SIMPSON ASSOCIATES
CONSULTING ENGINEERS LLP

DRAINAGE STATEMENT

FOR

PROPOSED SPA EXTENSION

AT

ALTON TOWERS RESORT,

ALTON, STAFFORDSHIRE.

PREPARED FOR:

MERLIN ENTERTAINMENTS GROUP

MC/12796/DS
February 2014

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consultancy engineering business environment

CONTENTS

APPENDICES

1. INTRODUCTION

1.1 This report has been prepared by Simpson Associates on behalf of Merlin Attractions Operations Ltd in support of a planning application for the proposed extension of the Spa facilities at Alton Towers Hotel.

1.2 This report considers and details a strategy for the disposal of foul and surface water runoff from the proposed development.

2. SURFACE WATER DRAINAGE STRATEGY

2.1 The site of the proposed Spa extension consists of a tarmac access road and footpath currently serving the existing Spa & Hotel, with surrounding areas of soft landscaping. The area of the access road at the north of the extension disposes of surface water runoff via 1no. trapped gully which connects into a traditional network of underground pipework and discharges into an existing drainage ditch situated along the southern boundary. The remaining area of access road is not served by a formal drainage system and simply allows runoff to discharge onto adjacent areas of soft landscaping. Surface water runoff from the areas of surrounding soft landscaping is disposed of by infiltration into the ground or by overland flow into the existing drainage ditch situated along the southern boundary. The existing drainage system is shown on the existing drainage network plan included in *Appendix A*.

2.2 The plan confirms that an existing surface water drain is situated beneath the footprint of the proposed Spa Hotel extension. It is proposed to divert the existing surface water drain prior to commencing construction of the extension to ensure there will be no disruption to flows. Proposals for the diversion of the surface water drainage are shown on the drainage strategy plan included in *Appendix B*.

2.3 It is considered appropriate to drain surface water flows from the proposed Spa Hotel extension in a similar manner to the existing situation, complying with the hierarchical approach adopted by Part H of the current Building Regulations, which prioritises the use of infiltration for the disposal of surface water runoff.

2.4 Preliminary soakage tests carried out by Enzygo Ltd in December 2013 as part of a wider ground investigation, confirmed infiltration rates of $2.8E^{-5}$ m/s to $7.5E^{-5}$ m/s in locations east of the site.

2.5 In comparison to the existing situation, new development has the potential to generate large volumes of surface water runoff, which can result in an increase in flood risk both on the site and elsewhere within the catchment. Therefore, it is proposed to store and attenuate excess surface water flows from the extension and associated hardstanding areas which have a combined drainage area of (0.054Ha) in a 5.0m x 12.0m x 0.4m Geocellular storage crate soakaway providing 24.0m³ storage for all storm return periods up to and including a 1 in 100 year design event with 30% allowance for climate change before naturally infiltrating into the ground.

2.6 The remaining system will comprise of a traditional network of underground pipework with flows passing through a catchpit manhole located immediately upstream from the Geocellular crate soakaway. The catchpit manhole will be constructed with a sediment sump to avoid any occurrence of silt and debris from entering the

Geocellular crate soakaway system. The overall strategy is outlined on the Drainage Strategy Plan, included in *Appendix C*.

2.7 The Geocellular storage crate soakaway has been designed using the Source Control design facility in the WINDES software package by MicroDrainage. The design results confirm that the soakaway will store and attenuate excess flows all storm return periods up to and including a 1 in 100 year design event with 30% allowance for future climate change. Copies of the WINDES calculations are included in *Appendix C*.

2.8 In terms of surface water management, it is concluded that through the proposed surface water strategy, which includes appropriate SUDS, that the development can be occupied safely and that there will be no increase in flood risk elsewhere. Therefore the scheme can be considered acceptable in terms of surface water drainage strategy.

3. FOUL WATER DRAINAGE STRATEGY

3.1 The park and existing hotel discharges foul water runoff to a pumping chamber via a traditional network of underground pipework, as shown on the Existing Drainage network plan included in Appendix A. The pumping chamber in turn discharges foul water runoff to Severn Trent`s public sewer network via a rising main.

3.2 Discussions with Alton Towers have confirmed that the existing foul drainage system serving the park has spare capacity for flows from the Spa extension, therefore it is proposed to discharge foul water runoff from the development to the gravity drainage system serving the existing Spa & Hotel. There would be no alterations made to the existing pumping chamber, therefore, there would be no increase in peak flow levels discharged to the public sewer system.

3.3 Severn Trent have confirmed that their off-site sewage infrastructure will not be affected by the development proposals on the basis that no alterations will be made to the maximum discharge characteristics of the existing pumping station serving the site. Correspondence received from Severn Trent is included in *Appendix D.*

3.4 The above foul water drainage proposals are illustrated on the Drainage Strategy Plan included in *Appendix B*.

APPENDIX A
EXISTING DRAINAGE NETWORK PLAN

MK	REVISION	DATE
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DRAWING TITLE

EXISTING DRAINAGE NETWORK

CONTRACT

ALTON TOWERS
ALTON
STAFFORDSHIRE

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APPENDIX B
DRAINAGE STRATEGY PLAN

DO NOT SCALE

LEGEND

- Surface water drainage
- Foul water drainage
- Diverted surface water drainage
- Existing surface water drainage
- Existing foul water drainage
- Drainage to be removed
- Site Boundary
- Existing Ditch
- 85.09 Existing level

Existing 450mm Surface water drain to be diverted. Existing manhole to be reconstructed to suit

Public Footpath

Proposed route of diverted surface water drainage

Existing Surface water manhole to be removed upon completion of diversion

Existing Surface water drainage to be diverted prior to commencing construction. Drainage to be removed upon completion of diversion

Proposed surface water catchpit manhole

5.0x12.0x0.4m Geocellular storage crate soakaway to store & attenuate excess surface water flows from the Spa Hotel Extension for all storm return periods up to and including a 1 in 100 year event with 30% allowance for climate change.
IL = 154.250

Proposed connection of diverted surface water drainage into existing surface water manhole. Existing surface water manhole to be reconstructed to suit

Proposed connection into existing Foul water drainage via construction of a new manhole

Existing outfall into drainage ditch to remain
IL = 153.77

MK	REVISION	DATE
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DRAWING TITLE

DRAINAGE STRATEGY
FOR SPA EXTENSION

CONTRACT

ALTON TOWERS
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APPENDIX C
WINDES MICRODRAINAGE – DESIGN RESULTS

Summary of Results for 1 year Return Period

Half Drain Time : 48 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
15 min Summer	154.293	0.043	0.7	2.5	O K
30 min Summer	154.301	0.051	0.9	2.9	O K
60 min Summer	154.308	0.058	0.9	3.3	O K
120 min Summer	154.312	0.062	0.9	3.5	O K
180 min Summer	154.311	0.061	0.9	3.5	O K
240 min Summer	154.309	0.059	0.9	3.3	O K
360 min Summer	154.303	0.053	0.9	3.0	O K
480 min Summer	154.298	0.048	0.8	2.7	O K
600 min Summer	154.295	0.045	0.8	2.5	O K
720 min Summer	154.292	0.042	0.7	2.4	O K
960 min Summer	154.287	0.037	0.6	2.1	O K
1440 min Summer	154.280	0.030	0.5	1.7	O K
2160 min Summer	154.274	0.024	0.4	1.4	O K
2880 min Summer	154.271	0.021	0.4	1.2	O K
4320 min Summer	154.266	0.016	0.3	0.9	O K
5760 min Summer	154.264	0.014	0.2	0.8	O K
7200 min Summer	154.262	0.012	0.2	0.7	O K
8640 min Summer	154.260	0.010	0.2	0.6	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	28.216	16
30 min Summer	18.684	28
60 min Summer	12.084	44
120 min Summer	7.673	80
180 min Summer	5.859	114
240 min Summer	4.835	146
360 min Summer	3.664	208
480 min Summer	3.000	270
600 min Summer	2.570	332
720 min Summer	2.264	392
960 min Summer	1.855	512
1440 min Summer	1.401	754
2160 min Summer	1.058	1124
2880 min Summer	0.866	1472
4320 min Summer	0.654	2204
5760 min Summer	0.537	2936
7200 min Summer	0.460	3672
8640 min Summer	0.406	4408

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Summer	154.259	0.009	0.2	0.5	O K
15 min Winter	154.299	0.049	0.8	2.8	O K
30 min Winter	154.309	0.059	0.9	3.3	O K
60 min Winter	154.316	0.066	0.9	3.8	O K
120 min Winter	154.318	0.068	0.9	3.9	O K
180 min Winter	154.314	0.064	0.9	3.7	O K
240 min Winter	154.310	0.060	0.9	3.4	O K
360 min Winter	154.300	0.050	0.9	2.9	O K
480 min Winter	154.295	0.045	0.8	2.5	O K
600 min Winter	154.290	0.040	0.7	2.3	O K
720 min Winter	154.287	0.037	0.6	2.1	O K
960 min Winter	154.281	0.031	0.5	1.8	O K
1440 min Winter	154.275	0.025	0.4	1.4	O K
2160 min Winter	154.269	0.019	0.3	1.1	O K
2880 min Winter	154.266	0.016	0.3	0.9	O K
4320 min Winter	154.262	0.012	0.2	0.7	O K
5760 min Winter	154.260	0.010	0.2	0.6	O K
7200 min Winter	154.259	0.009	0.2	0.5	O K
8640 min Winter	154.258	0.008	0.1	0.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	0.364	5136
15 min Winter	28.216	16
30 min Winter	18.684	30
60 min Winter	12.084	48
120 min Winter	7.673	86
180 min Winter	5.859	122
240 min Winter	4.835	156
360 min Winter	3.664	216
480 min Winter	3.000	280
600 min Winter	2.570	342
720 min Winter	2.264	404
960 min Winter	1.855	528
1440 min Winter	1.401	766
2160 min Winter	1.058	1124
2880 min Winter	0.866	1496
4320 min Winter	0.654	2196
5760 min Winter	0.537	2992
7200 min Winter	0.460	3640
8640 min Winter	0.406	4576

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Winter	154.257	0.007	0.1	0.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	0.364	4968

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time / Area Diagram

Total Area (ha) 0.054

Time (mins)	Area (ha)
0-4	0.054

Model Details

Storage is Online Cover Level (m) 156.000

Cellular Storage Structure

Invert Level (m) 154.250 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.10100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.10100

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.0	60.0	0.500	0.0	73.6
0.400	60.0	73.6			

Summary of Results for 30 year Return Period

Half Drain Time : 115 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
15 min Summer	154.412	0.112	0.9	6.4	O K
30 min Summer	154.443	0.143	0.9	8.1	O K
60 min Summer	154.467	0.167	0.9	9.5	O K
120 min Summer	154.477	0.177	0.9	10.1	O K
180 min Summer	154.477	0.177	0.9	10.1	O K
240 min Summer	154.474	0.174	0.9	9.9	O K
360 min Summer	154.462	0.162	0.9	9.3	O K
480 min Summer	154.450	0.150	0.9	8.5	O K
600 min Summer	154.438	0.138	0.9	7.8	O K
720 min Summer	154.426	0.126	0.9	7.2	O K
960 min Summer	154.404	0.104	0.9	5.9	O K
1440 min Summer	154.372	0.072	0.9	4.1	O K
2160 min Summer	154.348	0.048	0.8	2.7	O K
2880 min Summer	154.340	0.040	0.7	2.3	O K
4320 min Summer	154.330	0.030	0.5	1.7	O K
5760 min Summer	154.325	0.025	0.4	1.4	O K
7200 min Summer	154.321	0.021	0.4	1.2	O K
8640 min Summer	154.318	0.018	0.3	1.0	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	69.101	18
30 min Summer	45.919	32
60 min Summer	29.238	60
120 min Summer	18.077	98
180 min Summer	13.494	132
240 min Summer	10.913	166
360 min Summer	8.067	234
480 min Summer	6.508	302
600 min Summer	5.506	368
720 min Summer	4.801	434
960 min Summer	3.864	558
1440 min Summer	2.843	792
2160 min Summer	2.088	1124
2880 min Summer	1.676	1472
4320 min Summer	1.229	2204
5760 min Summer	0.985	2936
7200 min Summer	0.829	3664
8640 min Summer	0.721	4408

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Summer	154.316	0.016	0.3	0.9	O K
15 min Winter	154.426	0.126	0.9	7.2	O K
30 min Winter	154.462	0.162	0.9	9.2	O K
60 min Winter	154.491	0.191	0.9	10.9	O K
120 min Winter	154.504	0.204	0.9	11.6	O K
180 min Winter	154.502	0.202	0.9	11.5	O K
240 min Winter	154.496	0.196	0.9	11.2	O K
360 min Winter	154.478	0.178	0.9	10.2	O K
480 min Winter	154.459	0.159	0.9	9.0	O K
600 min Winter	154.439	0.139	0.9	7.9	O K
720 min Winter	154.421	0.121	0.9	6.9	O K
960 min Winter	154.389	0.089	0.9	5.1	O K
1440 min Winter	154.350	0.050	0.9	2.9	O K
2160 min Winter	154.338	0.038	0.7	2.1	O K
2880 min Winter	154.331	0.031	0.5	1.7	O K
4320 min Winter	154.323	0.023	0.4	1.3	O K
5760 min Winter	154.318	0.018	0.3	1.0	O K
7200 min Winter	154.315	0.015	0.3	0.9	O K
8640 min Winter	154.313	0.013	0.2	0.8	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	0.640	5136
15 min Winter	69.101	18
30 min Winter	45.919	32
60 min Winter	29.238	60
120 min Winter	18.077	114
180 min Winter	13.494	142
240 min Winter	10.913	180
360 min Winter	8.067	254
480 min Winter	6.508	326
600 min Winter	5.506	394
720 min Winter	4.801	460
960 min Winter	3.864	580
1440 min Winter	2.843	766
2160 min Winter	2.088	1124
2880 min Winter	1.676	1480
4320 min Winter	1.229	2176
5760 min Winter	0.985	2864
7200 min Winter	0.829	3672
8640 min Winter	0.721	4408

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Winter	154.312	0.012	0.2	0.7	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	0.640	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time / Area Diagram

Total Area (ha) 0.054

Time (mins)	Area (ha)
0-4	0.054

Model Details

Storage is Online Cover Level (m) 156.000

Cellular Storage Structure

Invert Level (m) 154.300 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.10100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.10100

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.0	60.0	0.500	0.0	73.6
0.400	60.0	73.6			

Summary of Results for 100 year Return Period

Half Drain Time : 150 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
15 min Summer	154.447	0.147	0.9	8.4	O K
30 min Summer	154.491	0.191	0.9	10.9	O K
60 min Summer	154.528	0.228	0.9	13.0	O K
120 min Summer	154.548	0.248	0.9	14.2	O K
180 min Summer	154.549	0.249	0.9	14.2	O K
240 min Summer	154.545	0.245	0.9	14.0	O K
360 min Summer	154.533	0.233	0.9	13.3	O K
480 min Summer	154.519	0.219	0.9	12.5	O K
600 min Summer	154.504	0.204	0.9	11.6	O K
720 min Summer	154.490	0.190	0.9	10.8	O K
960 min Summer	154.463	0.163	0.9	9.3	O K
1440 min Summer	154.418	0.118	0.9	6.7	O K
2160 min Summer	154.372	0.072	0.9	4.1	O K
2880 min Summer	154.350	0.050	0.9	2.8	O K
4320 min Summer	154.338	0.038	0.7	2.1	O K
5760 min Summer	154.330	0.030	0.5	1.7	O K
7200 min Summer	154.326	0.026	0.4	1.5	O K
8640 min Summer	154.322	0.022	0.4	1.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	89.379	18
30 min Summer	59.972	32
60 min Summer	38.413	62
120 min Summer	23.767	114
180 min Summer	17.687	144
240 min Summer	14.243	176
360 min Summer	10.458	244
480 min Summer	8.398	312
600 min Summer	7.078	380
720 min Summer	6.152	448
960 min Summer	4.927	578
1440 min Summer	3.595	822
2160 min Summer	2.618	1164
2880 min Summer	2.088	1472
4320 min Summer	1.515	2204
5760 min Summer	1.205	2936
7200 min Summer	1.009	3672
8640 min Summer	0.872	4400

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Summer	154.320	0.020	0.3	1.1	O K
15 min Winter	154.466	0.166	0.9	9.5	O K
30 min Winter	154.516	0.216	0.9	12.3	O K
60 min Winter	154.560	0.260	0.9	14.8	O K
120 min Winter	154.587	0.287	1.0	16.4	O K
180 min Winter	154.588	0.288	1.0	16.4	O K
240 min Winter	154.581	0.281	1.0	16.0	O K
360 min Winter	154.563	0.263	0.9	15.0	O K
480 min Winter	154.542	0.242	0.9	13.8	O K
600 min Winter	154.519	0.219	0.9	12.5	O K
720 min Winter	154.497	0.197	0.9	11.3	O K
960 min Winter	154.457	0.157	0.9	8.9	O K
1440 min Winter	154.391	0.091	0.9	5.2	O K
2160 min Winter	154.347	0.047	0.8	2.7	O K
2880 min Winter	154.338	0.038	0.7	2.2	O K
4320 min Winter	154.328	0.028	0.5	1.6	O K
5760 min Winter	154.322	0.022	0.4	1.3	O K
7200 min Winter	154.319	0.019	0.3	1.1	O K
8640 min Winter	154.316	0.016	0.3	0.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	0.772	5136
15 min Winter	89.379	18
30 min Winter	59.972	32
60 min Winter	38.413	60
120 min Winter	23.767	116
180 min Winter	17.687	166
240 min Winter	14.243	188
360 min Winter	10.458	266
480 min Winter	8.398	340
600 min Winter	7.078	412
720 min Winter	6.152	482
960 min Winter	4.927	616
1440 min Winter	3.595	852
2160 min Winter	2.618	1124
2880 min Winter	2.088	1488
4320 min Winter	1.515	2208
5760 min Winter	1.205	2936
7200 min Winter	1.009	3672
8640 min Winter	0.872	4400

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Winter	154.314	0.014	0.2	0.8	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	0.772	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time / Area Diagram

Total Area (ha) 0.054

Time (mins)	Area (ha)
0-4	0.054

Model Details

Storage is Online Cover Level (m) 156.000

Cellular Storage Structure

Invert Level (m) 154.300 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.10100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.10100

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.0	60.0	0.500	0.0	73.6
0.400	60.0	73.6			

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 209 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
15 min Summer	154.444	0.194	0.9	11.1	O K
30 min Summer	154.503	0.253	0.9	14.4	O K
60 min Summer	154.557	0.307	1.0	17.5	O K
120 min Summer	154.592	0.342	1.0	19.5	O K
180 min Summer	154.596	0.346	1.0	19.7	O K
240 min Summer	154.593	0.343	1.0	19.5	O K
360 min Summer	154.581	0.331	1.0	18.8	O K
480 min Summer	154.566	0.316	1.0	18.0	O K
600 min Summer	154.551	0.301	1.0	17.2	O K
720 min Summer	154.536	0.286	1.0	16.3	O K
960 min Summer	154.506	0.256	0.9	14.6	O K
1440 min Summer	154.452	0.202	0.9	11.5	O K
2160 min Summer	154.387	0.137	0.9	7.8	O K
2880 min Summer	154.340	0.090	0.9	5.1	O K
4320 min Summer	154.299	0.049	0.8	2.8	O K
5760 min Summer	154.289	0.039	0.7	2.2	O K
7200 min Summer	154.283	0.033	0.6	1.9	O K
8640 min Summer	154.279	0.029	0.5	1.6	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	18
30 min Summer	77.964	33
60 min Summer	49.937	62
120 min Summer	30.897	120
180 min Summer	22.993	160
240 min Summer	18.515	192
360 min Summer	13.595	256
480 min Summer	10.918	326
600 min Summer	9.202	394
720 min Summer	7.998	462
960 min Summer	6.405	596
1440 min Summer	4.674	852
2160 min Summer	3.404	1212
2880 min Summer	2.715	1556
4320 min Summer	1.970	2204
5760 min Summer	1.567	2936
7200 min Summer	1.311	3672
8640 min Summer	1.134	4408

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Summer	154.276	0.026	0.4	1.5	O K
15 min Winter	154.469	0.219	0.9	12.5	O K
30 min Winter	154.536	0.286	1.0	16.3	O K
60 min Winter	154.599	0.349	1.0	19.9	O K
120 min Winter	154.644	0.394	1.0	22.5	O K
180 min Winter	154.653	0.403	1.0	23.0	O K
240 min Winter	154.647	0.397	1.0	22.6	O K
360 min Winter	154.630	0.380	1.0	21.7	O K
480 min Winter	154.610	0.360	1.0	20.5	O K
600 min Winter	154.587	0.337	1.0	19.2	O K
720 min Winter	154.564	0.314	1.0	17.9	O K
960 min Winter	154.518	0.268	0.9	15.3	O K
1440 min Winter	154.436	0.186	0.9	10.6	O K
2160 min Winter	154.344	0.094	0.9	5.4	O K
2880 min Winter	154.299	0.049	0.8	2.8	O K
4320 min Winter	154.286	0.036	0.6	2.1	O K
5760 min Winter	154.279	0.029	0.5	1.6	O K
7200 min Winter	154.274	0.024	0.4	1.4	O K
8640 min Winter	154.271	0.021	0.4	1.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Summer	1.004	5096
15 min Winter	116.192	18
30 min Winter	77.964	32
60 min Winter	49.937	60
120 min Winter	30.897	118
180 min Winter	22.993	172
240 min Winter	18.515	222
360 min Winter	13.595	276
480 min Winter	10.918	352
600 min Winter	9.202	428
720 min Winter	7.998	502
960 min Winter	6.405	644
1440 min Winter	4.674	908
2160 min Winter	3.404	1252
2880 min Winter	2.715	1500
4320 min Winter	1.970	2204
5760 min Winter	1.567	2944
7200 min Winter	1.311	3672
8640 min Winter	1.134	4360

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
10080 min Winter	154.269	0.019	0.3	1.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
10080 min Winter	1.004	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.054

Time (mins)	Area (ha)
0-4	0.054

Model Details

Storage is Online Cover Level (m) 156.000

Cellular Storage Structure

Invert Level (m) 154.250 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.10100 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.10100

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.0	60.0	0.500	0.0	73.6
0.400	60.0	73.6			

APPENDIX D
SEVERN TRENT CORRESPONDENCE

SEVERN TRENT WATER

Severn Trent Water

Severn Trent Water Ltd
Regis Road
Wolverhampton
WV6 8RU

Tel: 01902 793871
Fax: 01902 793971

www.stwater.co.uk
net.dev.west@severntrent.co.uk

Contact: Jim Wincott

Your ref:
Our ref: WT34673 & SAP8130388

Simpson Associates
8 Friday Street
Henley-on-Thames
Oxfordshire
RG9 1AH

Ftao Alex Bone

3rd December 2013

Dear Sirs,

Proposed Development at Alton Towers, Alton, Staffordshire

I refer to your Development Enquiry Request together with your covering letter dated 18th November 2013 in respect of the above site involving a 680 bed holiday accommodation.

Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) referred to below.

FOUL WATER DRAINAGE DISCHARGES

Public Foul Water Sewer (FWS) or Combined Water Sewer (CWS) Discharges

It is understood that foul water only is required to discharge to the public sewerage system and that this will discharge to the on-site existing private Sewage Pumping Station (SPS), situated in the southeast of the Alton Towers site.
This SPS has a 150mm dia Rising Main (RM) and pumps directly to the inlet works at Alton Sewage Treatment Works (STW) located to the southwest of the site.
It is also understood that the on-site private SPS will remain unchanged and it is proposed to provide additional storage only to accommodate the increased flows, which will result in slightly more frequent pumping events.

Providing the pumping rate from the existing private SPS remains unaltered then sewage treatment is not expected to be affected.

Severn Trent Water

SURFACE WATER DRAINAGE DISCHARGES

The Water Companies requirement in respect of surface water drainage is contained in the Supplementary Guidance Notes (SGN) enclosed.

Soakaway Discharges

As you may know Soakaways are the preferred method of surface water disposal, but if these are inappropriate site investigation evidence is required to be furnished.

Public Storm Water Sewer (SWS) or Combined Water Sewer (CWS) Discharges

As there are no public Storm Water Sewers (SWS) in the vicinity and a surface water discharge is not required, it is presumed surface water runoff will outfall to on-site facilities.

S106 Sewer Connections

For any new connections (including the re-use of existing connections – indirect) to the public sewerage system, you will need to submit a Section 106 application form. Our New Connections department are responsible for handling all such enquiries and applications. To contact them for an application form and associated guidance notes please call 0800 7076600 or download from www.stwater.co.uk.

Reference

Please quote WT34673 and SAP 8130388 in any future correspondence (including e-mails) with STW Limited. Please note that 'Development Enquiry' responses are only valid for 6 months from the date of this letter.

Yours faithfully,

Jim Wincott
Waste Water Services - Asset Protection (West)