

BANNERS GATE

CIVIL, STRUCTURAL AND
TRANSPORTATION ENGINEERS

**Flood Risk Assessment for Proposed Development of
Land off Fairfield Road, Havant, Hampshire**

9 March 2011

Our Ref: 11010

Prepared by Roger Williams BA MCIWEM CEnv

Job 11010	Revision	Prepared and checked by	Date
	0	RGW	9 March 2011
	1	RGW	15 April 2011
	2	RGW	29 November 2011

PPS25 Flood Risk Assessment

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1.0 Introduction

- 1.1 Banners Gate Limited is acting on behalf of Bloor Homes Southern in respect of the proposed development of a greenfield site with a gross site area of approximately 1.94 hectares at off Fairfield Road, Havant, Hampshire (See Site Location Plan in Appendix A).
- 1.2 Proposed development involves the construction of approximately 79 domestic dwellings with vehicular access from Fairfield Road.
- 1.3 This flood risk assessment (FRA) has been prepared to accompany a planning application for the development of the site to be submitted by Bloor Homes Southern.
- 1.4 Communities and Local Government Planning Policy Statement 25 (PPS 25) published in December 2006 requires that a flood risk assessment should be carried out to the appropriate degree at all levels of the planning process, to assess the risks of all forms of flooding to and from development taking climate change into account and to inform the application of the sequential approach.
- 1.5 Where applicable the Communities and Local Government Code for Sustainable Homes sets minimum standards for surface water run-off (SUR 1) and flood risk (SUR 2).
- 1.6 The Code requires that peak surface water run-off rates and annual volumes of run-off will be no greater than the previous conditions of development. Credit is given where sustainable drainage systems are used to attenuate flow from hard surfaces and roofs. The Code requires the provision of areas of porous paving and the use of soakaways where ground conditions are suitable.
- 1.7 Credit is given where the development is located in an area of low annual probability of flooding (PPS25 Zone 1) or where appropriate measures are employed to mitigate the effect of flooding where planning consent is given in areas of medium/high annual probability of flooding (PPS25 Zones 2, 3a and 3b).
- 1.8 This report has been commissioned to identify the likely flooding issues associated with the above site and the possible constraints that could be imposed on the development. This report proposes a strategy for not increasing and where practical reducing surface water run-off from the site in order to minimise the impact of the development upon properties and watercourses situated downstream in accordance with PPS25.

2.0 Requirements of Flood Risk Assessment

2.1 PPS25: Annex E: The Assessment of Flood Risk: General Principles: states that at all stages of the planning process, the minimum requirement for flood risk assessments are that they should:

- be proportionate to the risk and appropriate to the scale, nature and location of the development;
- consider the risk of flooding arising from the development in addition to the risk of flooding to the development;
- take the impacts of climate change into account
- be undertaken by competent people, as early as possible in the particular planning process, to avoid misplaced effort and raising landowner expectations where land is unsuitable for development;
- consider both the potential adverse and beneficial effects of flood risk management infrastructure including raised defences, flow channels, flood storage areas and other artificial features together with the consequences of their failure;
- consider the vulnerability of those that could occupy and use the development, taking account of the Sequential and Exceptional Tests and the vulnerability classification, including arrangements for safe access;
- consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that the assessments are fit for the purpose of the decision being made;
- consider the effects of a range of flooding events including extreme events on people, property, and the natural and historic environment and river and coastal processes;
- include the assessment of the remaining (known as 'residual') risk after the risk reduction measures have been taken into account and demonstrate that that this is acceptable for the particular development or land use;
- consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the development may affect drainage systems; and
- Be supported by appropriate data and information, including historical information on previous events.

3.0 Site Location

- 3.1 The site is located approximately 0.75 kilometres east of Havant town centre at Grid Reference 472180, 106500. The site is bounded to the north by a railway embankment, to the east by school playing fields, to the south by residential development and to the west by Fairfield Road and further residential development. The east part of the site is presently occupied by a disused school playing field. The smaller west part of the site is wooded with gravel and wood chip surfaced pathways and a small pond below the canopies of the trees. See aerial photograph in Appendix B.

4.0 Site Levels

- 4.1 The site takes the form of a generally flat plateau (a disused sports ground) with embankments adjacent to the east and south site boundaries rising to natural ground level. The highest level recorded by survey within the site boundary is 12.15maOD near to the south east corner of the site. The lowest level recorded by survey is 9.17maOD in the centre of the western part of the site. Levels indicate that before the sports ground was created, natural ground level would have fallen from south to north at a gradient of approximately 1 in 135.
- 4.2 Topographical survey information for the existing site is included in Appendix H.

5.0 Ground Conditions

- 5.1 A ground investigation report prepared by Ashdown Site Investigation Limited in November 2009 (see Appendix D) indicated that soil within the site boundary generally comprised topsoil over made ground comprising grey silty clayey fine to coarse gravel of flint down to between 0.7 to 1.2mbgl. Below this stratum the ground generally comprises stiff gravelly clay or clayey sandy gravel down to between 1.1 and 1.7mbgl overlying silty fine sand (the Bognor Sand Formation) becoming interlaminated with depth. Standing water levels of between 1.0 and 1.5m depth were recorded in window samples throughout the site.
- 5.2 The report concluded that Bognor Sand Formation soils were suitable to accept surface water from soakaways.

6.0 Existing Flood Protection Measures

- 6.1 The Environment Agency flood map (see Appendix C) shows no flood protection measure within the vicinity of the proposed development.

7.0 Sources of Flooding

- 7.1 The topographical survey shows no watercourse within or adjacent to the site boundary.
- 7.2 The Environment Agency flood map shows the nearest significant water feature to the proposed development to be a small watercourse which runs north to south approximately 0.15km west of the site boundary. The map shows some flooding associated with this watercourse but no flooding from this or any other source which affects the proposed development.
- 7.3 In view of the fact that the lowest ground level within the site boundary is 9.17maOD the

site is not expected to be subject to flooding from the sea.

- 7.4 For planning purposes the proposed development is therefore deemed by PPS25: Table D.1 to fall into Low Probability Zone 1.
- 7.5 In PPS25: Table D2 the proposed development (dwelling houses) has a Flood Risk Vulnerability Classification of More Vulnerable.
- 7.6 PPS25: Table D.3 indicates that the proposed development falls into the category Flood Zone 1/More Vulnerable Flood Risk and therefore residential development within the site is appropriate.

8.0 Effects on Flood Plain Storage Volume

- 8.1 The Environment Agency flood map indicates that the proposed development does not lie within the flood plain and therefore no additional flood plain storage volume is required nor will any storage volume be displaced.

9.0 Impact on Fluvial Morphology

- 9.1 The proposed development is expected to have no detrimental impacts on fluvial morphology.

10.0 Overland Flow

- 10.1 Any overland flow which does occur will tend to flow from higher ground in the south of the site towards the railway embankment which marks the northern boundary of the proposed development.
- 10.2 In order to ensure that new dwellings are not affected by overland flow it is recommended that the finished floor levels of new houses should, wherever possible, be set 0.15m above surrounding finished ground levels.
- 10.3 Although it is anticipated that the proposed development will be at, or marginally above existing ground levels, it may be necessary to raise ground levels locally in order to create adequate cover to services or to provide overland flood routing from surface water sewers during events exceeding the standard Sewers for Adoption design criteria.

11.0 Land Drainage

- 11.1 No record of existing land drainage is available. Any land drainage found will be removed or accommodated as part of the development drainage proposals.

12.0 Existing Foul Sewers

- 12.1 Sewer records provided by Southern Water Services Limited indicate that the nearest public foul sewer to the proposed development is in Fairfield Road adjacent to the west site boundary. In their letter of 10 March 2011 (see Appendix E) Southern Water Services state that there is currently adequate capacity within the local foul sewerage network to accommodate a flow of 3.4 litres per second at manhole reference 0501 in Fairfield Road.

13.0 Existing Surface Water Sewers

- 13.1 Sewer records provided by Southern Water Services Limited show no public surface water sewer adjacent to the site boundary.

14.0 Climate Change Impact

- 14.1 Climate change over the next few decades is likely to mean milder wetter winters and hotter drier summers. These factors are expected to lead to an increased risk of flooding within the lifetime of planned developments. In order to allow for climate change and in order to mitigate the risk of flooding both within and downstream of the proposed development an allowance for additional surface water flow resulting from projected climate change may, where appropriate, be included in surface water flow calculations in accordance with PPS25 Table B.

15.0 Residual Risk Assessment and Mitigation

- 15.1 Provision is to be made to contain on site all surface water flow from impermeable areas within the proposed development during a 1 in 100 year storm plus 30% for climatic change. The route of any overland flow arising from storms of greater intensity than that for adoptable surface water sewers are designed will be considered as part of the detailed design in order to reduce to a minimum the risk of damage to existing and proposed property downstream.
- 15.2 In order to ensure that new dwellings are not affected by overland flow, it is recommended that the finished floor levels of new houses should, wherever possible, be set 0.15m above surrounding finished ground levels.

16.0 Proposed Development Drainage

- 16.1 DETR Circular 03/99 states that when drawing up foul sewerage proposals for any development the first presumption must always be to provide a system of foul drainage discharging to a public sewer.
- 16.2 It is envisaged that all foul flows arising from the proposed development will be discharged to the existing public foul sewerage network at a location to be agreed with Southern Water. A development of 79 dwellings will have a design foul of approximately 3.65 litres per second.
- 16.3 In view of the relatively high level of the existing public foul sewer in Fairfield Road it is proposed to construct an adoptable foul pumping station adjacent to Fairfield Road rather than build up the site to the extent necessary to enable foul flows to gravitate to the existing sewerage system.
- 16.4 Part H of the Building Regulations sets out a hierarchy for the disposal of surface water as follows:
- An adequate soakaway or some other adequate filtration system: or where that is not reasonably practicable;
 - A watercourse: or where that is not reasonably practicable;
 - A sewer

- 16.5 Soakaway tests carried out by Hydrock Consultants in April 2011 at various locations within the site boundary yielded infiltration rates varying from 7.2×10^{-6} m/s in made ground in the northern part of the site to 4.12×10^{-4} m/s in gravels in the southern part of the site. These results confirmed that the disposal of surface water by infiltration into the ground was practical. A high water table with standing water levels of between 0.81 and 1.17 metres below existing ground level precluded the use of conventional deep trench soakaways but allowed the use of shallow blanket soakaways.
- 16.6 The Environment Agency in their letter of 3 May 2011 (see Appendix F) confirmed that the use of soakaway blankets was acceptable to them provided that it could be demonstrated that soils were not contaminated and that a margin of at least 500mm could be maintained between the underside of the soakaway blanket and the water table at its highest recorded level.
- 16.7 Hydrock Consulting Engineers have confirmed that soils within the site boundary are not contaminated and therefore suitable for infiltration.
- 16.8 In view of this and in order to comply with the preferred option for the disposal of surface water from the development, it was decided to utilise soakaway blankets in the form of either modular storage units or the porous sub-base of permeable paved areas in suitable locations throughout the development. In all cases a margin of at least 500mm was maintained between the underside of the drainage blanket and the water table at its highest level.
- 16.9 Where water is passed through the porous sub-base of permeable blockwork before being infiltrated into the ground it is expected that water quality will be improved by an increased rate of ingestion of hydrocarbons by naturally occurring microbes as well as by filtration through granular material. A degree of additional attenuation is also achieved by an increased rate of evaporation.
- 16.10 It is proposed that all sewers serving the proposed development shall be designed in accordance with Sewers for Adoption 6th Edition or Part H of the Building Regulations 2002 as appropriate.

17.0 Conclusions

- 17.1 Banners Gate Ltd is acting on behalf of Bloor Homes Southern in respect of a proposed development of a greenfield site off Fairfield Road, Havant, Hampshire.
- 17.2 Proposed development involves the construction of approximately 79 domestic dwellings with vehicular access from Fairfield Road.
- 17.3 The Environment Agency flood map shows the nearest significant water feature to be a small watercourse which runs north to south approximately 0.15km west of the site boundary. The map shows some flooding associated with this watercourse but no flooding from this or any other source which affects the proposed development.
- 17.4 It is anticipated that all foul flow from the proposed development will be pumped to the existing public foul sewer in Fairfield Road.
- 17.5 A ground investigation report prepared by Ashdown Site Investigation Limited indicated that soil within the site boundary generally comprised topsoil over made ground over stiff gravelly clay or sandy gravel. The report concluded that the stratum of fine sand will accept surface water from soakaways.

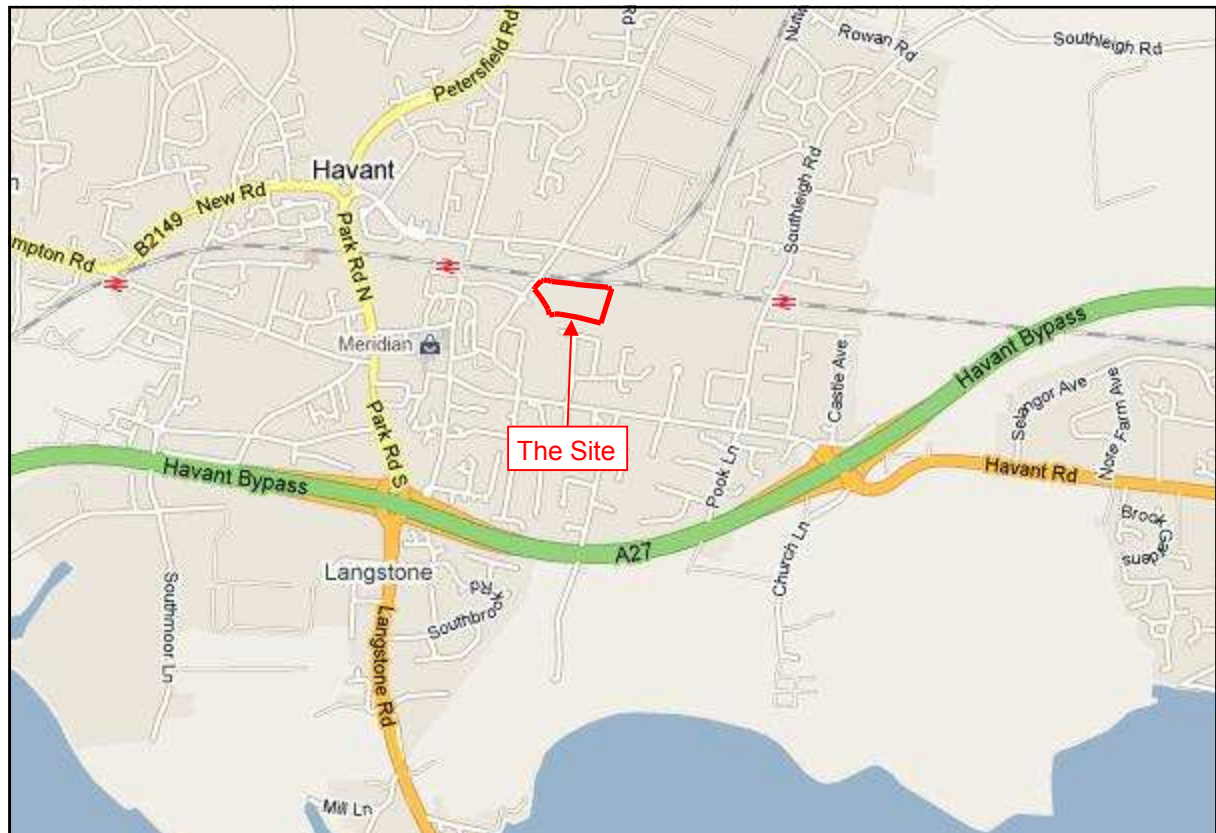
- 17.6 Soakaway tests carried out by Hydrock Consultants in April 2011 at various locations within the site boundary yielded infiltration rates varying from 7.2×10^{-6} m/s to 4.12×10^{-4} m/s and confirmed that the disposal of surface water by infiltration into the ground was practical. A high water table with standing water levels of between 0.81 and 1.17 metres below existing ground level precluded the use of conventional deep trench soakaways but allowed the use of shallow blanket soakaways.
- 17.7 The Environment Agency in their letter of 3 May 2011 confirmed that the use of soakaway blankets was acceptable provided that it could be demonstrated that soils were not contaminated and that a margin of at least 500mm could be maintained between the underside of the soakaway blanket and the water table at its highest recorded level.
- 17.8 Hydrock Consulting Engineers have confirmed that soils within the site boundary are not contaminated and therefore suitable for infiltration.
- 17.9 In view of this and in order to comply with the preferred option for the disposal of surface water from the development, it was decided to utilise soakaway blankets in the form of either form of modular storage units or the porous sub-base of permeable paved areas in suitable locations throughout the development. In all cases a margin of at least 500mm was to be maintained between the underside of the drainage blanket and the water table at its highest level.
- 17.10 Where water is passed through the porous sub-base of permeable blockwork before being infiltrated into the ground it is expected that water quality will be improved by an increased rate of ingestion of hydrocarbons by naturally occurring microbes as well as by filtration through granular material. A degree of additional attenuation is also achieved by an increased rate of evaporation.
- 17.11 It is proposed that all sewers serving the proposed development shall be designed in accordance with Sewers for Adoption 6th Edition or Part H of the Building Regulations 2002 as appropriate.
- 17.12 In order to ensure that new dwellings are not affected by any overland flow that does occur, it is recommended that the finished floor levels of all houses within the development should, wherever possible, be set 0.15m above finished ground levels.
- 17.13 It is proposed that all sewers serving the proposed development shall be designed in accordance with Sewers for Adoption 6th Edition or Part H of the Building Regulations 2002 as appropriate.
- 17.14 For planning purposes the proposed development is deemed by PPS25: Table D.1 to fall into Low Probability Zone 1. Homes within the development will therefore have a low annual probability of flooding and will comply with the requirement of the Code for Sustainable Homes SUR 2.
- 17.15 In PPS25: Table D.2 the proposed development (dwelling houses) has a Flood Risk Vulnerability classification of More Vulnerable.
- 17.16 PPS25: Table D.3 indicates that the proposed development falls into the category Flood Zone 1/More Vulnerable Flood Risk and therefore residential development within the site is appropriate.
- 17.17 Surface water management within the proposed development will be designed to sustainable principles with the aim of providing sufficient storage on site to enable surface discharge from proposed development to be regulated to no greater than the rate

of run-off from the undeveloped site. The site is therefore presented as sustainable in terms of flood risk.

APPENDIX A

Site Location Plan

Site Location Plan



APPENDIX B

Aerial Photograph of Site

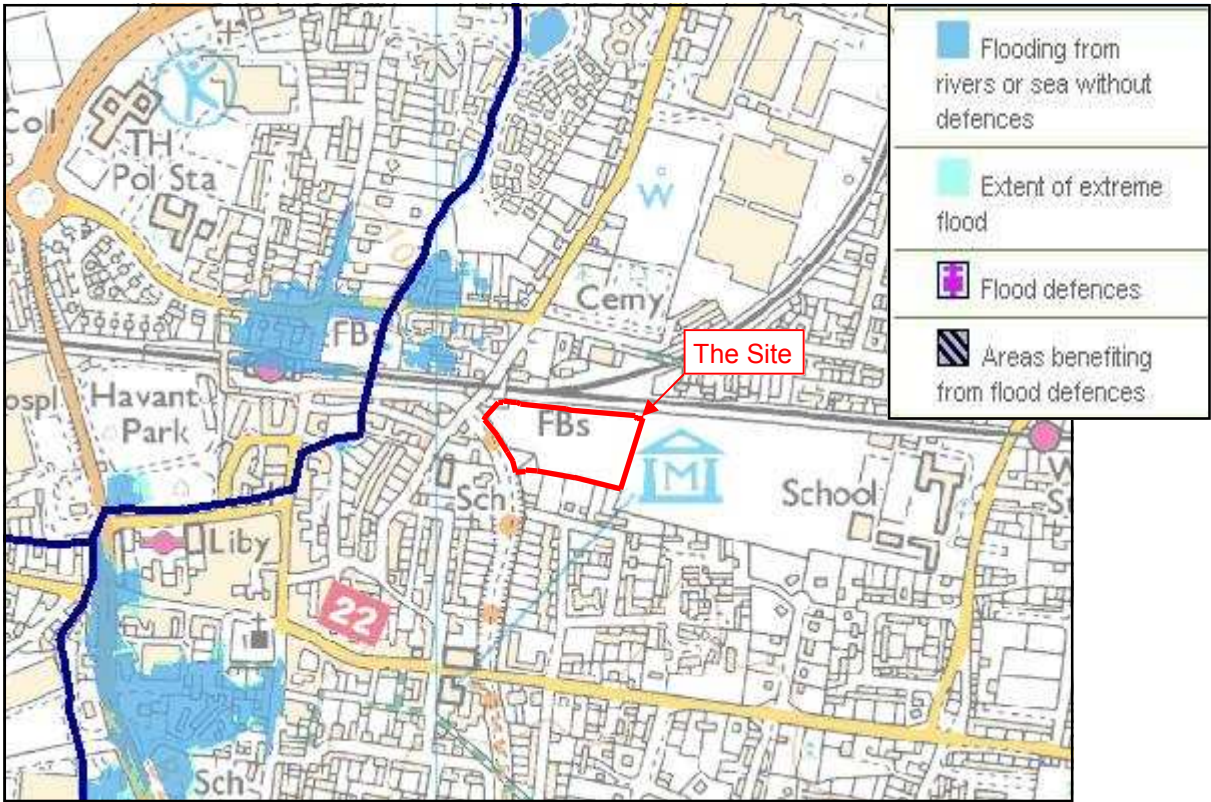
Aerial Photograph



APPENDIX C

Environment Agency Flood Map

Flood Map



APPENDIX D

Borehole Logs and Location Plan by Ashdown Site Investigation Limited

Table 4. Groundwater Summary

Borehole	Groundwater Depth (m)
WS1	1.50
WS2	1.30
WS3	1.00
WS4	1.30 to 1.80
WS5	1.00
S1	1.30
S2	1.10
S3	1.00

Borehole No.: WS1

Site Name: Warblington School, Southleigh Road, Havant, Hampshire

Job No.: LW20180

Start Date: 13/10/2009

Ground Level: 10.10m

End Date: 13/10/2009

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 , 15 , 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							10.10 0.00	Ground Level Topsoil.
	J D	0.50		>250			9.85 0.25	MADE GROUND: Brown and grey slightly clayey fine to coarse gravel of flint with occasional fine to medium gravel of brick
	D H	0.80					9.40 0.70	Stiff to very stiff brown grey slightly gravelly CLAY with red brown staining. Gravel is flint. (Head)
	D	1.00					9.20 0.90	Stiff brown very gravelly CLAY. Gravel is fine to coarse flint. (Head)
	J D	1.90		155			8.60 1.50	Loose green grey and orange brown silty fine SAND. (Bognor Sand Member) with a black stained horizon (50mm thick) at 1.7m depth.
	D	2.60					7.70 2.40	Firm very closely spaced inter-laminated brown CLAY and silty fine SAND. (Bognor Sand Member)
	D H	3.00					7.30 2.80	Firm very closely to closely inter-laminated orange brown gravelly CLAY and orange fine SAND. Gravel is fine to coarse flint. (Bognor Sand Member)
							7.10 3.00	End of Borehole

Remarks:

Groundwater noted below 1.5m depth.

Borehole collapsed to 1.55m depth on completion (running sand).

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: TH

ASHDOWN SITE INVESTIGATION **L · I · M · I · T · E · D**

GEOTECHNICAL AND ENVIRONMENTAL
ENGINEERS
Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: WS2

Site Name: Warblington School, Southleigh Road, Havant, Hampshire

Job No.: LW21080

Start Date: 13/10/2009

Ground Level: 9.95m

End Date: 13/10/2009

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 , 15 , 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							9.95 0.00	Ground Level
	J	0.30					9.55 0.40	Topsoil (100mm) over, MADE GROUND: Pale brown silty clay with a trace of fine to coarse gravel of brick.
	J D	0.70					9.05 0.90	MADE GROUND: Grey slightly clayey fine to coarse gravel of flint.
	D	1.00					8.45 1.50	Loose orange brown clayey very sandy fine to coarse GRAVEL of flint. (River Terrace Deposits)
	D	2.00					7.25 2.70	Medium dense brown silty fine SAND with medium spaced thick laminae of clay. (Bognor Sand Member)
	D	2.70						becoming loose to medium dense below 2.0m depth. becoming grey brown with orange staining with depth. becoming inter-laminated fine SAND and CLAY towards base.
								End of Borehole

Remarks:

No further progress below 2.7m depth - too dense.

Borehole collapsed to 1.3m depth on completion (running sand).

Groundwater ponding at base of collapsed borehole (1.3m).

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: TH

ASHDOWN SITE INVESTIGATION

L · I · M · I · T · E · D

GEOTECHNICAL AND ENVIRONMENTAL
ENGINEERS
Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: WS3

Site Name: Warblington School, Southleigh Road, Havant, Hampshire

Job No.: LW20180

Start Date: 13/10/2009

Ground Level: 9.60m

End Date: 13/10/2009

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 , 15 , 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							9.60 0.00	Ground Level
	D	0.30					9.20 0.40	Topsoil (100mm) over, MADE GROUND: Grey brown silty clay with a little fine to medium gravel of flint, coal, brick and clinker.
	D	0.60					8.70 0.90	MADE GROUND: Grey sandy medium to coarse gravel of flint and occasional fine brick.
	D	1.00					8.50 1.10	Loose to medium dense orange brown sandy very clayey fine to coarse GRAVEL of flint. (Head)
	D	1.50					7.90 1.70	Loose orange brown silty sandy fine to coarse GRAVEL flint. (River Terrace Deposits)
	D	2.00					7.40 2.20	Loose brown silty fine SAND with medium spaced thick laminae of clay. (Bognor Sand Member)
	D	2.30					7.10 2.50	Firm to stiff very closely spaced inter-laminated dark grey CLAY and gravelly fine SAND. Gravel is rounded fine to medium flint. (Bognor Sand Member)
	D	2.70					6.85 2.75	Dense green brown silty fine SAND. (Bognor Sand Member)
								End of Borehole

Remarks:

No further progress below 2.75m depth - too dense.

Groundwater noted below 1.0m depth.

Borehole collapsed to 1.1m depth on completion (running sand).

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: TH

Borehole No.: WS4

Site Name: Warblington School, Southleigh Road, Havant, Hampshire

Job No.: LW20180

Start Date: 13/10/2009

Ground Level: 9.50m

End Date: 13/10/2009

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 , 15 , 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							9.50	Ground Level
	J	0.20					0.00	Topsoil over, Subsoil.
	J	0.50					9.20	MADE GROUND: Brown and grey slightly clayey fine to coarse gravel of flint and brick.
	D	0.70					0.30	
							8.30	Firm orange brown slightly sandy gravelly CLAY. Gravel is fine to coarse flint. (Head)
							1.20	
	D	1.50					1.30	Medium dense orange brown very silty fine SAND. (Bognor Sand Member) becoming loose below 1.6m depth.
							7.70	Loose green grey silty fine SAND with medium spaced thick laminae of clay. (Bognor Sand Member) with occasional shell fragments below 2.0m depth.
							1.80	
	D	2.20					7.10	becoming inter-laminated with CLAY below 2.3m depth.
							2.40	Soft brown grey gravelly CLAY. Gravel is fine to medium flint. (Bognor Sand Member)
							2.50	
	D	3.00						Dense green brown silty fine SAND. (Bognor Sand Member)
							6.50	End of Borehole
							3.00	

Remarks:

Groundwater noted between 1.3m and 1.8m depth.

Borehole collapsed to 1.5m depth on completion (running sand).

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: TH

ASHDOWN SITE INVESTIGATION

L · I · M · I · T · E · D

GEOTECHNICAL AND ENVIRONMENTAL
ENGINEERS
Swanborough Farm
Swanborough
Lewes, East Sussex
BN7 3PF

Borehole No.: WS5

Site Name: Warblington School, Southleigh Road, Havant, Hampshire

Job No.: LW20180

Start Date: 13/10/2009

Ground Level: 9.55m

End Date: 13/10/2009

Standpipe Installation	Samples and Testing					Strata		
	Sample Type	Depths		Vane/ Pen Test N Value	DPSH Profile Blows/100mm 5 , 15 , 25	Legend	Depth / Reduced Level	Strata Descriptions
		From (m)	To (m)					
							9.55	Ground Level
							0.00	Topsoil.
	J	0.30					9.35	
							0.20	MADE GROUND: Pale brown silty clay with a trace of gravel of brick.
							9.15	
	J D	0.60					0.40	MADE GROUND: Grey slightly clayey fine to coarse gravel of flint.
							8.65	
	J	1.00					0.90	Medium dense orange brown clayey sandy fine to coarse flint GRAVEL. (River Terrace Deposits)
	D	1.50						
							7.85	
							1.70	Loose green grey slightly gravelly silty fine SAND with medium spaced thick laminae of clay and occasional shell fragments. Gravel is fine to coarse flint. (Bognor Sand Member)
	D	2.00						
								becoming dark grey below 2.5m depth.
								with no gravel content towards base.
	D	3.00					6.55	
							3.00	End of Borehole

Remarks:

Groundwater noted below 1.2m depth.

Borehole collapsed 1.0m depth on completion (running sand).

Groundwater ponding at base of collapsed borehole (1.0m).

Excavation Method: Window Sampler

Borehole Diameter: Various

Made By: TH

APPENDIX E

Southern Water letter of 10 March 2011 and Sewer Records

Mr. Andy McClelland
Banners Gate Limited
10-11 Birmingham Street
Halesowen
West Midlands
B63 3HN



Atkins Limited
Anglo St James House
39A Southgate Street
Winchester
Hampshire SO23 9EH

Telephone +44 (0)1962 858688
Fax +44 (0)1962 810296
winchester.enquiries@atkinsglobal.com
www.atkinsglobal.com

10/03/2011

Our Ref: SWS-HANTS-CC-000774

RE: Capacity check application for Warblington School, Fairfield Road, Havant, Hampshire, PO9 1AZ

Dear Mr. McClelland,

We have completed the capacity check for the above development site and the results are as follows:-

Foul capacity check:

There is currently adequate capacity within the local foul sewerage network to accommodate a flow of 3.4 l/s at manhole reference SU72060501. Please note that no surface water flows (existing or proposed) can be accommodated within the foul sewerage system.

Before any connections are made, an application form needs to be completed and approved by Southern Water Services.

Surface water capacity check:

As surface water capacity check has not been requested it is assumed that surface water will be disposed off by alternative means such as soakaways, once soakaways tests confirm that they are suitable.

Should you require any further information, please contact us at the above mentioned phone number or address.

Yours faithfully,



Network Development

Please note: -

The information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

Date: 9-3-2011

APPENDIX F

Environment Agency letter of 3 May 2011

Mr Roger Williams
Banners Gate Ltd.
Cavendish House Birmingham Street
Halesowen
West Midlands
B63 3HN

Our ref: HA/2011/111589/01-L01
Your ref: 11010 Fairfield Road
Date: 03 May 2011

Dear Mr Williams

FAIRFIELD ROAD, HAVANT, HAMPSHIRE

Thank you for providing surface water drainage information relating to the proposed development at the above location.

Protection of Groundwater

We note the shallow nature of the groundwater present at the site.

As you have acknowledged in your email, there is a requirement for at least 500mm of unsaturated zone to be maintained between the base of any infiltration area to the level of the groundwater. Any designs must account for the seasonal variability of groundwater. The maintenance of the unsaturated zone is required to ensure that groundwater quality is protected from potential sources of pollution resulting from any development.

The document titled '*Appendix D3 - Trial Pit*' includes the trial pit logs for the investigation undertaken, however no laboratory test results are included. As the site is located immediately adjacent to a disused/dismantled railway line and that the trial pit logs indicate the presence of Made Ground, the contamination test results or preferably the complete investigation report (should it contain the laboratory test results and comment) must be submitted for review.

Flood Risk

The proposed development site at Fairfield Road, Havant is located within flood zone 1, defined by Planning Policy Statement 25 _ "Development and Flood Risk" (PPS25) as having a low probability of flooding.

Environment Agency
Guildbourne House Chatsworth Road, Worthing, West Sussex, BN11 1LD.
Customer services line: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

Cont/d..

However as the site is over one hectare, in accordance with PPS25 a Flood Risk Assessment (FRA) will need to be submitted with any planning application.

For development proposals on sites of one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be fully investigated within the FRA.

The FRA will need to be produced in accordance with PPS25 Annex E: The Assessment of Flood Risk. Further information on the requirements of an FRA can be obtained from the following website:

<http://www.environment-agency.gov.uk/research/planning/82587.aspx>

The FRA will need to detail how surface water runoff generated by the developed site will be managed. Surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management. Sustainable Drainage Systems (SuDS) are an approach to managing surface water run-off which seeks to mimic natural drainage systems and retain water on or near the site as opposed to traditional drainage approaches which involve piping water off site as quickly as possible. SuDS involve a range of techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands. SuDS offer significant advantages over conventional piped drainage systems in reducing flood risk by attenuating the rate and quantity of surface water run-off from a site, promoting groundwater recharge, and improving water quality and amenity.

The information supplied indicates that surface water runoff from the site will be managed through infiltration methods.

Approved Document Part H of the Building Regulations 2000 establishes a hierarchy for surface water disposal, which encourages a SuDS approach. Under Approved Document Part H the first option for surface water disposal should be the use of SuDS, which encourage infiltration such as soakaways or infiltration trenches. In all cases, it must be established that these options are feasible, can be adopted and properly maintained and would not lead to any other environmental problems. For example, using soakaways or other infiltration methods on contaminated land carries groundwater pollution risks and may not work in areas with a high water table. Where the intention is to dispose to soakaway, these should be shown to work through an appropriate assessment carried out under Building Research Establishment (BRE) Digest 365.

If infiltration methods are used to manage surface water runoff we would expect to see the system designed according to the following criteria:

- There should be no surface flooding resulting from the surcharging of the drainage system for storm events with a return period of up to 1 in 30 years
- For storm events exceeding this surface flooding may be acceptable for short periods providing water is routed away from buildings, access ways and does not increase risk off site.

- There should be no flooding of buildings as a result of storms up to the 1 in 100 30% (climate change allowance) event.

If a planning application is submitted for the site we are likely to request a planning condition to be attached to any planning permission ensuring that the above criteria are incorporated into the development.

The information above has been based solely on the information provided. Please note that we reserve our right to make further comments or indeed object to the proposal, upon receipt of any subsequent formal planning application.

I trust that the above comments are satisfactory but if you require any further information please contact me.

Yours sincerely

Helen Tier
Planning Liaison Officer

Environment Agency South East
(Solent and South Downs Area)

Direct dial 01903 703862

Direct e-mail PlanningSSD@environment-agency.gov.uk

APPENDIX G

Source Control Calculations

Banners Gate		Page 1			
United House	Fairfield Rd,				
North Road, Islington	Havant				
London, N7 9DP	SK 1				
Date 30/11/2011 11:39	Designed by TL				
File Aquacell SK1 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
Summary of Results for 100 year Return Period (+30%)					
Half Drain Time : 642 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	100.146	0.146	0.1	3.5	0 K
30 min Summer	100.190	0.190	0.1	4.6	0 K
60 min Summer	100.232	0.232	0.1	5.6	0 K
120 min Summer	100.271	0.271	0.1	6.6	0 K
180 min Summer	100.288	0.288	0.1	7.0	0 K
240 min Summer	100.296	0.296	0.1	7.2	0 K
360 min Summer	100.301	0.301	0.1	7.3	0 K
480 min Summer	100.299	0.299	0.1	7.2	0 K
600 min Summer	100.295	0.295	0.1	7.2	0 K
720 min Summer	100.291	0.291	0.1	7.1	0 K
960 min Summer	100.282	0.282	0.1	6.8	0 K
1440 min Summer	100.263	0.263	0.1	6.4	0 K
2160 min Summer	100.234	0.234	0.1	5.7	0 K
2880 min Summer	100.208	0.208	0.1	5.0	0 K
4320 min Summer	100.162	0.162	0.1	3.9	0 K
5760 min Summer	100.124	0.124	0.1	3.0	0 K
7200 min Summer	100.095	0.095	0.1	2.3	0 K
8640 min Summer	100.073	0.073	0.1	1.8	0 K
10080 min Summer	100.058	0.058	0.1	1.4	0 K
15 min Winter	100.164	0.164	0.1	4.0	0 K
30 min Winter	100.213	0.213	0.1	5.2	0 K
60 min Winter	100.261	0.261	0.1	6.3	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
15 min Summer	128.285	19			
30 min Summer	84.226	34			
60 min Summer	52.662	64			
120 min Summer	31.800	122			
180 min Summer	23.353	182			
240 min Summer	18.644	242			
360 min Summer	13.543	360			
480 min Summer	10.792	466			
600 min Summer	9.043	514			
720 min Summer	7.823	572			
960 min Summer	6.219	700			
1440 min Summer	4.493	968			
2160 min Summer	3.241	1384			
2880 min Summer	2.568	1784			
4320 min Summer	1.847	2552			
5760 min Summer	1.461	3288			
7200 min Summer	1.217	3968			
8640 min Summer	1.048	4664			
10080 min Summer	0.923	5248			
15 min Winter	128.285	19			
30 min Winter	84.226	33			
60 min Winter	52.662	62			
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Banners Gate		Page 2			
United House	Fairfield Rd,				
North Road, Islington	Havant				
London, N7 9DP	SK 1				
Date 30/11/2011 11:39	Designed by TL				
File Aquacell SK1 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	100.305	0.305	0.1	7.4	0 K
180 min Winter	100.326	0.326	0.1	7.9	0 K
240 min Winter	100.336	0.336	0.1	8.1	0 K
360 min Winter	100.345	0.345	0.1	8.4	0 K
480 min Winter	100.346	0.346	0.1	8.4	0 K
600 min Winter	100.342	0.342	0.1	8.3	0 K
720 min Winter	100.336	0.336	0.1	8.1	0 K
960 min Winter	100.324	0.324	0.1	7.9	0 K
1440 min Winter	100.298	0.298	0.1	7.2	0 K
2160 min Winter	100.256	0.256	0.1	6.2	0 K
2880 min Winter	100.216	0.216	0.1	5.2	0 K
4320 min Winter	100.149	0.149	0.1	3.6	0 K
5760 min Winter	100.097	0.097	0.1	2.3	0 K
7200 min Winter	100.061	0.061	0.1	1.5	0 K
8640 min Winter	100.047	0.047	0.1	1.1	0 K
10080 min Winter	100.042	0.042	0.1	1.0	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
120 min Winter	31.800	120			
180 min Winter	23.353	178			
240 min Winter	18.644	236			
360 min Winter	13.543	350			
480 min Winter	10.792	462			
600 min Winter	9.043	568			
720 min Winter	7.823	664			
960 min Winter	6.219	750			
1440 min Winter	4.493	1054			
2160 min Winter	3.241	1496			
2880 min Winter	2.568	1928			
4320 min Winter	1.847	2684			
5760 min Winter	1.461	3400			
7200 min Winter	1.217	3968			
8640 min Winter	1.048	4504			
10080 min Winter	0.923	5240			
©1982-2011 Micro Drainage Ltd					

Banners Gate		Page 3																												
United House North Road, Islington London, N7 9DP	Fairfield Rd, Havant SK 1																													
Date 30/11/2011 11:39 File Aquacell SK1 - P...	Designed by TL Checked by																													
Micro Drainage Source Control W.12.6																														
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>20.000</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.400</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+30</td> </tr> </table> <u>Time / Area Diagram</u> Total Area (ha) 0.015 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> </tr> </thead> <tbody> <tr> <td>0-4</td> <td>0.015</td> </tr> </tbody> </table>			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)	20.000	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins)	Area (ha)	0-4	0.015
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Banners Gate		Page 4																		
United House North Road, Islington London, N7 9DP	Fairfield Rd, Havant SK 1																			
Date 30/11/2011 11:39 File Aquacell SK1 - P...	Designed by TL Checked by																			
Micro Drainage Source Control W.12.6																				
<u>Model Details</u> Storage is Online Cover Level (m) 103.000 <u>Cellular Storage Structure</u> Invert Level (m) 100.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.02592 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.02592 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>25.5</td> <td>25.5</td> <td>0.500</td> <td>0.0</td> <td>34.6</td> </tr> <tr> <td>0.400</td> <td>25.5</td> <td>33.6</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	25.5	25.5	0.500	0.0	34.6	0.400	25.5	33.6			
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©1982-2011 Micro Drainage Ltd																				

Banners Gate		Page 1																																																																																																																																																																																																															
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Summer</td><td>100.324</td><td>0.324</td><td>0.1</td><td>7.8</td><td>0 K</td></tr><tr><td>600 min Summer</td><td>100.320</td><td>0.320</td><td>0.1</td><td>7.7</td><td>0 K</td></tr><tr><td>720 min Summer</td><td>100.316</td><td>0.316</td><td>0.1</td><td>7.6</td><td>0 K</td></tr><tr><td>960 min Summer</td><td>100.306</td><td>0.306</td><td>0.1</td><td>7.4</td><td>0 K</td></tr><tr><td>1440 min Summer</td><td>100.287</td><td>0.287</td><td>0.1</td><td>6.9</td><td>0 K</td></tr><tr><td>2160 min Summer</td><td>100.257</td><td>0.257</td><td>0.1</td><td>6.2</td><td>0 K</td></tr><tr><td>2880 min Summer</td><td>100.230</td><td>0.230</td><td>0.1</td><td>5.6</td><td>0 K</td></tr><tr><td>4320 min Summer</td><td>100.182</td><td>0.182</td><td>0.1</td><td>4.4</td><td>0 K</td></tr><tr><td>5760 min Summer</td><td>100.142</td><td>0.142</td><td>0.1</td><td>3.4</td><td>0 K</td></tr><tr><td>7200 min Summer</td><td>100.110</td><td>0.110</td><td>0.1</td><td>2.7</td><td>0 K</td></tr><tr><td>8640 min Summer</td><td>100.086</td><td>0.086</td><td>0.1</td><td>2.1</td><td>0 K</td></tr><tr><td>10080 min Summer</td><td>100.067</td><td>0.067</td><td>0.1</td><td>1.6</td><td>0 K</td></tr><tr><td>15 min Winter</td><td>100.175</td><td>0.175</td><td>0.1</td><td>4.2</td><td>0 K</td></tr><tr><td>30 min Winter</td><td>100.227</td><td>0.227</td><td>0.1</td><td>5.5</td><td>0 K</td></tr><tr><td>60 min Winter</td><td>100.279</td><td>0.279</td><td>0.1</td><td>6.8</td><td>0 K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>128.285</td><td>19</td></tr><tr><td>30 min Summer</td><td>84.226</td><td>34</td></tr><tr><td>60 min Summer</td><td>52.662</td><td>64</td></tr><tr><td>120 min Summer</td><td>31.800</td><td>122</td></tr><tr><td>180 min Summer</td><td>23.353</td><td>182</td></tr><tr><td>240 min Summer</td><td>18.644</td><td>242</td></tr><tr><td>360 min 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15 min Winter	100.175	0.175	0.1	4.2	0 K																																																																																																																																																																																																												
30 min Winter	100.227	0.227	0.1	5.5	0 K																																																																																																																																																																																																												
60 min Winter	100.279	0.279	0.1	6.8	0 K																																																																																																																																																																																																												
Storm Event	Rain (mm/hr)	Time-Peak (mins)																																																																																																																																																																																																															
15 min Summer	128.285	19																																																																																																																																																																																																															
30 min Summer	84.226	34																																																																																																																																																																																																															
60 min Summer	52.662	64																																																																																																																																																																																																															
120 min Summer	31.800	122																																																																																																																																																																																																															
180 min Summer	23.353	182																																																																																																																																																																																																															
240 min Summer	18.644	242																																																																																																																																																																																																															
360 min Summer	13.543	360																																																																																																																																																																																																															
480 min Summer	10.792	480																																																																																																																																																																																																															
600 min Summer	9.043	526																																																																																																																																																																																																															
720 min Summer	7.823	588																																																																																																																																																																																																															
960 min Summer	6.219	712																																																																																																																																																																																																															
1440 min Summer	4.493	982																																																																																																																																																																																																															
2160 min Summer	3.241	1384																																																																																																																																																																																																															
2880 min Summer	2.568	1788																																																																																																																																																																																																															
4320 min Summer	1.847	2556																																																																																																																																																																																																															
5760 min Summer	1.461	3296																																																																																																																																																																																																															
7200 min Summer	1.217	4032																																																																																																																																																																																																															
8640 min Summer	1.048	4672																																																																																																																																																																																																															
10080 min Summer	0.923	5344																																																																																																																																																																																																															
15 min Winter	128.285	19																																																																																																																																																																																																															
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Banners Gate		Page 2			
United House	Fairfield Rd				
North Road, Islington	Havant				
London, N7 9DP	SK2				
Date 30/11/2011 11:42	Designed by TL				
File Aquacell SK2 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	100.327	0.327	0.1	7.9	0 K
180 min Winter	100.350	0.350	0.1	8.5	0 K
240 min Winter	100.361	0.361	0.1	8.8	0 K
360 min Winter	100.372	0.372	0.1	9.0	0 K
480 min Winter	100.374	0.374	0.1	9.1	0 K
600 min Winter	100.371	0.371	0.1	9.0	0 K
720 min Winter	100.365	0.365	0.1	8.8	0 K
960 min Winter	100.352	0.352	0.1	8.5	0 K
1440 min Winter	100.326	0.326	0.1	7.9	0 K
2160 min Winter	100.284	0.284	0.1	6.9	0 K
2880 min Winter	100.243	0.243	0.1	5.9	0 K
4320 min Winter	100.172	0.172	0.1	4.2	0 K
5760 min Winter	100.116	0.116	0.1	2.8	0 K
7200 min Winter	100.075	0.075	0.1	1.8	0 K
8640 min Winter	100.051	0.051	0.1	1.2	0 K
10080 min Winter	100.045	0.045	0.1	1.1	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
120 min Winter	31.800	120			
180 min Winter	23.353	180			
240 min Winter	18.644	238			
360 min Winter	13.543	352			
480 min Winter	10.792	462			
600 min Winter	9.043	572			
720 min Winter	7.823	672			
960 min Winter	6.219	758			
1440 min Winter	4.493	1066			
2160 min Winter	3.241	1512			
2880 min Winter	2.568	1932			
4320 min Winter	1.847	2724			
5760 min Winter	1.461	3456			
7200 min Winter	1.217	4104			
8640 min Winter	1.048	4576			
10080 min Winter	0.923	5240			
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Banners Gate		Page 3																												
United House North Road, Islington London, N7 9DP	Fairfield Rd Havant SK2																													
Date 30/11/2011 11:42 File Aquacell SK2 - P...	Designed by TL Checked by																													
Micro Drainage Source Control W.12.6																														
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>20.000</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.400</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+30</td> </tr> </table> <u>Time / Area Diagram</u> Total Area (ha) 0.016 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> </tr> </thead> <tbody> <tr> <td>0-4</td> <td>0.016</td> </tr> </tbody> </table>			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)	20.000	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins)	Area (ha)	0-4	0.016
Rainfall Model	FSR	Winter Storms	Yes																											
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Time (mins)	Area (ha)																													
0-4	0.016																													
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Banners Gate		Page 4																		
United House North Road, Islington London, N7 9DP	Fairfield Rd Havant SK2																			
Date 30/11/2011 11:42 File Aquacell SK2 - P...	Designed by TL Checked by																			
Micro Drainage	Source Control W.12.6																			
Model Details Storage is Online Cover Level (m) 103.000 Cellular Storage Structure Invert Level (m) 100.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.02592 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.02592 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>25.5</td><td>25.5</td><td>0.500</td><td>0.0</td><td>34.6</td></tr><tr><td>0.400</td><td>25.5</td><td>33.6</td><td></td><td></td><td></td></tr></tbody></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	25.5	25.5	0.500	0.0	34.6	0.400	25.5	33.6			
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)															
0.000	25.5	25.5	0.500	0.0	34.6															
0.400	25.5	33.6																		
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Banners Gate		Page 1			
United House	Fairfield Rd				
North Road, Islington	Havant				
London, N7 9DP	SK 3				
Date 30/11/2011 11:43	Designed by TL				
File Aquacell SK3 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Half Drain Time : 722 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	100.163	0.163	0.1	5.0	0 K
30 min Summer	100.212	0.212	0.1	6.4	0 K
60 min Summer	100.260	0.260	0.1	7.9	0 K
120 min Summer	100.304	0.304	0.1	9.2	0 K
180 min Summer	100.325	0.325	0.1	9.9	0 K
240 min Summer	100.335	0.335	0.1	10.2	0 K
360 min Summer	100.343	0.343	0.1	10.4	0 K
480 min Summer	100.343	0.343	0.1	10.4	0 K
600 min Summer	100.339	0.339	0.1	10.3	0 K
720 min Summer	100.335	0.335	0.1	10.2	0 K
960 min Summer	100.326	0.326	0.1	9.9	0 K
1440 min Summer	100.306	0.306	0.1	9.3	0 K
2160 min Summer	100.276	0.276	0.1	8.4	0 K
2880 min Summer	100.248	0.248	0.1	7.6	0 K
4320 min Summer	100.199	0.199	0.1	6.0	0 K
5760 min Summer	100.157	0.157	0.1	4.8	0 K
7200 min Summer	100.124	0.124	0.1	3.8	0 K
8640 min Summer	100.097	0.097	0.1	2.9	0 K
10080 min Summer	100.076	0.076	0.1	2.3	0 K
15 min Winter	100.183	0.183	0.1	5.6	0 K
30 min Winter	100.238	0.238	0.1	7.2	0 K
60 min Winter	100.293	0.293	0.1	8.9	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
15 min Summer	128.285	19			
30 min Summer	84.226	34			
60 min Summer	52.662	64			
120 min Summer	31.800	122			
180 min Summer	23.353	182			
240 min Summer	18.644	242			
360 min Summer	13.543	360			
480 min Summer	10.792	480			
600 min Summer	9.043	550			
720 min Summer	7.823	606			
960 min Summer	6.219	724			
1440 min Summer	4.493	994			
2160 min Summer	3.241	1404			
2880 min Summer	2.568	1812			
4320 min Summer	1.847	2592			
5760 min Summer	1.461	3344			
7200 min Summer	1.217	4040			
8640 min Summer	1.048	4752			
10080 min Summer	0.923	5352			
15 min Winter	128.285	19			
30 min Winter	84.226	33			
60 min Winter	52.662	62			
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United House	Fairfield Rd				
North Road, Islington	Havant				
London, N7 9DP	SK 3				
Date 30/11/2011 11:43	Designed by TL				
File Aquacell SK3 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	100.343	0.343	0.1	10.4	0 K
180 min Winter	100.367	0.367	0.1	11.2	0 K
240 min Winter	100.380	0.380	0.1	11.6	0 K
360 min Winter	100.393	0.393	0.1	11.9	0 K
480 min Winter	100.396	0.396	0.1	12.0	0 K
600 min Winter	100.394	0.394	0.1	12.0	0 K
720 min Winter	100.389	0.389	0.1	11.8	0 K
960 min Winter	100.375	0.375	0.1	11.4	0 K
1440 min Winter	100.350	0.350	0.1	10.6	0 K
2160 min Winter	100.307	0.307	0.1	9.3	0 K
2880 min Winter	100.266	0.266	0.1	8.1	0 K
4320 min Winter	100.193	0.193	0.1	5.9	0 K
5760 min Winter	100.133	0.133	0.1	4.1	0 K
7200 min Winter	100.088	0.088	0.1	2.7	0 K
8640 min Winter	100.057	0.057	0.1	1.7	0 K
10080 min Winter	100.047	0.047	0.1	1.4	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
120 min Winter	31.800	120			
180 min Winter	23.353	180			
240 min Winter	18.644	238			
360 min Winter	13.543	352			
480 min Winter	10.792	464			
600 min Winter	9.043	572			
720 min Winter	7.823	678			
960 min Winter	6.219	770			
1440 min Winter	4.493	1070			
2160 min Winter	3.241	1516			
2880 min Winter	2.568	1960			
4320 min Winter	1.847	2764			
5760 min Winter	1.461	3512			
7200 min Winter	1.217	4176			
8640 min Winter	1.048	4672			
10080 min Winter	0.923	5240			
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United House North Road, Islington London, N7 9DP	Fairfield Rd Havant SK 3																													
Date 30/11/2011 11:43 File Aquacell SK3 - P...	Designed by TL Checked by																													
Micro Drainage Source Control W.12.6																														
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Rainfall Model	FSR	Winter Storms	Yes																											
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Summer Storms	Yes	Climate Change %	+30																											
Time (mins)	Area (ha)																													
0-4	0.021																													
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Banners Gate		Page 4																		
United House North Road, Islington London, N7 9DP	Fairfield Rd Havant SK 3																			
Date 30/11/2011 11:43 File Aquacell SK3 - P...	Designed by TL Checked by																			
Micro Drainage Source Control W.12.6																				
<u>Model Details</u> Storage is Online Cover Level (m) 103.000 <u>Cellular Storage Structure</u> Invert Level (m) 100.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.02592 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.02592 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>32.0</td> <td>32.0</td> <td>0.500</td> <td>0.0</td> <td>42.2</td> </tr> <tr> <td>0.400</td> <td>32.0</td> <td>41.1</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	32.0	32.0	0.500	0.0	42.2	0.400	32.0	41.1			
Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)															
0.000	32.0	32.0	0.500	0.0	42.2															
0.400	32.0	41.1																		
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United House	Fairfield Rd				
North Road, Islington	Havant				
London, N7 9DP	SK4				
Date 30/11/2011 11:45	Designed by TL				
File Aquacell SK4 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Half Drain Time : 633 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	100.145	0.145	0.1	3.3	0 K
30 min Summer	100.188	0.188	0.1	4.3	0 K
60 min Summer	100.230	0.230	0.1	5.3	0 K
120 min Summer	100.268	0.268	0.1	6.1	0 K
180 min Summer	100.285	0.285	0.1	6.5	0 K
240 min Summer	100.293	0.293	0.1	6.7	0 K
360 min Summer	100.298	0.298	0.1	6.8	0 K
480 min Summer	100.296	0.296	0.1	6.7	0 K
600 min Summer	100.292	0.292	0.1	6.7	0 K
720 min Summer	100.288	0.288	0.1	6.6	0 K
960 min Summer	100.279	0.279	0.1	6.4	0 K
1440 min Summer	100.260	0.260	0.1	5.9	0 K
2160 min Summer	100.231	0.231	0.1	5.3	0 K
2880 min Summer	100.205	0.205	0.1	4.7	0 K
4320 min Summer	100.159	0.159	0.1	3.6	0 K
5760 min Summer	100.122	0.122	0.1	2.8	0 K
7200 min Summer	100.093	0.093	0.1	2.1	0 K
8640 min Summer	100.072	0.072	0.1	1.6	0 K
10080 min Summer	100.057	0.057	0.1	1.3	0 K
15 min Winter	100.162	0.162	0.1	3.7	0 K
30 min Winter	100.211	0.211	0.1	4.8	0 K
60 min Winter	100.259	0.259	0.1	5.9	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
15 min Summer	128.285	19			
30 min Summer	84.226	34			
60 min Summer	52.662	64			
120 min Summer	31.800	122			
180 min Summer	23.353	182			
240 min Summer	18.644	242			
360 min Summer	13.543	360			
480 min Summer	10.792	460			
600 min Summer	9.043	512			
720 min Summer	7.823	572			
960 min Summer	6.219	696			
1440 min Summer	4.493	968			
2160 min Summer	3.241	1380			
2880 min Summer	2.568	1784			
4320 min Summer	1.847	2548			
5760 min Summer	1.461	3280			
7200 min Summer	1.217	3968			
8640 min Summer	1.048	4664			
10080 min Summer	0.923	5248			
15 min Winter	128.285	19			
30 min Winter	84.226	33			
60 min Winter	52.662	62			
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United House	Fairfield Rd				
North Road, Islington	Havant				
London, N7 9DP	SK4				
Date 30/11/2011 11:45	Designed by TL				
File Aquacell SK4 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	100.303	0.303	0.1	6.9	0 K
180 min Winter	100.323	0.323	0.1	7.4	0 K
240 min Winter	100.333	0.333	0.1	7.6	0 K
360 min Winter	100.342	0.342	0.1	7.8	0 K
480 min Winter	100.342	0.342	0.1	7.8	0 K
600 min Winter	100.338	0.338	0.1	7.7	0 K
720 min Winter	100.332	0.332	0.1	7.6	0 K
960 min Winter	100.320	0.320	0.1	7.3	0 K
1440 min Winter	100.294	0.294	0.1	6.7	0 K
2160 min Winter	100.252	0.252	0.1	5.7	0 K
2880 min Winter	100.213	0.213	0.1	4.8	0 K
4320 min Winter	100.146	0.146	0.1	3.3	0 K
5760 min Winter	100.094	0.094	0.1	2.2	0 K
7200 min Winter	100.060	0.060	0.1	1.4	0 K
8640 min Winter	100.047	0.047	0.1	1.1	0 K
10080 min Winter	100.042	0.042	0.1	0.9	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
120 min Winter	31.800	120			
180 min Winter	23.353	178			
240 min Winter	18.644	236			
360 min Winter	13.543	350			
480 min Winter	10.792	462			
600 min Winter	9.043	566			
720 min Winter	7.823	660			
960 min Winter	6.219	744			
1440 min Winter	4.493	1052			
2160 min Winter	3.241	1492			
2880 min Winter	2.568	1908			
4320 min Winter	1.847	2684			
5760 min Winter	1.461	3400			
7200 min Winter	1.217	3968			
8640 min Winter	1.048	4496			
10080 min Winter	0.923	5240			
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Date 30/11/2011 11:45 File Aquacell SK4 - P...	Designed by TL Checked by																													
Micro Drainage		Source Control W.12.6																												
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>20.000</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.400</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+30</td> </tr> </table> <u>Time / Area Diagram</u> Total Area (ha) 0.014 <table> <tr> <th>Time (mins)</th> <th>Area (ha)</th> </tr> <tr> <td>0-4</td> <td>0.014</td> </tr> </table>			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)	20.000	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins)	Area (ha)	0-4	0.014
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Banners Gate		Page 4
United House North Road, Islington London, N7 9DP	Fairfield Rd Havant SK4	
Date 30/11/2011 11:45 File Aquacell SK4 - P...	Designed by TL Checked by	
Micro Drainage		Source Control W.12.6

Model Details

Storage is Online Cover Level (m) 103.000

Cellular Storage Structure

Invert Level (m) 100.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.02592 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.02592

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	24.0	24.0	0.500	0.0	32.8
0.400	24.0	31.8			

Banners Gate		Page 1			
United House	Fairfield Rd				
North Road, Islington	Havant				
London, N7 9DP	Sk 5				
Date 30/11/2011 11:48	Designed by TL				
File Aquacell SK5 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Half Drain Time : 11 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	100.295	0.295	2.8	2.8	0 K
30 min Summer	100.313	0.313	2.9	3.0	0 K
60 min Summer	100.280	0.280	2.8	2.7	0 K
120 min Summer	100.198	0.198	2.6	1.9	0 K
180 min Summer	100.131	0.131	2.4	1.2	0 K
240 min Summer	100.084	0.084	2.3	0.8	0 K
360 min Summer	100.047	0.047	2.0	0.4	0 K
480 min Summer	100.038	0.038	1.7	0.4	0 K
600 min Summer	100.032	0.032	1.4	0.3	0 K
720 min Summer	100.028	0.028	1.2	0.3	0 K
960 min Summer	100.022	0.022	1.0	0.2	0 K
1440 min Summer	100.016	0.016	0.7	0.2	0 K
2160 min Summer	100.012	0.012	0.5	0.1	0 K
2880 min Summer	100.009	0.009	0.4	0.1	0 K
4320 min Summer	100.007	0.007	0.3	0.1	0 K
5760 min Summer	100.005	0.005	0.2	0.1	0 K
7200 min Summer	100.005	0.005	0.2	0.0	0 K
8640 min Summer	100.004	0.004	0.2	0.0	0 K
10080 min Summer	100.004	0.004	0.2	0.0	0 K
15 min Winter	100.339	0.339	2.9	3.2	0 K
30 min Winter	100.353	0.353	3.0	3.4	0 K
60 min Winter	100.297	0.297	2.8	2.8	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
15 min Summer	128.285	14			
30 min Summer	84.226	22			
60 min Summer	52.662	40			
120 min Summer	31.800	72			
180 min Summer	23.353	102			
240 min Summer	18.644	130			
360 min Summer	13.543	184			
480 min Summer	10.792	244			
600 min Summer	9.043	306			
720 min Summer	7.823	366			
960 min Summer	6.219	486			
1440 min Summer	4.493	720			
2160 min Summer	3.241	1084			
2880 min Summer	2.568	1460			
4320 min Summer	1.847	2132			
5760 min Summer	1.461	2928			
7200 min Summer	1.217	3616			
8640 min Summer	1.048	4312			
10080 min Summer	0.923	5128			
15 min Winter	128.285	14			
30 min Winter	84.226	24			
60 min Winter	52.662	42			
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Banners Gate		Page 2			
United House	Fairfield Rd				
North Road, Islington	Havant				
London, N7 9DP	Sk 5				
Date 30/11/2011 11:48	Designed by TL				
File Aquacell SK5 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	100.171	0.171	2.5	1.6	0 K
180 min Winter	100.082	0.082	2.3	0.8	0 K
240 min Winter	100.047	0.047	2.1	0.4	0 K
360 min Winter	100.035	0.035	1.5	0.3	0 K
480 min Winter	100.028	0.028	1.2	0.3	0 K
600 min Winter	100.023	0.023	1.0	0.2	0 K
720 min Winter	100.020	0.020	0.9	0.2	0 K
960 min Winter	100.016	0.016	0.7	0.2	0 K
1440 min Winter	100.012	0.012	0.5	0.1	0 K
2160 min Winter	100.008	0.008	0.4	0.1	0 K
2880 min Winter	100.007	0.007	0.3	0.1	0 K
4320 min Winter	100.005	0.005	0.2	0.0	0 K
5760 min Winter	100.004	0.004	0.2	0.0	0 K
7200 min Winter	100.003	0.003	0.1	0.0	0 K
8640 min Winter	100.003	0.003	0.1	0.0	0 K
10080 min Winter	100.003	0.003	0.1	0.0	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
120 min Winter	31.800	74			
180 min Winter	23.353	102			
240 min Winter	18.644	126			
360 min Winter	13.543	184			
480 min Winter	10.792	246			
600 min Winter	9.043	308			
720 min Winter	7.823	366			
960 min Winter	6.219	486			
1440 min Winter	4.493	740			
2160 min Winter	3.241	1104			
2880 min Winter	2.568	1460			
4320 min Winter	1.847	2128			
5760 min Winter	1.461	2832			
7200 min Winter	1.217	3552			
8640 min Winter	1.048	4304			
10080 min Winter	0.923	5360			
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Banners Gate		Page 3																												
United House North Road, Islington London, N7 9DP	Fairfield Rd Havant Sk 5																													
Date 30/11/2011 11:48 File Aquacell SK5 - P...	Designed by TL Checked by																													
Micro Drainage Source Control W.12.6																														
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Banners Gate		Page 4																		
United House North Road, Islington London, N7 9DP	Fairfield Rd Havant Sk 5																			
Date 30/11/2011 11:48 File Aquacell SK5 - P...	Designed by TL Checked by																			
Micro Drainage Source Control W.12.6																				
<u>Model Details</u> Storage is Online Cover Level (m) 103.000 <u>Cellular Storage Structure</u> Invert Level (m) 100.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 1.48320 Porosity 0.95 Infiltration Coefficient Side (m/hr) 1.48320 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>10.0</td> <td>10.0</td> <td>0.500</td> <td>0.0</td> <td>15.7</td> </tr> <tr> <td>0.400</td> <td>10.0</td> <td>15.1</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	10.0	10.0	0.500	0.0	15.7	0.400	10.0	15.1			
Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)															
0.000	10.0	10.0	0.500	0.0	15.7															
0.400	10.0	15.1																		
©1982-2011 Micro Drainage Ltd																				

Banners Gate		Page 1			
United House	Fairfield Rd				
North Road, Islington	Havant				
London, N7 9DP	Sk 6				
Date 30/11/2011 11:51	Designed by TL				
File Aquacell SK6 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Half Drain Time : 11 minutes.					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	100.314	0.314	2.6	2.7	0 K
30 min Summer	100.334	0.334	2.7	2.9	0 K
60 min Summer	100.302	0.302	2.6	2.6	0 K
120 min Summer	100.217	0.217	2.4	1.9	0 K
180 min Summer	100.147	0.147	2.2	1.3	0 K
240 min Summer	100.096	0.096	2.1	0.8	0 K
360 min Summer	100.049	0.049	1.9	0.4	0 K
480 min Summer	100.040	0.040	1.6	0.3	0 K
600 min Summer	100.033	0.033	1.3	0.3	0 K
720 min Summer	100.029	0.029	1.2	0.2	0 K
960 min Summer	100.023	0.023	0.9	0.2	0 K
1440 min Summer	100.017	0.017	0.7	0.1	0 K
2160 min Summer	100.012	0.012	0.5	0.1	0 K
2880 min Summer	100.010	0.010	0.4	0.1	0 K
4320 min Summer	100.007	0.007	0.3	0.1	0 K
5760 min Summer	100.006	0.006	0.2	0.0	0 K
7200 min Summer	100.005	0.005	0.2	0.0	0 K
8640 min Summer	100.004	0.004	0.2	0.0	0 K
10080 min Summer	100.004	0.004	0.1	0.0	0 K
15 min Winter	100.360	0.360	2.7	3.1	0 K
30 min Winter	100.377	0.377	2.8	3.2	0 K
60 min Winter	100.321	0.321	2.6	2.7	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
15 min Summer	128.285	14			
30 min Summer	84.226	22			
60 min Summer	52.662	40			
120 min Summer	31.800	72			
180 min Summer	23.353	102			
240 min Summer	18.644	130			
360 min Summer	13.543	186			
480 min Summer	10.792	246			
600 min Summer	9.043	306			
720 min Summer	7.823	366			
960 min Summer	6.219	486			
1440 min Summer	4.493	732			
2160 min Summer	3.241	1088			
2880 min Summer	2.568	1468			
4320 min Summer	1.847	2184			
5760 min Summer	1.461	2928			
7200 min Summer	1.217	3576			
8640 min Summer	1.048	4304			
10080 min Summer	0.923	5016			
15 min Winter	128.285	15			
30 min Winter	84.226	24			
60 min Winter	52.662	42			
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United House	Fairfield Rd				
North Road, Islington	Havant				
London, N7 9DP	Sk 6				
Date 30/11/2011 11:51	Designed by TL				
File Aquacell SK6 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	100.192	0.192	2.3	1.6	0 K
180 min Winter	100.098	0.098	2.1	0.8	0 K
240 min Winter	100.049	0.049	1.9	0.4	0 K
360 min Winter	100.036	0.036	1.4	0.3	0 K
480 min Winter	100.029	0.029	1.1	0.2	0 K
600 min Winter	100.024	0.024	1.0	0.2	0 K
720 min Winter	100.021	0.021	0.8	0.2	0 K
960 min Winter	100.017	0.017	0.7	0.1	0 K
1440 min Winter	100.012	0.012	0.5	0.1	0 K
2160 min Winter	100.009	0.009	0.3	0.1	0 K
2880 min Winter	100.007	0.007	0.3	0.1	0 K
4320 min Winter	100.005	0.005	0.2	0.0	0 K
5760 min Winter	100.004	0.004	0.2	0.0	0 K
7200 min Winter	100.004	0.004	0.1	0.0	0 K
8640 min Winter	100.003	0.003	0.1	0.0	0 K
10080 min Winter	100.003	0.003	0.1	0.0	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
120 min Winter	31.800	76			
180 min Winter	23.353	104			
240 min Winter	18.644	126			
360 min Winter	13.543	184			
480 min Winter	10.792	248			
600 min Winter	9.043	306			
720 min Winter	7.823	372			
960 min Winter	6.219	488			
1440 min Winter	4.493	722			
2160 min Winter	3.241	1080			
2880 min Winter	2.568	1444			
4320 min Winter	1.847	2140			
5760 min Winter	1.461	2736			
7200 min Winter	1.217	3624			
8640 min Winter	1.048	4480			
10080 min Winter	0.923	5104			
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United House North Road, Islington London, N7 9DP	Fairfield Rd Havant Sk 6																															
Date 30/11/2011 11:51 File Aquacell SK6 - P...	Designed by TL Checked by																															
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Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)															
0.000	9.0	9.0	0.500	9.0	15.0															
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Summer</td><td>100.038</td><td>0.038</td><td>0.5</td><td>0.1</td><td>0 K</td></tr><tr><td>600 min Summer</td><td>100.032</td><td>0.032</td><td>0.4</td><td>0.1</td><td>0 K</td></tr><tr><td>720 min Summer</td><td>100.028</td><td>0.028</td><td>0.4</td><td>0.1</td><td>0 K</td></tr><tr><td>960 min Summer</td><td>100.022</td><td>0.022</td><td>0.3</td><td>0.1</td><td>0 K</td></tr><tr><td>1440 min Summer</td><td>100.016</td><td>0.016</td><td>0.2</td><td>0.0</td><td>0 K</td></tr><tr><td>2160 min Summer</td><td>100.012</td><td>0.012</td><td>0.2</td><td>0.0</td><td>0 K</td></tr><tr><td>2880 min Summer</td><td>100.009</td><td>0.009</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>4320 min Summer</td><td>100.007</td><td>0.007</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>5760 min Summer</td><td>100.005</td><td>0.005</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>7200 min Summer</td><td>100.005</td><td>0.005</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>8640 min Summer</td><td>100.004</td><td>0.004</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>10080 min Summer</td><td>100.004</td><td>0.004</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>15 min Winter</td><td>100.338</td><td>0.338</td><td>1.1</td><td>1.0</td><td>0 K</td></tr><tr><td>30 min Winter</td><td>100.344</td><td>0.344</td><td>1.1</td><td>1.0</td><td>0 K</td></tr><tr><td>60 min Winter</td><td>100.281</td><td>0.281</td><td>1.0</td><td>0.8</td><td>0 K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>128.285</td><td>13</td></tr><tr><td>30 min Summer</td><td>84.226</td><td>22</td></tr><tr><td>60 min Summer</td><td>52.662</td><td>38</td></tr><tr><td>120 min Summer</td><td>31.800</td><td>70</td></tr><tr><td>180 min Summer</td><td>23.353</td><td>100</td></tr><tr><td>240 min Summer</td><td>18.644</td><td>130</td></tr><tr><td>360 min Summer</td><td>13.543</td><td>184</td></tr><tr><td>480 min Summer</td><td>10.792</td><td>246</td></tr><tr><td>600 min Summer</td><td>9.043</td><td>306</td></tr><tr><td>720 min Summer</td><td>7.823</td><td>366</td></tr><tr><td>960 min Summer</td><td>6.219</td><td>488</td></tr><tr><td>1440 min Summer</td><td>4.493</td><td>732</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>1100</td></tr><tr><td>2880 min Summer</td><td>2.568</td><td>1452</td></tr><tr><td>4320 min Summer</td><td>1.847</td><td>2176</td></tr><tr><td>5760 min Summer</td><td>1.461</td><td>2864</td></tr><tr><td>7200 min Summer</td><td>1.217</td><td>3568</td></tr><tr><td>8640 min Summer</td><td>1.048</td><td>4344</td></tr><tr><td>10080 min Summer</td><td>0.923</td><td>4976</td></tr><tr><td>15 min Winter</td><td>128.285</td><td>14</td></tr><tr><td>30 min Winter</td><td>84.226</td><td>23</td></tr><tr><td>60 min Winter</td><td>52.662</td><td>40</td></tr></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	100.297	0.297	1.0	0.8	0 K	30 min Summer	100.310	0.310	1.1	0.9	0 K	60 min Summer	100.273	0.273	1.0	0.8	0 K	120 min Summer	100.191	0.191	0.9	0.5	0 K	180 min Summer	100.127	0.127	0.8	0.4	0 K	240 min Summer	100.083	0.083	0.7	0.2	0 K	360 min Summer	100.047	0.047	0.6	0.1	0 K	480 min Summer	100.038	0.038	0.5	0.1	0 K	600 min Summer	100.032	0.032	0.4	0.1	0 K	720 min Summer	100.028	0.028	0.4	0.1	0 K	960 min Summer	100.022	0.022	0.3	0.1	0 K	1440 min Summer	100.016	0.016	0.2	0.0	0 K	2160 min Summer	100.012	0.012	0.2	0.0	0 K	2880 min Summer	100.009	0.009	0.1	0.0	0 K	4320 min Summer	100.007	0.007	0.1	0.0	0 K	5760 min Summer	100.005	0.005	0.1	0.0	0 K	7200 min Summer	100.005	0.005	0.1	0.0	0 K	8640 min Summer	100.004	0.004	0.1	0.0	0 K	10080 min Summer	100.004	0.004	0.1	0.0	0 K	15 min Winter	100.338	0.338	1.1	1.0	0 K	30 min Winter	100.344	0.344	1.1	1.0	0 K	60 min Winter	100.281	0.281	1.0	0.8	0 K	Storm Event	Rain (mm/hr)	Time-Peak (mins)	15 min Summer	128.285	13	30 min Summer	84.226	22	60 min Summer	52.662	38	120 min Summer	31.800	70	180 min Summer	23.353	100	240 min Summer	18.644	130	360 min Summer	13.543	184	480 min Summer	10.792	246	600 min Summer	9.043	306	720 min Summer	7.823	366	960 min Summer	6.219	488	1440 min Summer	4.493	732	2160 min Summer	3.241	1100	2880 min Summer	2.568	1452	4320 min Summer	1.847	2176	5760 min Summer	1.461	2864	7200 min Summer	1.217	3568	8640 min Summer	1.048	4344	10080 min Summer	0.923	4976	15 min Winter	128.285	14	30 min Winter	84.226	23	60 min Winter	52.662	40
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Banners Gate		Page 2			
United House	Fairfield Rd,				
North Road, Islington	Havant				
London, N7 9DP	Sk 7				
Date 30/11/2011 11:53	Designed by TL				
File Aquacell SK7 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	100.160	0.160	0.8	0.5	0 K
180 min Winter	100.081	0.081	0.7	0.2	0 K
240 min Winter	100.047	0.047	0.7	0.1	0 K
360 min Winter	100.035	0.035	0.5	0.1	0 K
480 min Winter	100.028	0.028	0.4	0.1	0 K
600 min Winter	100.023	0.023	0.3	0.1	0 K
720 min Winter	100.020	0.020	0.3	0.1	0 K
960 min Winter	100.016	0.016	0.2	0.0	0 K
1440 min Winter	100.012	0.012	0.2	0.0	0 K
2160 min Winter	100.009	0.009	0.1	0.0	0 K
2880 min Winter	100.007	0.007	0.1	0.0	0 K
4320 min Winter	100.005	0.005	0.1	0.0	0 K
5760 min Winter	100.004	0.004	0.1	0.0	0 K
7200 min Winter	100.003	0.003	0.0	0.0	0 K
8640 min Winter	100.003	0.003	0.0	0.0	0 K
10080 min Winter	100.003	0.003	0.0	0.0	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
120 min Winter	31.800	74			
180 min Winter	23.353	102			
240 min Winter	18.644	126			
360 min Winter	13.543	184			
480 min Winter	10.792	246			
600 min Winter	9.043	302			
720 min Winter	7.823	364			
960 min Winter	6.219	490			
1440 min Winter	4.493	720			
2160 min Winter	3.241	1084			
2880 min Winter	2.568	1384			
4320 min Winter	1.847	2216			
5760 min Winter	1.461	2824			
7200 min Winter	1.217	3616			
8640 min Winter	1.048	4248			
10080 min Winter	0.923	5304			
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United House North Road, Islington London, N7 9DP	Fairfield Rd, Havant Sk 7	
Date 30/11/2011 11:53 File Aquacell SK7 - P...	Designed by TL Checked by	
Micro Drainage		Source Control W.12.6

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)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.006

Time (mins)	Area (ha)
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0-4	0.006
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Banners Gate		Page 4																								
United House North Road, Islington London, N7 9DP	Fairfield Rd, Havant Sk 7																									
Date 30/11/2011 11:53 File Aquacell SK7 - P...	Designed by TL Checked by																									
Micro Drainage Source Control W.12.6																										
<u>Model Details</u> Storage is Online Cover Level (m) 103.000 <u>Cellular Storage Structure</u> Invert Level (m) 100.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 1.48320 Porosity 0.95 Infiltration Coefficient Side (m/hr) 1.48320 <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>3.0</td> <td>3.0</td> <td>0.300</td> <td>3.0</td> <td>5.1</td> </tr> <tr> <td>0.100</td> <td>3.0</td> <td>3.7</td> <td>0.400</td> <td>3.0</td> <td>5.8</td> </tr> <tr> <td>0.200</td> <td>3.0</td> <td>4.4</td> <td>0.500</td> <td>3.0</td> <td>6.5</td> </tr> </tbody> </table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	3.0	3.0	0.300	3.0	5.1	0.100	3.0	3.7	0.400	3.0	5.8	0.200	3.0	4.4	0.500	3.0	6.5
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Summer</td><td>100.202</td><td>0.202</td><td>0.3</td><td>1.3</td><td>0 K</td></tr><tr><td>600 min Summer</td><td>100.169</td><td>0.169</td><td>0.3</td><td>1.1</td><td>0 K</td></tr><tr><td>720 min Summer</td><td>100.142</td><td>0.142</td><td>0.3</td><td>0.9</td><td>0 K</td></tr><tr><td>960 min Summer</td><td>100.099</td><td>0.099</td><td>0.3</td><td>0.7</td><td>0 K</td></tr><tr><td>1440 min Summer</td><td>100.053</td><td>0.053</td><td>0.3</td><td>0.3</td><td>0 K</td></tr><tr><td>2160 min Summer</td><td>100.038</td><td>0.038</td><td>0.2</td><td>0.3</td><td>0 K</td></tr><tr><td>2880 min Summer</td><td>100.031</td><td>0.031</td><td>0.2</td><td>0.2</td><td>0 K</td></tr><tr><td>4320 min Summer</td><td>100.022</td><td>0.022</td><td>0.1</td><td>0.1</td><td>0 K</td></tr><tr><td>5760 min Summer</td><td>100.018</td><td>0.018</td><td>0.1</td><td>0.1</td><td>0 K</td></tr><tr><td>7200 min Summer</td><td>100.015</td><td>0.015</td><td>0.1</td><td>0.1</td><td>0 K</td></tr><tr><td>8640 min Summer</td><td>100.013</td><td>0.013</td><td>0.1</td><td>0.1</td><td>0 K</td></tr><tr><td>10080 min Summer</td><td>100.011</td><td>0.011</td><td>0.1</td><td>0.1</td><td>0 K</td></tr><tr><td>15 min Winter</td><td>100.285</td><td>0.285</td><td>0.4</td><td>1.9</td><td>0 K</td></tr><tr><td>30 min Winter</td><td>100.350</td><td>0.350</td><td>0.4</td><td>2.3</td><td>0 K</td></tr><tr><td>60 min Winter</td><td>100.381</td><td>0.381</td><td>0.4</td><td>2.5</td><td>0 K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>128.285</td><td>17</td></tr><tr><td>30 min Summer</td><td>84.226</td><td>31</td></tr><tr><td>60 min Summer</td><td>52.662</td><td>52</td></tr><tr><td>120 min Summer</td><td>31.800</td><td>84</td></tr><tr><td>180 min Summer</td><td>23.353</td><td>120</td></tr><tr><td>240 min Summer</td><td>18.644</td><td>154</td></tr><tr><td>360 min Summer</td><td>13.543</td><td>220</td></tr><tr><td>480 min Summer</td><td>10.792</td><td>284</td></tr><tr><td>600 min Summer</td><td>9.043</td><td>346</td></tr><tr><td>720 min Summer</td><td>7.823</td><td>406</td></tr><tr><td>960 min Summer</td><td>6.219</td><td>522</td></tr><tr><td>1440 min Summer</td><td>4.493</td><td>738</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>1100</td></tr><tr><td>2880 min Summer</td><td>2.568</td><td>1468</td></tr><tr><td>4320 min Summer</td><td>1.847</td><td>2200</td></tr><tr><td>5760 min Summer</td><td>1.461</td><td>2888</td></tr><tr><td>7200 min Summer</td><td>1.217</td><td>3664</td></tr><tr><td>8640 min Summer</td><td>1.048</td><td>4344</td></tr><tr><td>10080 min Summer</td><td>0.923</td><td>5120</td></tr><tr><td>15 min Winter</td><td>128.285</td><td>17</td></tr><tr><td>30 min Winter</td><td>84.226</td><td>31</td></tr><tr><td>60 min Winter</td><td>52.662</td><td>58</td></tr></tbody></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	100.252	0.252	0.3	1.7	0 K	30 min Summer	100.306	0.306	0.4	2.0	0 K	60 min Summer	100.331	0.331	0.4	2.2	0 K	120 min Summer	100.325	0.325	0.4	2.2	0 K	180 min Summer	100.305	0.305	0.4	2.0	0 K	240 min Summer	100.282	0.282	0.4	1.9	0 K	360 min Summer	100.239	0.239	0.3	1.6	0 K	480 min Summer	100.202	0.202	0.3	1.3	0 K	600 min Summer	100.169	0.169	0.3	1.1	0 K	720 min Summer	100.142	0.142	0.3	0.9	0 K	960 min Summer	100.099	0.099	0.3	0.7	0 K	1440 min Summer	100.053	0.053	0.3	0.3	0 K	2160 min Summer	100.038	0.038	0.2	0.3	0 K	2880 min Summer	100.031	0.031	0.2	0.2	0 K	4320 min Summer	100.022	0.022	0.1	0.1	0 K	5760 min Summer	100.018	0.018	0.1	0.1	0 K	7200 min Summer	100.015	0.015	0.1	0.1	0 K	8640 min Summer	100.013	0.013	0.1	0.1	0 K	10080 min Summer	100.011	0.011	0.1	0.1	0 K	15 min Winter	100.285	0.285	0.4	1.9	0 K	30 min Winter	100.350	0.350	0.4	2.3	0 K	60 min Winter	100.381	0.381	0.4	2.5	0 K	Storm Event	Rain (mm/hr)	Time-Peak (mins)	15 min Summer	128.285	17	30 min Summer	84.226	31	60 min Summer	52.662	52	120 min Summer	31.800	84	180 min Summer	23.353	120	240 min Summer	18.644	154	360 min Summer	13.543	220	480 min Summer	10.792	284	600 min Summer	9.043	346	720 min Summer	7.823	406	960 min Summer	6.219	522	1440 min Summer	4.493	738	2160 min Summer	3.241	1100	2880 min Summer	2.568	1468	4320 min Summer	1.847	2200	5760 min Summer	1.461	2888	7200 min Summer	1.217	3664	8640 min Summer	1.048	4344	10080 min Summer	0.923	5120	15 min Winter	128.285	17	30 min Winter	84.226	31	60 min Winter	52.662	58
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United House	Fairfield Rd,				
North Road, Islington	Havant				
London, N7 9DP	Sk 8				
Date 30/11/2011 11:55	Designed by TL				
File Aquacell SK8 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	100.371	0.371	0.4	2.5	0 K
180 min Winter	100.340	0.340	0.4	2.3	0 K
240 min Winter	100.306	0.306	0.4	2.0	0 K
360 min Winter	100.242	0.242	0.3	1.6	0 K
480 min Winter	100.189	0.189	0.3	1.3	0 K
600 min Winter	100.144	0.144	0.3	1.0	0 K
720 min Winter	100.107	0.107	0.3	0.7	0 K
960 min Winter	100.057	0.057	0.3	0.4	0 K
1440 min Winter	100.039	0.039	0.2	0.3	0 K
2160 min Winter	100.028	0.028	0.2	0.2	0 K
2880 min Winter	100.022	0.022	0.1	0.1	0 K
4320 min Winter	100.016	0.016	0.1	0.1	0 K
5760 min Winter	100.013	0.013	0.1	0.1	0 K
7200 min Winter	100.011	0.011	0.1	0.1	0 K
8640 min Winter	100.009	0.009	0.1	0.1	0 K
10080 min Winter	100.008	0.008	0.0	0.1	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
120 min Winter	31.800	92			
180 min Winter	23.353	130			
240 min Winter	18.644	166			
360 min Winter	13.543	236			
480 min Winter	10.792	300			
600 min Winter	9.043	362			
720 min Winter	7.823	420			
960 min Winter	6.219	520			
1440 min Winter	4.493	736			
2160 min Winter	3.241	1088			
2880 min Winter	2.568	1468			
4320 min Winter	1.847	2164			
5760 min Winter	1.461	2856			
7200 min Winter	1.217	3608			
8640 min Winter	1.048	4344			
10080 min Winter	0.923	5008			
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Banners Gate		Page 3																												
United House North Road, Islington London, N7 9DP	Fairfield Rd, Havant Sk 8																													
Date 30/11/2011 11:55 File Aquacell SK8 - P...	Designed by TL Checked by																													
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<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>20.000</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.400</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+30</td> </tr> </table> <u>Time / Area Diagram</u> Total Area (ha) 0.008 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> </tr> </thead> <tbody> <tr> <td>0-4</td> <td>0.008</td> </tr> </tbody> </table>			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)	20.000	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins)	Area (ha)	0-4	0.008
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United House North Road, Islington London, N7 9DP	Fairfield Rd, Havant Sk 8	
Date 30/11/2011 11:55 File Aquacell SK8 - P...	Designed by TL Checked by	
Micro Drainage		Source Control W.12.6

Model Details

Storage is Online Cover Level (m) 103.000

Cellular Storage Structure

Invert Level (m) 100.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.25920 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.25920

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	7.0	7.0	0.300	7.0	10.2
0.100	7.0	8.1	0.400	7.0	11.2
0.200	7.0	9.1	0.500	7.0	12.3

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Summer</td><td>100.031</td><td>0.031</td><td>0.4</td><td>0.1</td><td>0 K</td></tr><tr><td>600 min Summer</td><td>100.027</td><td>0.027</td><td>0.4</td><td>0.1</td><td>0 K</td></tr><tr><td>720 min Summer</td><td>100.023</td><td>0.023</td><td>0.3</td><td>0.1</td><td>0 K</td></tr><tr><td>960 min Summer</td><td>100.018</td><td>0.018</td><td>0.3</td><td>0.1</td><td>0 K</td></tr><tr><td>1440 min Summer</td><td>100.013</td><td>0.013</td><td>0.2</td><td>0.0</td><td>0 K</td></tr><tr><td>2160 min Summer</td><td>100.010</td><td>0.010</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>2880 min Summer</td><td>100.008</td><td>0.008</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>4320 min Summer</td><td>100.006</td><td>0.006</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>5760 min Summer</td><td>100.005</td><td>0.005</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>7200 min Summer</td><td>100.004</td><td>0.004</td><td>0.1</td><td>0.0</td><td>0 K</td></tr><tr><td>8640 min Summer</td><td>100.003</td><td>0.003</td><td>0.0</td><td>0.0</td><td>0 K</td></tr><tr><td>10080 min Summer</td><td>100.003</td><td>0.003</td><td>0.0</td><td>0.0</td><td>0 K</td></tr><tr><td>15 min Winter</td><td>100.267</td><td>0.267</td><td>1.0</td><td>0.8</td><td>0 K</td></tr><tr><td>30 min Winter</td><td>100.266</td><td>0.266</td><td>1.0</td><td>0.8</td><td>0 K</td></tr><tr><td>60 min Winter</td><td>100.206</td><td>0.206</td><td>0.9</td><td>0.6</td><td>0 K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>128.285</td><td>13</td></tr><tr><td>30 min Summer</td><td>84.226</td><td>21</td></tr><tr><td>60 min Summer</td><td>52.662</td><td>38</td></tr><tr><td>120 min Summer</td><td>31.800</td><td>68</td></tr><tr><td>180 min Summer</td><td>23.353</td><td>98</td></tr><tr><td>240 min Summer</td><td>18.644</td><td>126</td></tr><tr><td>360 min Summer</td><td>13.543</td><td>184</td></tr><tr><td>480 min Summer</td><td>10.792</td><td>246</td></tr><tr><td>600 min Summer</td><td>9.043</td><td>306</td></tr><tr><td>720 min Summer</td><td>7.823</td><td>366</td></tr><tr><td>960 min Summer</td><td>6.219</td><td>490</td></tr><tr><td>1440 min Summer</td><td>4.493</td><td>734</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>1084</td></tr><tr><td>2880 min Summer</td><td>2.568</td><td>1444</td></tr><tr><td>4320 min Summer</td><td>1.847</td><td>2180</td></tr><tr><td>5760 min Summer</td><td>1.461</td><td>2920</td></tr><tr><td>7200 min Summer</td><td>1.217</td><td>3648</td></tr><tr><td>8640 min Summer</td><td>1.048</td><td>4368</td></tr><tr><td>10080 min Summer</td><td>0.923</td><td>5064</td></tr><tr><td>15 min Winter</td><td>128.285</td><td>14</td></tr><tr><td>30 min Winter</td><td>84.226</td><td>23</td></tr><tr><td>60 min Winter</td><td>52.662</td><td>40</td></tr></tbody></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	100.235	0.235	1.0	0.7	0 K	30 min Summer	100.242	0.242	1.0	0.7	0 K	60 min Summer	100.207	0.207	0.9	0.6	0 K	120 min Summer	100.133	0.133	0.8	0.4	0 K	180 min Summer	100.082	0.082	0.7	0.2	0 K	240 min Summer	100.054	0.054	0.7	0.2	0 K	360 min Summer	100.039	0.039	0.5	0.1	0 K	480 min Summer	100.031	0.031	0.4	0.1	0 K	600 min Summer	100.027	0.027	0.4	0.1	0 K	720 min Summer	100.023	0.023	0.3	0.1	0 K	960 min Summer	100.018	0.018	0.3	0.1	0 K	1440 min Summer	100.013	0.013	0.2	0.0	0 K	2160 min Summer	100.010	0.010	0.1	0.0	0 K	2880 min Summer	100.008	0.008	0.1	0.0	0 K	4320 min Summer	100.006	0.006	0.1	0.0	0 K	5760 min Summer	100.005	0.005	0.1	0.0	0 K	7200 min Summer	100.004	0.004	0.1	0.0	0 K	8640 min Summer	100.003	0.003	0.0	0.0	0 K	10080 min Summer	100.003	0.003	0.0	0.0	0 K	15 min Winter	100.267	0.267	1.0	0.8	0 K	30 min Winter	100.266	0.266	1.0	0.8	0 K	60 min Winter	100.206	0.206	0.9	0.6	0 K	Storm Event	Rain (mm/hr)	Time-Peak (mins)	15 min Summer	128.285	13	30 min Summer	84.226	21	60 min Summer	52.662	38	120 min Summer	31.800	68	180 min Summer	23.353	98	240 min Summer	18.644	126	360 min Summer	13.543	184	480 min Summer	10.792	246	600 min Summer	9.043	306	720 min Summer	7.823	366	960 min Summer	6.219	490	1440 min Summer	4.493	734	2160 min Summer	3.241	1084	2880 min Summer	2.568	1444	4320 min Summer	1.847	2180	5760 min Summer	1.461	2920	7200 min Summer	1.217	3648	8640 min Summer	1.048	4368	10080 min Summer	0.923	5064	15 min Winter	128.285	14	30 min Winter	84.226	23	60 min Winter	52.662	40
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Banners Gate			Page 2		
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North Road, Islington	Havant				
London, N7 9DP	SK 9 & SK10				
Date 30/11/2011 11:56	Designed by TL				
File Aquacell SK9 - P...	Checked by				
Micro Drainage	Source Control W.12.6				
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
120 min Winter	100.101	0.101	0.8	0.3	0 K
180 min Winter	100.049	0.049	0.7	0.1	0 K
240 min Winter	100.040	0.040	0.5	0.1	0 K
360 min Winter	100.029	0.029	0.4	0.1	0 K
480 min Winter	100.023	0.023	0.3	0.1	0 K
600 min Winter	100.019	0.019	0.3	0.1	0 K
720 min Winter	100.017	0.017	0.2	0.0	0 K
960 min Winter	100.013	0.013	0.2	0.0	0 K
1440 min Winter	100.010	0.010	0.1	0.0	0 K
2160 min Winter	100.007	0.007	0.1	0.0	0 K
2880 min Winter	100.006	0.006	0.1	0.0	0 K
4320 min Winter	100.004	0.004	0.1	0.0	0 K
5760 min Winter	100.003	0.003	0.0	0.0	0 K
7200 min Winter	100.003	0.003	0.0	0.0	0 K
8640 min Winter	100.003	0.003	0.0	0.0	0 K
10080 min Winter	100.002	0.002	0.0	0.0	0 K
Storm Event	Rain (mm/hr)	Time-Peak (mins)			
120 min Winter	31.800	72			
180 min Winter	23.353	94			
240 min Winter	18.644	124			
360 min Winter	13.543	186			
480 min Winter	10.792	250			
600 min Winter	9.043	308			
720 min Winter	7.823	358			
960 min Winter	6.219	490			
1440 min Winter	4.493	720			
2160 min Winter	3.241	1084			
2880 min Winter	2.568	1512			
4320 min Winter	1.847	2276			
5760 min Winter	1.461	2832			
7200 min Winter	1.217	3656			
8640 min Winter	1.048	4176			
10080 min Winter	0.923	5288			
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Banners Gate		Page 3																														
United House North Road, Islington London, N7 9DP	Fairfield Rd, Havant SK 9 & SK10																															
Date 30/11/2011 11:56 File Aquacell SK9 - P...	Designed by TL Checked by																															
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<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>20.000</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.400</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+30</td> </tr> </table> <u>Time / Area Diagram</u> Total Area (ha) 0.005 <table> <tr> <td>Time</td> <td>Area</td> </tr> <tr> <td>(mins)</td> <td>(ha)</td> </tr> <tr> <td>0-4</td> <td>0.005</td> </tr> </table>			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)	20.000	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time	Area	(mins)	(ha)	0-4	0.005
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Micro Drainage Source Control W.12.6																				
<u>Model Details</u> Storage is Online Cover Level (m) 103.000 <u>Cellular Storage Structure</u> Invert Level (m) 100.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 1.48320 Porosity 0.95 Infiltration Coefficient Side (m/hr) 1.48320 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>3.0</td> <td>3.0</td> <td>0.500</td> <td>3.0</td> <td>6.5</td> </tr> <tr> <td>0.400</td> <td>3.0</td> <td>5.8</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	3.0	3.0	0.500	3.0	6.5	0.400	3.0	5.8			
Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)															
0.000	3.0	3.0	0.500	3.0	6.5															
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APPENDIX H

Topographical Survey

APPENDIX J

Proposed Site Layout

