groundwater area is of high sensitivity and consequently all measures to prevent pollution during and post construction are required in order to safeguard the local public water supply.

Recommended Planning Conditions

- 1. No development shall take place until a surface water drainage scheme based on sustainable drainage principles and a comprehensive assessment of the hydrological and hydrogeological context of the development, has been submitted to and approved in writing by the local planning authority in consultation with Portsmouth Water. The scheme shall subsequently be implemented in accordance with the approved details before any building within that phase is occupied.***

Details of how the scheme shall be maintained and managed after completion shall also be included.

Reason - To ensure that any proposed surface water drainage scheme does not harm groundwater resources in line with paragraph 170 of the NPPF and to reduce the risk of groundwater pollution.

- 2. No development shall commence until such time as a scheme to dispose of foul water has been submitted to, and approved in writing by, the local planning authority in consultation with Portsmouth Water. The scheme shall be implemented in accordance with the timetable agreed as part of the approved scheme.***

The scheme shall also include:

- details of how the scheme shall be maintained and managed after completion.***
- details of the sewage pipe work layout and specifications.***

Reason- This is in order to manage the quantity of foul sewage in order to minimise the risk to controlled waters and the public drinking water supply.

- 3. No piling or any other foundation construction using penetrative methods shall be carried out other than with the express written consent of the local planning authority in consultation with Portsmouth Water. The development shall be carried out in accordance with the approved details.***

Thus it should be demonstrated that any proposed piling;

- a. Will not result in contamination of groundwater. This is in accordance with National Planning Policy Framework paragraph 109.***
- b. Nor any increased risk to drinking water supplies (including turbidity).***
- c. Nor deterioration in the transmissivity of the aquifer.***

Reason- Piling or any other foundation designs using penetrative methods can pose a risk to potable supplies from, for example, turbidity, mobilisation of historical contaminants, drilling through different aquifers and creation of preferential pathways.

- 4. If, during development, contamination not previously identified is found to be present at the site then the local planning authority must be notified immediately. No further development (unless otherwise agreed in writing with the local planning authority in consultation with the Environment Agency and Portsmouth Water)***

shall be undertaken in that phase until the developer has submitted and had approved a site investigation, risk assessment and remediation strategy report, detailing how to mitigate the contamination identified.

The remediation strategy approved by the local planning authority shall be implemented in full before development in that phase recommences.

Reason - To ensure that risks from land contamination to drinking water supplies is controlled and mitigated.

- 5. No development shall start on site until a construction environmental management plan (CEMP) has been submitted to and approved in writing by the Planning Authority in consultation with Portsmouth Water detailing all pollution mitigation measures to be adopted during the construction phase. This should include management of overland runoff, storage of hazardous materials, chemical and hydrocarbons on site and temporary drainage infrastructure to ensure that water resources are not put at risk from leaks or spillages.*

Reason- Fugitive emissions from the site during construction could pose a significant threat to groundwater and therefore the local water supply source.

Informatives

Drainage

The Flood Risk Assessment and Drainage Strategy should clearly identify the means of foul and surface water drainage for the site.

Portsmouth Water would have a presumption against the use of deep bore soakaways at this site and the discharge of foul and surface water into ground where adequate pollution prevention measures are not in place. If deep bore soakaways are proposed the application must be accompanied by detailed plans and a hydrogeological risk assessment stating how risk to groundwater have been assessed and mitigated through design.

Portsmouth Water will only agree to the use of deep pit based systems (including boreholes or other structures that bypass the soil layers) for surface water disposal if the developer can show that all of the following apply:

- there are no other feasible disposal options such as shallow infiltration systems (for surface water) that can be operated in accordance with current British Standards;
- the system is no deeper than is required to obtain sufficient soakage;
- pollution control measures are in place;
- risk assessment demonstrates that no unacceptable discharge to groundwater will take place, in particular that inputs of hazardous substances to groundwater will be prevented; and
- there are sufficient mitigating factors or measures to compensate for the increased risk arising from the use of deep structures.

Portsmouth Water request that no development shall commence until a scheme for surface and foul water drainage has been submitted to and approved in writing by the Local Planning Authority in consultation with Portsmouth Water, in line with recommended Conditions 1 and 2.

Piling & Foundations

Portsmouth Water would have no objection to piling at this location if the piles terminate within the Clay cover. If the piles penetrate the full depth of the Clay cover we would expect a piling risk assessment and method statement, this should detail the depth and type of piling to be undertaken and the methodology by which such piling will be carried out, including pollution prevention measures. Portsmouth Water should be consulted on the piling design and risk assessment in line with recommended Condition 3.

Pollution Prevention & CEMP

Portsmouth Water wish to be consulted on the Construction Environmental Management Plan (CEMP) for comment in line with recommended Condition 5. The CEMP should specifically outline the proposed means of surface water management during development.

Portsmouth Water requests that storage for fuels, oils or other chemicals be contained within a bund capable of holding 110% of the total capacity. The hook up/discharge points should be within the bunded area.

Portsmouth Water would require further information on the fire prevention plan for the site in regards the potential drainage of fire water and associated substances. This detail can be provided at full planning/ detailed stage of the development.

Catchment Management Team
Portsmouth Water

catchment.management@portsmouthwater.co.uk



Department of Planning and Development
Havant Borough Council
Public Service Plaza
Civic Centre Road
Havant
Hampshire
PO9 2AX

Your ref
GEN/20/00451

Our ref
PLAN-034255

Date
29/07/2020

Contact
Tel 0330 303 0119

Dear Sir/Madam,

Proposal: Redevelopment of industrial land for the erection of a distribution warehouse building and a vehicle storage deck (Use Class B8), construction of an additional access, car parking and associated works.

Site: GEN/20/00451: - 32 New Lane, Havant, PO9 2NG.

Thank you for your letter dated 09/07/2020.

Further to your scoping document for the above site Southern Water have the following observations to make with respect to the proposed development:

- Due to the size of the development and to protect the premises from the impact of sewage flooding, an assessment is required to ascertain an appropriate point of connection to the foul and surface water sewerage network.
- Southern Water requires a formal application for a connection to the public foul and surface water sewer to be made by the applicant or developer.

The disposal of surface water from this development shall follow the hierarchy within Part H3 of Building Regulations:

- a) An adequate soakaway or some other adequate infiltration system.
- b) A water course.
- c) Where neither of the above is practicable: a sewer.

- It is possible that a sewer now deemed to be public could be crossing the development site. Therefore, should any sewer be found during construction works, an investigation of the sewer will be required to ascertain its ownership before any further works commence on site.



In case you require any further information, please do not hesitate to contact us via the address shown in the footer of this document.

Yours faithfully,



Joff Edevane
Growth Planning Lead
Business Channels

Solent & South Downs Area

Pre-application Advice Note

September 2019

This document sets out the environmental issues we will consider when providing our planning application consultation advice to Local Councils. It can be used by applicants, developers and consultants at the pre-planning stage.

Fluvial Flood Risk

Development must be safe and should not increase the risk of flooding.

You can view a site's flood zone on the Flood Map for Planning on our website: <https://flood-map-for-planning.service.gov.uk>

If your proposed development is located within flood zone 2 or 3 you should consult the Flood Risk and Coastal Change pages of the National Planning Policy Guidance (NPPG)
<http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

Here you can determine whether the flood risk vulnerability of your proposed development and the flood zone are compatible. You can also establish if there are flood risk sequential test and exception test requirements for your proposed development. In the first instance we recommend the developer/applicant liaises with the Local Planning Authority (LPA) to undertake the Sequential Test in accordance with the National Planning Policy Framework (NPPF).

If your proposed development is located within flood zone 2 or 3 and its vulnerability and flood zone are considered acceptable under the NPPG then a site specific Flood Risk Assessment (FRA) is required to support any subsequent planning application. This is required by paragraph 163 of the NPPF: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

Guidance on the content of a site specific FRA can be found in the NPPG and online: <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>

More detailed flood risk modelling data is available to help you produce a FRA please contact our Customers and Engagement team at SSDenquiries@environment-agency.gov.uk.

Climate Change Allowances

On 19 February 2016, we published new guidance for planners and developers on how to use climate change allowances in a site-specific FRA: <https://www.gov.uk/guidance/flood-risk-assessments-climatechange-allowances>

Groundwater Quality

Development must not cause pollution to the water environment.

Source Protection Zones

We have defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used across the country for public drinking water supply. These zones are more sensitive to contamination from activities that might cause pollution in the area. The closer the activity, the greater the risk.



SPZ1s are the areas designated as most at risk from contamination and development activities and in these areas we may consider it inappropriate for development to discharge foul or surface water into the ground.

To see if your proposed development is located within a Source Protection Zone, please use our online map: <https://magic.defra.gov.uk/>

Contaminated Land

The NPPF takes a precautionary approach to land contamination. Before the principle of development can be determined, land contamination should be investigated to see whether it could preclude certain development due to environmental risk or cost of remediation. Where contamination is known or suspected, a desk study, site investigation, remediation and other works may be required to enable safe development.

Pollution

If the proposed development use has the potential to pollute ground or surface water receptors then an assessment to establish whether the risk of pollution is acceptable or can be mitigated will be required within any planning application.

Foul Drainage

When drawing up wastewater treatment proposals for any development, the first presumption is to provide a system of foul drainage discharging into a public sewer to be treated at a public sewage treatment works (those provided and operated by the water and sewerage companies). This should be done in consultation with the sewerage company of the area prior to the submission of a formal planning application.

If connection to a public sewage treatment plant is not feasible, a package sewage treatment plant may be considered. If you would like further advice please call 03708 506 506.

Cemeteries

The development of new cemeteries in areas where groundwater vulnerability is high should be avoided, except where the thickness and nature of the unsaturated zone, or the impermeable formations beneath the site, protect groundwater; or where the long-term risk is mitigated by appropriate engineering methods.

Main Rivers

Ecology

In accordance with the National Planning Policy Framework (NPPF), any development proposal should avoid significant harm to biodiversity and seek to protect and enhance it. Opportunities to incorporate biodiversity in and around the development will be encouraged.

Your scheme should be designed with a naturalised buffer zone of at least 8 metres from the main river to protect and enhance the conservation value of the watercourse and ensure access for flood defence maintenance.

This buffer zone should be managed for the benefit of biodiversity for example by the planting of locally appropriate, UK native species. The buffer zone should be undisturbed by development with no fencing, footpaths or other structures. This buffer zone will help provide more space for flood waters, provide improved habitat for local biodiversity and allows access for any maintenance requirements.

To identify any Main Rivers in proximity to your proposed development please see our Main Rivers Consultation Map: <http://apps.environment-agency.gov.uk/wiyby/151293.aspx>

customer service line
03708 506 506

www.gov.uk/environment-agency

incident hotline
0800 80 70 60

floodline
0345 988 1188

Culverting

The Environment Agency is likely to oppose culverting as it is damaging to the ecological integrity of the river channel and its corridor and acts as a barrier to the movement of wildlife, including fish and may also increase flood risk. If the proposal will impact an existing culvert the Environment Agency may oppose planning consent for development either over, or within 8 metres of an existing culvert. Wherever possible, existing culverts should be removed and the river channel and bankside habitat reinstated to restore the ecological continuity of the river channel and its corridor.

Water Framework Directive (WFD)

Any marine works below MHWS require an assessment of possible impacts on Water Framework Directive (WFD) . The assessment should include all elements of the works that fall within, or have the potential to affect, a WFD water body and any of the protected areas therein (including Bathing Waters and Shellfish Waters).

The WFD assessment should follow the 'Clearing the Waters for All' guidance available at <https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters>

Where appropriate, a WFD Assessment should assess any potential impacts and demonstrate that the required enhancements will be delivered. In some cases the requirements of a WFD assessment can be incorporated into an Environmental Impact Assessment (EIA). Any development that has the potential to cause deterioration in classification under WFD or that precludes the recommended actions from being delivered in the future is likely to be considered unacceptable to us.

Permits & Consents

Environmental Permitting Regulations

To see if your proposed development requires an Environmental Permit under the Environment Permitting Regulations please refer to our website: <https://www.gov.uk/guidance/check-if-you-need-an-environmental-permit>

From 6 April 2016 an Environmental Permit is required for any proposed works or structures, in, under, over or within 8 metres of the top of the bank of designated Main River, and within 16 metres of a tidal defence.

Ordinary Watercourse Consent

The prior written consent of the relevant Lead Local Flood Authority is required for the erection of any flow control structures, culverting or diversion of ordinary watercourses, including streams, land drains and ditches.

Marine Licence

A marine licence may be required for any activities at the mean high water spring tide up to the territorial limit. This also includes the waters of every estuary, river or channel where the tide flows at mean high water spring tide.

Any development must demonstrate how adverse impacts on migratory fish, bathing waters, shellfish waters, designated sites, protected and priority species and habitats will be avoided, minimised, mitigated and if necessary compensated for. Works within or affecting a Water Framework Directive (WFD) waterbody will need to demonstrate that compliance with WFD objectives will be achieved. 'Clearing the Waters for All' provides guidance on how the impacts on WFD should be addressed, and should be used when preparing an assessment, including the screening and scoping of activities. <https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters>

Further pre-application options

The information provided above details generic information which may or may not be applicable to your development. We are able to provide more detailed and bespoke advice and answer technical questions for a charged fee of £100 per person per hour +VAT.

If you are interested in finding out more about this service, please email:

planningssd@environment-agency.gov.uk

We can explain this service and provide you with a bespoke quote for further pre-application advice that you may require please see .gov - <https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

Please note

Please note that the view expressed in this letter by the Environment Agency is in response to the enquiry only and does not represent our final view in relation to any future planning application made in relation to this site.

We reserve the right to change our position in relation to any such application.

As part of this preliminary response we have not technically reviewed any documents. This opinion is based on the information submitted and current planning policy and guidance.

If you have any questions please contact the Solent & South Downs Sustainable Places team:

planningssd@environment-agency.gov.uk

To make a request for data

Please submit your request for data to ssdenquiries@environment-agency.gov.uk. You should get the information within 20 working days. We will tell you when to expect the information if we need more time.

There are many datasets available online at www.data.gov.uk including flood maps, historic landfill, waste exemptions, consented discharges to controlled waters, and much more.

customer service line
03708 506 506

www.gov.uk/environment-agency

incident hotline
0800 80 70 60

floodline
0345 988 1188

NORWICH
Pinnacle House
3 Meridian Way
Norwich
NR7 0TA

01603 327 170

norwich@ukpinnacle.com

WELWYN GARDEN CITY
Alchemy
Bessemer Road
Welwyn Garden City
AL7 1HE

01707 527 630

welwyn@ukpinnacle.com

LONDON
Woolverstone House
61 Berners Street
London
W1T 3NJ

0207 043 3410

london@ukpinnacle.com

DUBLIN
Grosvenor Court
67 Patrick Street
Dun Laoghaire
County Dublin

+353 1231 1041

dublin@iepinncle.com

THE HAGUE
Business Suite 5.01 D-1
Business Center, WTC
Prinses Margrietplantsoen 33
2595 AM, The Hague
Netherlands

+31 70 240 0412

netherlands@nlpinncle.com