

Welwyn Hatfield Borough Council
Welwyn Hatfield Borough Council Offices
Local Planning Authority
The Campus
Welwyn Garden City
Hertfordshire
AL8 6AE

8 October 2023
JD/203905

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For the attention of William Myers/David Uncle

Dear William/David,

**Peartree Lane, Welwyn Garden City.
LLFA comments**

Thank you for your comments dated 15 June 2023 relating to the information to support the discharge of Condition 5 (Drainage Scheme), 29 (Drainage Strategy), and 33 (Final Design of Drainage Scheme) of the Outline Application (6/2019/2714/OUTLINE).

Thank you to your team for attending a meeting on 16 August 2023 to discuss the outstanding points. Our formal response these is given below.

LLFA Point 8 of condition 5 and 33

Following our meeting and discussion with the client and design team we propose to raise the floor level to 83.60m AOD. This is 300mm above the level recommended in the Pinnacle report. On this basis we would propose that flood resilient measure 300mm above the FFL (of 83.30) are now not required.

Condition 29

LLFA Point 4 of condition 29

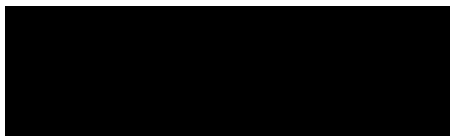
We have provided updated design hydraulic calculations using the FEH 22 method with a MADD factor of 0 (no additional storage), see calculations enclosed Appendix A. The calculations cover the 1 in 1yr, 1 in 30yr, and 1 in 100yr with climate change for +40%CC storm events. The 1 in 100 year +40%CC storm event calculations show no flooding of the site with volumes contained in the tank.

Also at:
London
Winchester

	Structural Engineering
	Civil Engineering
	CDM Consultants
	Sustainability and BREEAM
	Traffic and Transport
	Flood Risk Assessments
	Highway Engineering
	Event Engineering

I trust this provides the further information you require. Please call if you have any queries.

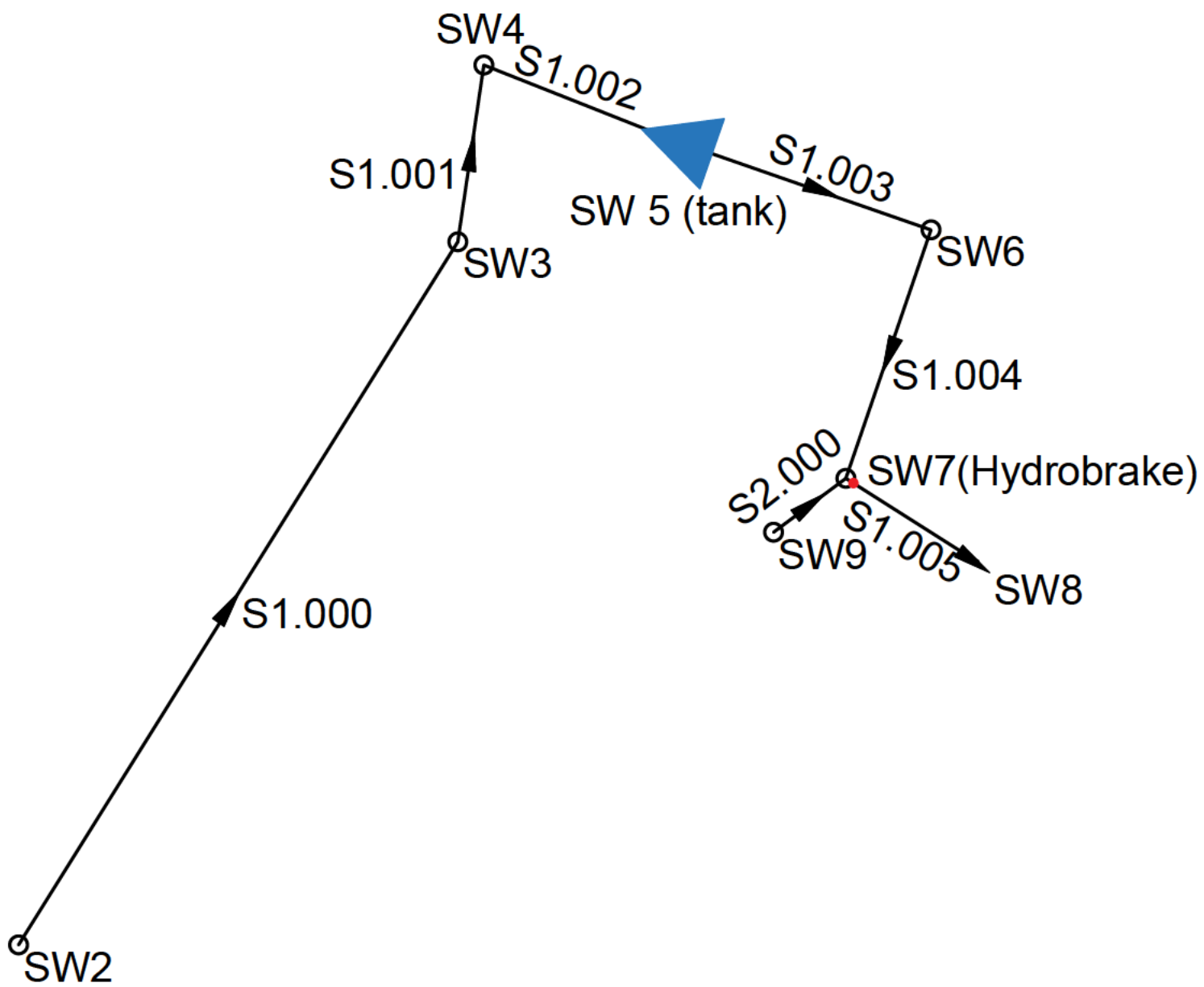
Yours Sincerely



Jason Daniels BEng(Hons) CEng MICE MIStructE
Technical Director
Scott White and Hookins Ltd

Appendix A

Assessment of design using FEH values.



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	0.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	2.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW2	0.073	5.00	83.327	Manhole	Adoptable		524352.278	212590.751	0.692
SW3	0.017	5.00	83.250	Manhole	Adoptable		524381.896	212638.153	0.944
SW4			84.405	Manhole	Adoptable		524383.651	212650.082	2.220
SW5			84.083	Manhole	Adoptable		524396.673	212644.921	1.991
SW6	0.081	5.00	83.650	Manhole	Adoptable		524413.794	212638.961	1.745
SW9	0.068	5.00	83.150	Manhole	Adoptable		524403.180	212618.572	0.997
SW7			83.100	Manhole	Adoptable	1200	524408.058	212622.211	1.310
SW8			83.080	Manhole	Adoptable		524416.892	212616.597	1.395

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0

Node SW7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	81.790	Product Number	CTL-SHE-0072-2500-1200-2500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node SW5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	82.092
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	212.5	212.5	0.800	212.5	212.5	0.801	0.0	212.5

Node SW2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	83.030	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	1.500	Inf Depth (m)	
Porosity	0.30	Length (m)	40.000		

Node SW9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	82.880	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	13.600	Inf Depth (m)	
Porosity	0.30	Length (m)	13.600		

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	1 year 720 minute winter	5.513	2.199
1 year 15 minute winter	76.857	30.991	1 year 960 minute summer	6.768	1.782
1 year 30 minute summer	71.439	20.215	1 year 960 minute winter	4.483	1.782
1 year 30 minute winter	50.133	20.215	1 year 1440 minute summer	4.949	1.326
1 year 60 minute summer	48.435	12.800	1 year 1440 minute winter	3.326	1.326
1 year 60 minute winter	32.179	12.800	1 year 2160 minute summer	3.574	0.988
1 year 120 minute summer	30.053	7.942	1 year 2160 minute winter	2.462	0.988
1 year 120 minute winter	19.966	7.942	1 year 2880 minute summer	2.986	0.800
1 year 180 minute summer	23.233	5.979	1 year 2880 minute winter	2.007	0.800
1 year 180 minute winter	15.102	5.979	1 year 4320 minute summer	2.276	0.595
1 year 240 minute summer	18.475	4.882	1 year 4320 minute winter	1.499	0.595
1 year 240 minute winter	12.274	4.882	1 year 5760 minute summer	1.885	0.483
1 year 360 minute summer	14.169	3.646	1 year 5760 minute winter	1.220	0.483
1 year 360 minute winter	9.210	3.646	1 year 7200 minute summer	1.609	0.410
1 year 480 minute summer	11.185	2.956	1 year 7200 minute winter	1.038	0.410
1 year 480 minute winter	7.431	2.956	1 year 8640 minute summer	1.409	0.359
1 year 600 minute summer	9.182	2.511	1 year 8640 minute winter	0.910	0.359
1 year 600 minute winter	6.274	2.511	1 year 10080 minute summer	1.260	0.322
1 year 720 minute summer	8.203	2.199	1 year 10080 minute winter	0.813	0.322

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW2	11	82.723	0.088	13.1	0.0000	0.0000	OK
15 minute summer	SW3	9	82.405	0.099	15.8	0.0000	0.0000	OK
15 minute winter	SW4	9	82.403	0.218	16.9	0.0000	0.0000	OK
180 minute summer	SW5	136	82.200	0.108	12.0	21.8068	0.0000	OK
15 minute summer	SW6	10	82.504	0.599	28.0	0.0000	0.0000	SURCHARGED
15 minute summer	SW9	10	82.530	0.377	12.2	0.0000	0.0000	SURCHARGED
15 minute summer	SW7	10	82.523	0.733	13.7	0.8289	0.0000	SURCHARGED
15 minute summer	SW8	1	81.685	0.000	2.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW2	1.000	SW3	12.8	0.872	0.321	0.8587	
15 minute summer	SW3	1.001	SW4	19.3	0.942	0.371	0.3303	
15 minute winter	SW4	1.002	SW5	21.7	1.555	0.514	0.2778	
180 minute summer	SW5	1.003	SW6	-6.6	0.454	-0.161	0.5289	
15 minute summer	SW6	1.004	SW7	-14.2	0.399	-0.339	0.7041	
15 minute summer	SW9	2.000	SW7	13.7	1.043	0.121	0.2420	
15 minute summer	SW7	Hydro-Brake®	SW8	2.3				16.6

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	2.000
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	0.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW2	0.073	5.00	83.327	Manhole	Adoptable		524352.278	212590.751	0.692
SW3	0.017	5.00	83.250	Manhole	Adoptable		524381.896	212638.153	0.944
SW4			84.405	Manhole	Adoptable		524383.651	212650.082	2.220
SW5			84.083	Manhole	Adoptable		524396.673	212644.921	1.991
SW6	0.081	5.00	83.650	Manhole	Adoptable		524413.794	212638.961	1.745
SW9	0.068	5.00	83.150	Manhole	Adoptable		524403.180	212618.572	0.997
SW7			83.100	Manhole	Adoptable	1200	524408.058	212622.211	1.310
SW8			83.080	Manhole	Adoptable		524416.892	212616.597	1.395

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

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

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

Node SW7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	81.790	Product Number	CTL-SHE-0072-2500-1200-2500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node SW5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	82.092
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	212.5	212.5	0.800	212.5	212.5	0.801	0.0	212.5

Node SW2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	83.030	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	1.500	Inf Depth (m)	
Porosity	0.30	Length (m)	40.000		

Node SW9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	82.880	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	13.600	Inf Depth (m)	
Porosity	0.30	Length (m)	13.600		

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 15 minute summer	297.087	84.065	30 year 720 minute winter	11.766	4.692
30 year 15 minute winter	208.482	84.065	30 year 960 minute summer	13.779	3.628
30 year 30 minute summer	190.378	53.870	30 year 960 minute winter	9.127	3.628
30 year 30 minute winter	133.598	53.870	30 year 1440 minute summer	9.521	2.552
30 year 60 minute summer	124.435	32.885	30 year 1440 minute winter	6.399	2.552
30 year 60 minute winter	82.672	32.885	30 year 2160 minute summer	6.590	1.821
30 year 120 minute summer	73.860	19.519	30 year 2160 minute winter	4.541	1.821
30 year 120 minute winter	49.071	19.519	30 year 2880 minute summer	5.386	1.444
30 year 180 minute summer	55.243	14.216	30 year 2880 minute winter	3.620	1.444
30 year 180 minute winter	35.909	14.216	30 year 4320 minute summer	4.003	1.047
30 year 240 minute summer	43.002	11.364	30 year 4320 minute winter	2.636	1.047
30 year 240 minute winter	28.570	11.364	30 year 5760 minute summer	3.287	0.841
30 year 360 minute summer	32.626	8.396	30 year 5760 minute winter	2.127	0.841
30 year 360 minute winter	21.208	8.396	30 year 7200 minute summer	2.823	0.720
30 year 480 minute summer	25.138	6.643	30 year 7200 minute winter	1.822	0.720
30 year 480 minute winter	16.701	6.643	30 year 8640 minute summer	2.501	0.638
30 year 600 minute summer	20.100	5.498	30 year 8640 minute winter	1.614	0.638
30 year 600 minute winter	13.734	5.498	30 year 10080 minute summer	2.265	0.578
30 year 720 minute summer	17.507	4.692	30 year 10080 minute winter	1.462	0.578

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW2	10	82.801	0.166	35.4	0.0000	0.0000	OK
15 minute summer	SW3	11	82.489	0.183	43.1	0.0000	0.0000	OK
360 minute winter	SW4	344	82.461	0.276	5.3	0.0000	0.0000	SURCHARGED
360 minute winter	SW5	344	82.461	0.369	11.4	74.4127	0.0000	SURCHARGED
15 minute summer	SW6	9	82.849	0.944	72.7	0.0000	0.0000	SURCHARGED
15 minute summer	SW9	10	82.922	0.769	33.0	0.7368	0.0000	FLOOD RISK
15 minute summer	SW7	9	82.888	1.098	37.5	1.2423	0.0000	FLOOD RISK
15 minute summer	SW8	1	81.685	0.000	2.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW2	1.000	SW3	34.9	1.064	0.878	1.8313	
15 minute summer	SW3	1.001	SW4	43.0	1.232	0.825	0.4204	
360 minute winter	SW4	1.002	SW5	5.1	0.729	0.120	0.5571	
360 minute winter	SW5	1.003	SW6	-6.3	0.361	-0.155	0.7210	
15 minute summer	SW6	1.004	SW7	-40.6	-1.021	-0.971	0.7041	
15 minute summer	SW9	2.000	SW7	37.5	1.078	0.330	0.2420	
15 minute summer	SW7	Hydro-Brake®	SW8	2.4				34.5

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	2.000
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	0.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW2	0.073	5.00	83.327	Manhole	Adoptable		524352.278	212590.751	0.692
SW3	0.017	5.00	83.250	Manhole	Adoptable		524381.896	212638.153	0.944
SW4			84.405	Manhole	Adoptable		524383.651	212650.082	2.220
SW5			84.083	Manhole	Adoptable		524396.673	212644.921	1.991
SW6	0.081	5.00	83.650	Manhole	Adoptable		524413.794	212638.961	1.745
SW9	0.068	5.00	83.150	Manhole	Adoptable		524403.180	212618.572	0.997
SW7			83.100	Manhole	Adoptable	1200	524408.058	212622.211	1.310
SW8			83.080	Manhole	Adoptable		524416.892	212616.597	1.395

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

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

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

Node SW7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	81.790	Product Number	CTL-SHE-0072-2500-1200-2500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node SW5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	82.092
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	212.5	212.5	0.800	212.5	212.5	0.801	0.0	212.5

Node SW2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	83.030	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	1.500	Inf Depth (m)	
Porosity	0.30	Length (m)	40.000		

Node SW9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	82.880	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	13.600	Inf Depth (m)	
Porosity	0.30	Length (m)	13.600		

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +40% CC 15 minute summer	415.921	117.691	30 year +40% CC 720 minute winter	16.472	6.569
30 year +40% CC 15 minute winter	291.875	117.691	30 year +40% CC 960 minute summer	19.290	5.080
30 year +40% CC 30 minute summer	266.529	75.419	30 year +40% CC 960 minute winter	12.778	5.080
30 year +40% CC 30 minute winter	187.038	75.419	30 year +40% CC 1440 minute summer	13.330	3.573
30 year +40% CC 60 minute summer	174.210	46.038	30 year +40% CC 1440 minute winter	8.958	3.573
30 year +40% CC 60 minute winter	115.741	46.038	30 year +40% CC 2160 minute summer	9.227	2.550
30 year +40% CC 120 minute summer	103.404	27.327	30 year +40% CC 2160 minute winter	6.357	2.550
30 year +40% CC 120 minute winter	68.699	27.327	30 year +40% CC 2880 minute summer	7.541	2.021
30 year +40% CC 180 minute summer	77.340	19.902	30 year +40% CC 2880 minute winter	5.068	2.021
30 year +40% CC 180 minute winter	50.273	19.902	30 year +40% CC 4320 minute summer	5.605	1.465
30 year +40% CC 240 minute summer	60.203	15.910	30 year +40% CC 4320 minute winter	3.691	1.465
30 year +40% CC 240 minute winter	39.998	15.910	30 year +40% CC 5760 minute summer	4.601	1.178
30 year +40% CC 360 minute summer	45.677	11.754	30 year +40% CC 5760 minute winter	2.978	1.178
30 year +40% CC 360 minute winter	29.691	11.754	30 year +40% CC 7200 minute summer	3.952	1.008
30 year +40% CC 480 minute summer	35.194	9.301	30 year +40% CC 7200 minute winter	2.551	1.008
30 year +40% CC 480 minute winter	23.382	9.301	30 year +40% CC 8640 minute summer	3.501	0.893
30 year +40% CC 600 minute summer	28.140	7.697	30 year +40% CC 8640 minute winter	2.259	0.893
30 year +40% CC 600 minute winter	19.227	7.697	30 year +40% CC 10080 minute summer	3.171	0.809
30 year +40% CC 720 minute summer	24.510	6.569	30 year +40% CC 10080 minute winter	2.046	0.809

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 98.14%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW2	11	83.127	0.492	49.6	0.4337	0.0000	FLOOD RISK
360 minute winter	SW3	352	82.669	0.363	7.4	0.0000	0.0000	SURCHARGED
360 minute winter	SW4	352	82.669	0.484	7.2	0.0000	0.0000	SURCHARGED
360 minute winter	SW5	352	82.669	0.577	16.6	116.4598	0.0000	SURCHARGED
15 minute summer	SW6	9	82.896	0.991	85.4	0.0000	0.0000	SURCHARGED
15 minute summer	SW9	12	82.985	0.832	46.2	3.9478	0.0000	FLOOD RISK
15 minute summer	SW7	10	82.935	1.145	46.6	1.2952	0.0000	FLOOD RISK
15 minute summer	SW8	1	81.685	0.000	2.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW2	1.000	SW3	44.4	1.118	1.118	2.2230	
360 minute winter	SW3	1.001	SW4	7.2	0.787	0.139	0.4795	
360 minute winter	SW4	1.002	SW5	6.9	0.792	0.164	0.5571	
360 minute winter	SW5	1.003	SW6	-10.0	0.324	-0.245	0.7210	
15 minute summer	SW6	1.004	SW7	-45.1	-1.133	-1.078	0.7041	
15 minute summer	SW9	2.000	SW7	46.6	1.192	0.410	0.2420	
15 minute summer	SW7	Hydro-Brake®	SW8	2.4				32.8

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	2.000
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	0.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW2	0.073	5.00	83.327	Manhole	Adoptable		524352.278	212590.751	0.692
SW3	0.017	5.00	83.250	Manhole	Adoptable		524381.896	212638.153	0.944
SW4			84.405	Manhole	Adoptable		524383.651	212650.082	2.220
SW5			84.083	Manhole	Adoptable		524396.673	212644.921	1.991
SW6	0.081	5.00	83.650	Manhole	Adoptable		524413.794	212638.961	1.745
SW9	0.068	5.00	83.150	Manhole	Adoptable		524403.180	212618.572	0.997
SW7			83.100	Manhole	Adoptable	1200	524408.058	212622.211	1.310
SW8			83.080	Manhole	Adoptable		524416.892	212616.597	1.395

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

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

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

Node SW7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	81.790	Product Number	CTL-SHE-0072-2500-1200-2500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node SW5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	82.092
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	164

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	212.5	212.5	0.800	212.5	212.5	0.801	0.0	212.5

Node SW2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	83.030	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	1.500	Inf Depth (m)	
Porosity	0.30	Length (m)	40.000		

Node SW9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	82.880	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	13.600	Inf Depth (m)	
Porosity	0.30	Length (m)	13.600		

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year 15 minute summer	377.956	106.949	100 year 720 minute winter	14.345	5.721
100 year 15 minute winter	265.232	106.949	100 year 960 minute summer	16.995	4.475
100 year 30 minute summer	244.252	69.115	100 year 960 minute winter	11.258	4.475
100 year 30 minute winter	171.405	69.115	100 year 1440 minute summer	11.854	3.177
100 year 60 minute summer	160.540	42.426	100 year 1440 minute winter	7.967	3.177
100 year 60 minute winter	106.659	42.426	100 year 2160 minute summer	8.174	2.259
100 year 120 minute summer	93.616	24.740	100 year 2160 minute winter	5.632	2.259
100 year 120 minute winter	62.196	24.740	100 year 2880 minute summer	6.628	1.776
100 year 180 minute summer	69.397	17.858	100 year 2880 minute winter	4.454	1.776
100 year 180 minute winter	45.110	17.858	100 year 4320 minute summer	4.854	1.269
100 year 240 minute summer	53.552	14.152	100 year 4320 minute winter	3.196	1.269
100 year 240 minute winter	35.579	14.152	100 year 5760 minute summer	3.930	1.006
100 year 360 minute summer	39.739	10.226	100 year 5760 minute winter	2.543	1.006
100 year 360 minute winter	25.832	10.226	100 year 7200 minute summer	3.329	0.849
100 year 480 minute summer	30.485	8.056	100 year 7200 minute winter	2.149	0.849
100 year 480 minute winter	20.254	8.056	100 year 8640 minute summer	2.913	0.743
100 year 600 minute summer	24.413	6.678	100 year 8640 minute winter	1.880	0.743
100 year 600 minute winter	16.681	6.678	100 year 10080 minute summer	2.609	0.666
100 year 720 minute summer	21.344	5.721	100 year 10080 minute winter	1.684	0.666

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.19%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW2	11	83.044	0.409	45.0	0.0096	0.0000	FLOOD RISK
15 minute summer	SW3	11	82.619	0.313	52.7	0.0000	0.0000	SURCHARGED
240 minute winter	SW4	236	82.582	0.397	8.9	0.0000	0.0000	SURCHARGED
240 minute winter	SW5	236	82.582	0.490	20.7	98.8346	0.0000	SURCHARGED
15 minute summer	SW6	8	82.887	0.982	81.6	0.0000	0.0000	SURCHARGED
15 minute summer	SW9	11	82.963	0.810	42.0	2.7245	0.0000	FLOOD RISK
15 minute summer	SW7	10	82.918	1.128	45.6	1.2761	0.0000	FLOOD RISK
15 minute summer	SW8	1	81.685	0.000	2.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW2	1.000	SW3	42.8	1.085	1.075	2.2230	
15 minute summer	SW3	1.001	SW4	52.4	1.318	1.007	0.4795	
240 minute winter	SW4	1.002	SW5	8.5	0.855	0.201	0.5571	
240 minute winter	SW5	1.003	SW6	-12.2	-0.306	-0.299	0.7210	
15 minute summer	SW6	1.004	SW7	-43.9	-1.103	-1.050	0.7041	
15 minute summer	SW9	2.000	SW7	45.6	1.168	0.401	0.2420	
15 minute summer	SW7	Hydro-Brake®	SW8	2.4				33.5

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	2.000
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	0.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW2	0.073	5.00	83.327	Manhole	Adoptable		524352.278	212590.751	0.692
SW3	0.017	5.00	83.250	Manhole	Adoptable		524381.896	212638.153	0.944
SW4			84.405	Manhole	Adoptable		524383.651	212650.082	2.220
SW5			84.083	Manhole	Adoptable		524396.673	212644.921	1.991
SW6	0.081	5.00	83.650	Manhole	Adoptable		524413.794	212638.961	1.745
SW9	0.068	5.00	83.150	Manhole	Adoptable		524403.180	212618.572	0.997
SW7			83.100	Manhole	Adoptable	1200	524408.058	212622.211	1.310
SW8			83.080	Manhole	Adoptable		524416.892	212616.597	1.395

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

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

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

Node SW7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	81.790	Product Number	CTL-SHE-0072-2500-1200-2500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node SW5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	82.092
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	212.5	212.5	0.800	212.5	212.5	0.801	0.0	212.5

Node SW2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	83.030	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	1.500	Inf Depth (m)	
Porosity	0.30	Length (m)	40.000		

Node SW9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	82.880	Slope (1:X)	200.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	13.600	Inf Depth (m)	
Porosity	0.30	Length (m)	13.600		

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute summer	529.138	149.728
100 year +40% CC 15 minute winter	371.325	149.728
100 year +40% CC 30 minute summer	341.953	96.761
100 year +40% CC 30 minute winter	239.967	96.761
100 year +40% CC 60 minute summer	224.756	59.396
100 year +40% CC 60 minute winter	149.323	59.396
100 year +40% CC 120 minute summer	131.062	34.636
100 year +40% CC 120 minute winter	87.074	34.636
100 year +40% CC 180 minute summer	97.156	25.002
100 year +40% CC 180 minute winter	63.154	25.002
100 year +40% CC 240 minute summer	74.973	19.813
100 year +40% CC 240 minute winter	49.811	19.813
100 year +40% CC 360 minute summer	55.635	14.317
100 year +40% CC 360 minute winter	36.164	14.317
100 year +40% CC 480 minute summer	42.680	11.279
100 year +40% CC 480 minute winter	28.355	11.279
100 year +40% CC 600 minute summer	34.178	9.349
100 year +40% CC 600 minute winter	23.353	9.349
100 year +40% CC 720 minute summer	29.882	8.009
100 year +40% CC 720 minute winter	20.083	8.009
100 year +40% CC 960 minute summer	23.793	6.265
100 year +40% CC 960 minute winter	15.761	6.265
100 year +40% CC 1440 minute summer	16.595	4.448
100 year +40% CC 1440 minute winter	11.153	4.448
100 year +40% CC 2160 minute summer	11.443	3.162
100 year +40% CC 2160 minute winter	7.885	3.162
100 year +40% CC 2880 minute summer	9.279	2.487
100 year +40% CC 2880 minute winter	6.236	2.487
100 year +40% CC 4320 minute summer	6.795	1.777
100 year +40% CC 4320 minute winter	4.475	1.777
100 year +40% CC 5760 minute summer	5.502	1.408
100 year +40% CC 5760 minute winter	3.561	1.408
100 year +40% CC 7200 minute summer	4.661	1.189

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 7200 minute winter	3.008	1.189
100 year +40% CC 8640 minute summer	4.078	1.040
100 year +40% CC 8640 minute winter	2.632	1.040
100 year +40% CC 10080 minute summer	3.653	0.932
100 year +40% CC 10080 minute winter	2.358	0.932

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.11%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW2	12	83.289	0.654	63.0	2.8733	0.0000	FLOOD RISK
360 minute winter	SW3	352	82.828	0.522	9.0	0.0000	0.0000	SURCHARGED
360 minute winter	SW4	352	82.828	0.643	8.2	0.0000	0.0000	SURCHARGED
360 minute winter	SW5	352	82.828	0.736	20.6	148.6209	0.0000	SURCHARGED
15 minute summer	SW6	10	82.948	1.043	95.1	0.0000	0.0000	SURCHARGED
15 minute summer	SW9	12	83.068	0.915	58.7	8.5641	0.0000	FLOOD RISK
15 minute summer	SW7	12	83.023	1.233	47.3	1.3946	0.0000	FLOOD RISK
15 minute summer	SW8	1	81.685	0.000	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW2	1.000	SW3	47.6	1.197	1.198	2.2230	
360 minute winter	SW3	1.001	SW4	8.2	0.771	0.158	0.4795	
360 minute winter	SW4	1.002	SW5	8.1	0.838	0.191	0.5571	
360 minute winter	SW5	1.003	SW6	-12.6	-0.318	-0.310	0.7210	
15 minute summer	SW6	1.004	SW7	-45.5	-1.145	-1.089	0.7041	
15 minute summer	SW9	2.000	SW7	47.3	1.283	0.416	0.2420	
15 minute summer	SW7	Hydro-Brake®	SW8	2.5				30.3

Appendix B

Updated proposed site and building levels

DO NOT SCALE FROM THIS DRAWING



Notes

For notes refer to drawing 203905-SWH-ZZ-XX-DR-C-5700
All levels to OS datum in metres.

Key

- 83.400 Proposed contours
- 83.400 Proposed finished levels
- 83.920m Existing levels to remain
- Direction of fall
- 0.5m high gabion retaining wall
- 0.8m high gabion retaining wall
- 1.1m high gabion retaining wall
- 1.2m high retaining wall - Preferred construction to be confirmed by Architect/Client/Contractor

HAZARDS LEADING TO UNUSUAL OR SIGNIFICANT RISKS DURING THE CONSTRUCTION PROCESS ARE IDENTIFIED ON THIS DRAWING AS:

NOTE: THE LIST BELOW IDENTIFIES CERTAIN RISKS WHICH ARE DEEMED TO BE UNUSUAL, ABNORMAL OR UNEXPECTED TO A COMPETENT CONTRACTOR CARRYING OUT WORK OF THIS NATURE BUT DOES NOT COVER ALL POSSIBLE SITUATIONS WHICH MAY BE ENCOUNTERED DURING THE CONSTRUCTION PROCESS. IT IS THEREFORE THE MAIN CONTRACTOR'S RESPONSIBILITY TO IDENTIFY ANY FURTHER RISKS/HAZARDS AND TAKE APPROPRIATE ACTION.

RISKS/HAZARDS SPECIFIC TO THIS DRAWING:

PRELIMINARY - NOT FOR CONSTRUCTION

PM	PRELIMINARY	JD	NC	JD	05.10.23
P03	PRELIMINARY	JD	NC	JD	03.10.23
P02	PRELIMINARY	CW	NC	JD	26.05.23
P01	PRELIMINARY	CW	NC	JD	05.12.22
Rev	Amendment	Dm	Chkd	Appd	Date
Project					

PEARTREE LANE
WELWYN GARDEN CITY

Drawing

FINISHED LEVELS LAYOUT

Client
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Scale at A1 - 1:200
203905-SWH-ZZ-XX-DR-C-5501-P04
Project | Originator | Zone | Level | Type | Role | Number | Rev.