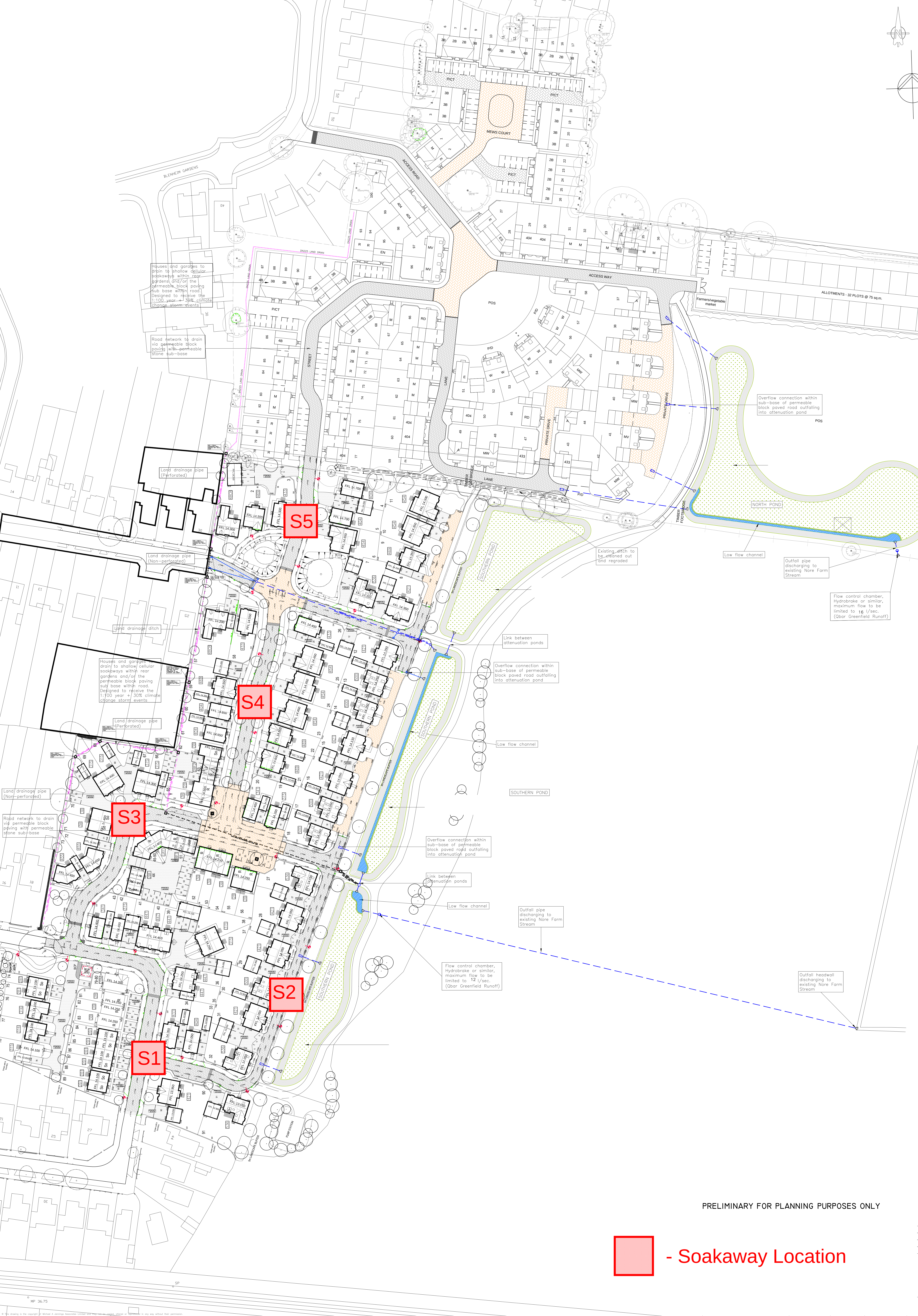
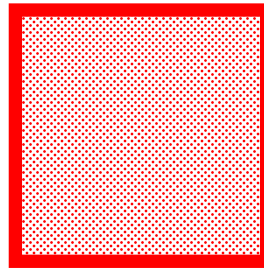


APPENDIX C
INFILTRATION TEST RESULTS – WILSON BAILEY 18.01.13



PRELIMINARY FOR PLANNING PURPOSES ONLY

 - Soakaway Location

Site Manor Farm, Denvilles, Hallett Road, Havant, Hampshire

Job Number
J11002

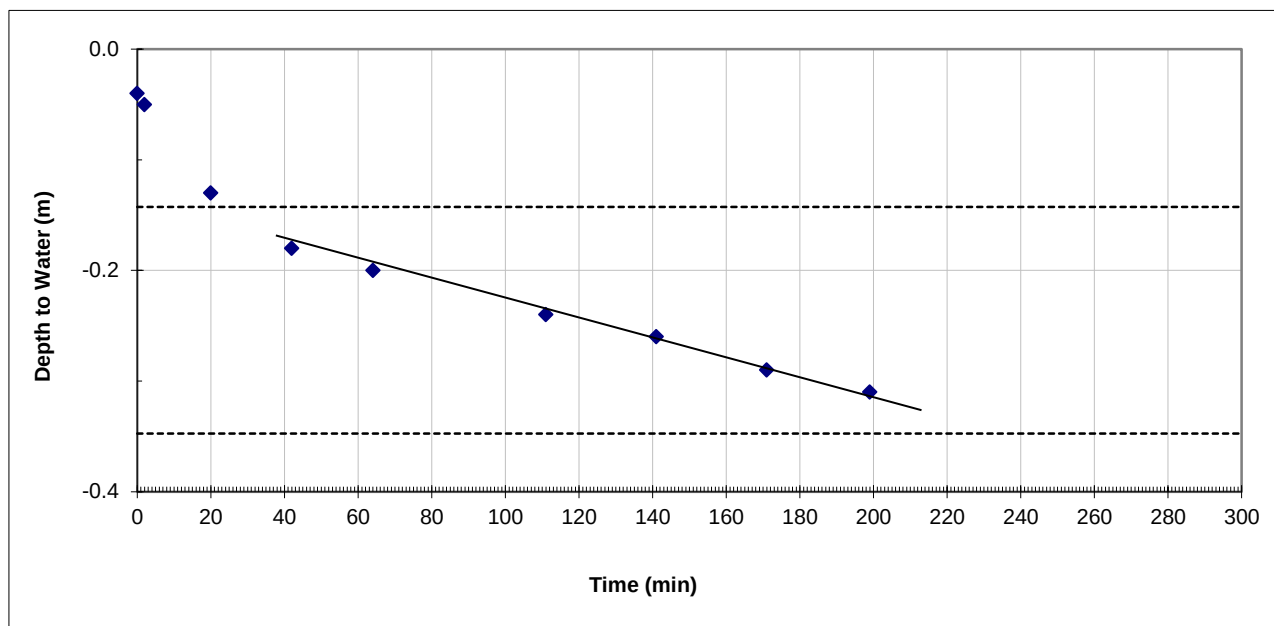
Client BDW Southampton

Sheet
1 / 3

Trial Pit No. S1

Soakage Test No. 1

Pit Length (m) 0.6 Pit Width (m) 0.6 Pit Depth (m) 0.45

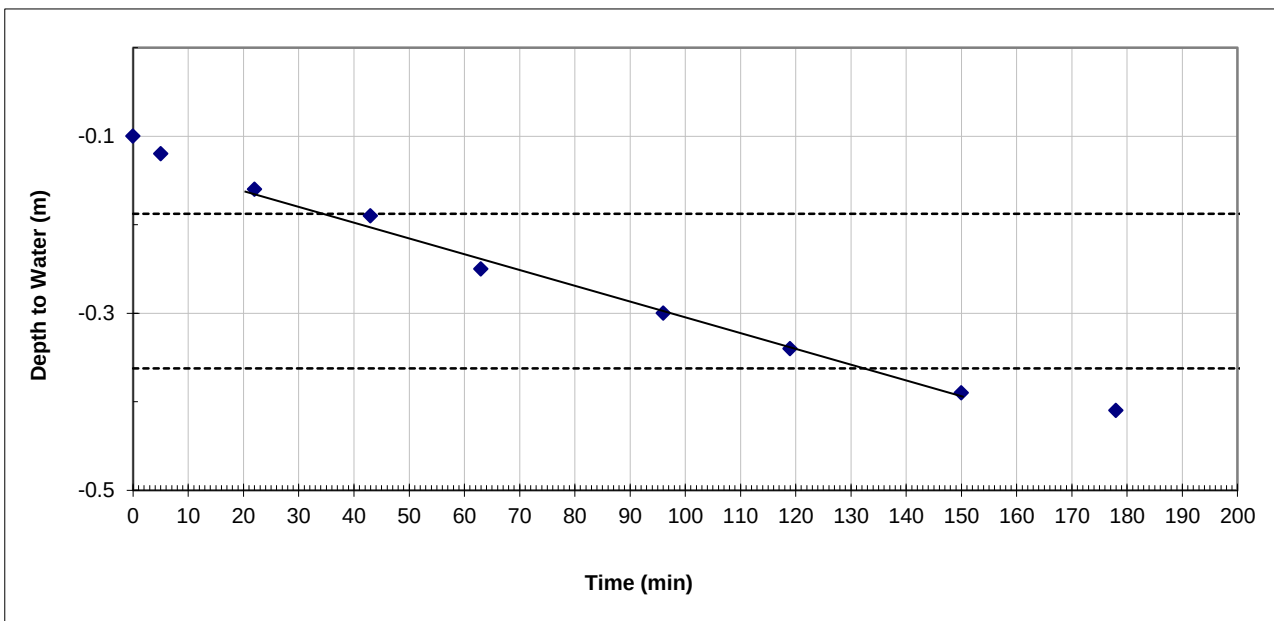


Design Soakage Rate 5.8E-06 m/s (based on linear portion of graph as shown)
0.50 m/day

Trial Pit No. S2

Soakage Test No. 1

Pit Length (m) 0.5 Pit Width (m) 0.5 Pit Depth (m) 0.45



Design Soakage Rate 1.2E-05 m/s (based on linear portion of graph as shown)
1.05 m/day

Site Manor Farm, Denvilles, Hallett Road, Havant, Hampshire

Client BDW Southampton

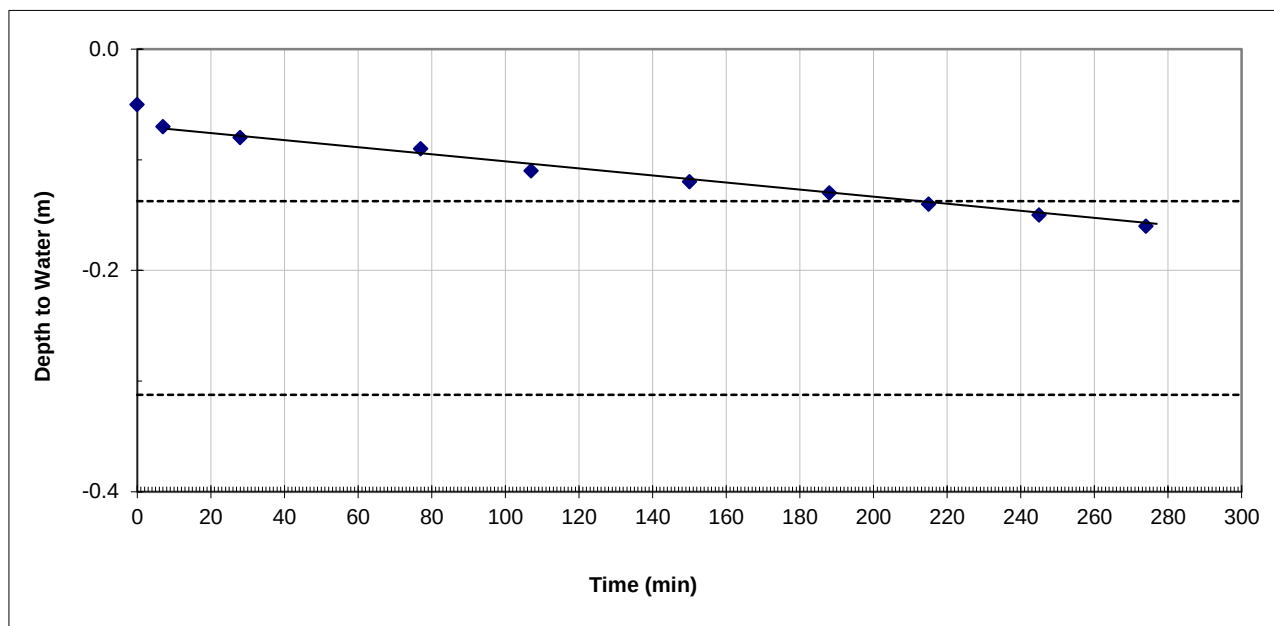
Job Number
J11002

Sheet
2 / 3

Trial Pit No. S3

Soakage Test No. 1

Pit Length (m) 0.6 Pit Width (m) 0.6 Pit Depth (m) 0.4

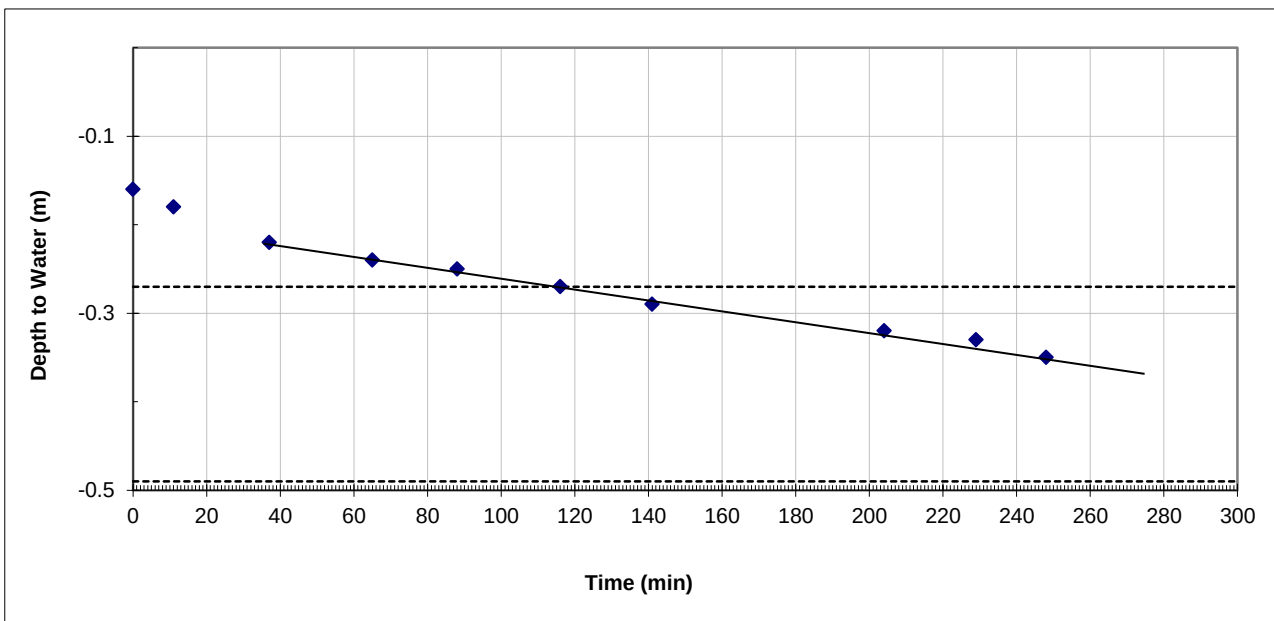


Design Soakage Rate 1.9E-06 m/s (based on linear portion of graph as shown)
0.17 m/day

Trial Pit No. S4

Soakage Test No. 1

Pit Length (m) 0.6 Pit Width (m) 0.6 Pit Depth (m) 0.6



Design Soakage Rate 3.1E-06 m/s (based on linear portion of graph as shown)
0.27 m/day

Site Manor Farm, Denvilles, Hallett Road, Havant, Hampshire

Job Number
J11002

Client BDW Southampton

Sheet
3 / 3

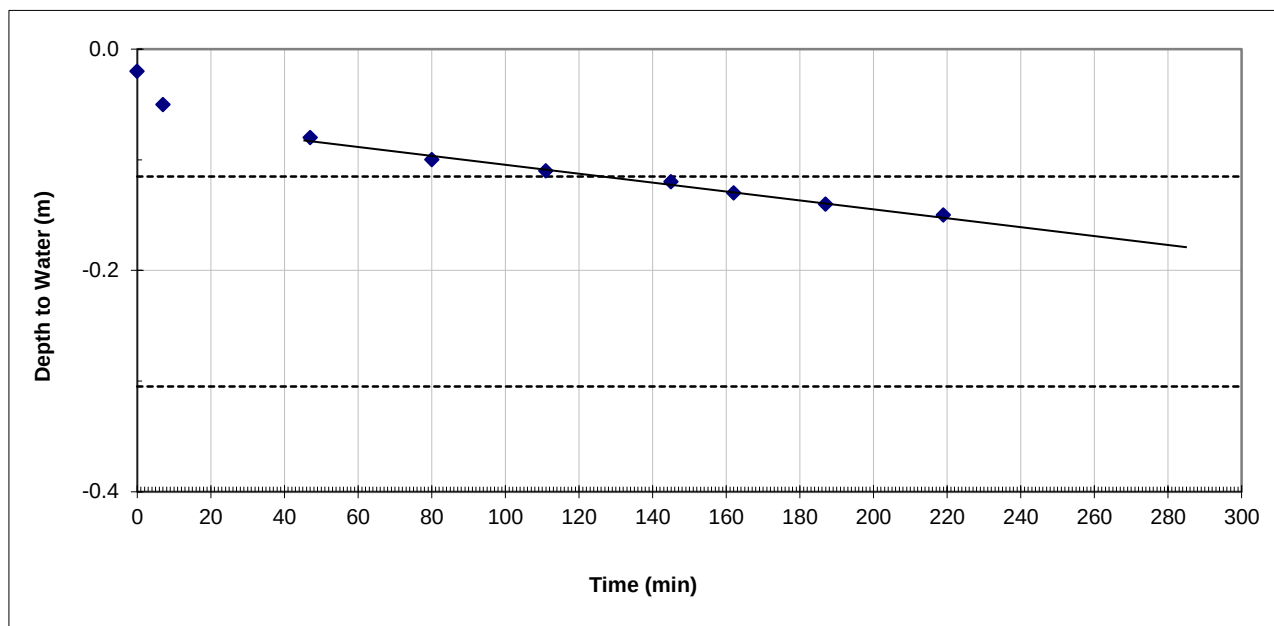
Trial Pit No. S5

Soakage Test No. 1

Pit Length (m) 0.4

Pit Width (m) 0.4

Pit Depth (m) 0.4



Design Soakage Rate

1.8E-06

m/s

(based on linear portion of graph as shown)

0.15

m/day

APPENDIX D
PRE/POST DEVELOPMENT FLOW RATES

Michael A Jennings Associates		Page 1
58-62 Ock Street Abingdon Oxon OX14 5BZ	Manor Farm (3.37ha) Greenfield Runoff Rate	
Date 02.04.13 File	Designed by C.Pendle Checked by	
Micro Drainage Source Control 2013.1		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 1 Soil 0.400 Area (ha) 3.370 Urban 0.000 SAAR (mm) 732 Region Number Region 7 Results 1/s QBAR Rural 12.1 QBAR Urban 12.1 Q1 year 10.3 Q1 year 10.3 Q30 years 27.4 Q100 years 38.5		
©1982-2012 Micro Drainage Ltd		

Michael A Jennings Associates		Page 1																										
58-62 Ock Street Abingdon Oxon OX14 5BZ	Manor Farm (3.37ha) Greenfield Runoff Volume 100year 6hr																											
Date 02.04.13 File	Designed by C.Pendle Checked by																											
Micro Drainage Source Control 2013.1																												
<u>Greenfield Runoff Volume</u> FSR Data <table> <tr> <td>Return Period (years)</td> <td>100</td> </tr> <tr> <td>Storm Duration (mins)</td> <td>360</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.500</td> </tr> <tr> <td>Ratio R</td> <td>0.350</td> </tr> <tr> <td>Areal Reduction Factor</td> <td>1.00</td> </tr> <tr> <td>Area (ha)</td> <td>3.370</td> </tr> <tr> <td>SAAR (mm)</td> <td>732</td> </tr> <tr> <td>CWI</td> <td>109.129</td> </tr> <tr> <td>Urban</td> <td>0.000</td> </tr> <tr> <td>SPR</td> <td>37.000</td> </tr> </table> Results <table> <tr> <td>Percentage Runoff (%)</td> <td>37.25</td> </tr> <tr> <td>Greenfield Runoff Volume (m³)</td> <td>808.962</td> </tr> </table>			Return Period (years)	100	Storm Duration (mins)	360	Region	England and Wales	M5-60 (mm)	19.500	Ratio R	0.350	Areal Reduction Factor	1.00	Area (ha)	3.370	SAAR (mm)	732	CWI	109.129	Urban	0.000	SPR	37.000	Percentage Runoff (%)	37.25	Greenfield Runoff Volume (m³)	808.962
Return Period (years)	100																											
Storm Duration (mins)	360																											
Region	England and Wales																											
M5-60 (mm)	19.500																											
Ratio R	0.350																											
Areal Reduction Factor	1.00																											
Area (ha)	3.370																											
SAAR (mm)	732																											
CWI	109.129																											
Urban	0.000																											
SPR	37.000																											
Percentage Runoff (%)	37.25																											
Greenfield Runoff Volume (m³)	808.962																											
©1982-2012 Micro Drainage Ltd																												

Michael A Jennings Associates		Page 1
58-62 Ock Street Abingdon Oxon OX14 5BZ	Copseys Nursery (4.48ha) Greenfield Runoff Rate	
Date 02.04.13 File	Designed by C.Pendle Checked by	
Micro Drainage		Source Control 2013.1
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 1 Soil 0.400 Area (ha) 4.480 Urban 0.000 SAAR (mm) 732 Region Number Region 7 Results 1/s QBAR Rural 16.1 QBAR Urban 16.1 Q1 year 13.7 Q1 year 13.7 Q30 years 36.4 Q100 years 51.2		
©1982-2012 Micro Drainage Ltd		

Michael A Jennings Associates		Page 1																										
58-62 Ock Street Abingdon Oxon OX14 5BZ	Copseys Nursery (4.48ha) Greenfield Runoff Volume 100y 6hr																											
Date 02.04.13 File	Designed by C.Pendle Checked by																											
Micro Drainage Source Control 2013.1																												
<u>Greenfield Runoff Volume</u> FSR Data <table> <tr> <td>Return Period (years)</td> <td>100</td> </tr> <tr> <td>Storm Duration (mins)</td> <td>360</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.500</td> </tr> <tr> <td>Ratio R</td> <td>0.350</td> </tr> <tr> <td>Areal Reduction Factor</td> <td>1.00</td> </tr> <tr> <td>Area (ha)</td> <td>4.480</td> </tr> <tr> <td>SAAR (mm)</td> <td>732</td> </tr> <tr> <td>CWI</td> <td>109.129</td> </tr> <tr> <td>Urban</td> <td>0.000</td> </tr> <tr> <td>SPR</td> <td>37.000</td> </tr> </table> Results <table> <tr> <td>Percentage Runoff (%)</td> <td>37.25</td> </tr> <tr> <td>Greenfield Runoff Volume (m³)</td> <td>1075.415</td> </tr> </table>			Return Period (years)	100	Storm Duration (mins)	360	Region	England and Wales	M5-60 (mm)	19.500	Ratio R	0.350	Areal Reduction Factor	1.00	Area (ha)	4.480	SAAR (mm)	732	CWI	109.129	Urban	0.000	SPR	37.000	Percentage Runoff (%)	37.25	Greenfield Runoff Volume (m³)	1075.415
Return Period (years)	100																											
Storm Duration (mins)	360																											
Region	England and Wales																											
M5-60 (mm)	19.500																											
Ratio R	0.350																											
Areal Reduction Factor	1.00																											
Area (ha)	4.480																											
SAAR (mm)	732																											
CWI	109.129																											
Urban	0.000																											
SPR	37.000																											
Percentage Runoff (%)	37.25																											
Greenfield Runoff Volume (m³)	1075.415																											
©1982-2012 Micro Drainage Ltd																												



Project

COPSEYS NURSERY
NORTHERN SITE-

Job No.

Date

02-04-13

Page No.

Rev.

Member/Location

Engineer

CP

Checked

POST DEVELOPMENT RUNOFF

RATIONAL METHOD - $Q = 2.78 \cdot C \cdot I \cdot A$

WHERE: C - RUNOFF COEFFICIENT (1.0)
I - RAINFALL INTENSITY ~ TOC (30 mins)
A - IMPERMEABLE AREA (1.81 ha)
Q - PEAK RUNOFF (l/s)

RP	D(min)	AVE I (mm/hr)	+30%
1	30	20.2	26.2
30	30	49.5	64.3
100	30	64.7	84.1
100	360	10.4	13.5

$$1 \text{ YEAR} - Q = 2.78 \times 1 \times 26.2 \times 1.81 = 131 \text{ l/s}$$

$$30 \text{ YEAR} - Q = 2.78 \times 1 \times 64.3 \times 1.81 = 323 \text{ l/s}$$

$$100 \text{ YEAR} - Q = 2.78 \times 1 \times 84.1 \times 1.81 = 423 \text{ l/s}$$

POST DEVELOPMENT VOLUME

100 YEAR OHR EVENT

$$V = (2.78 \times 1 \times 13.5 \times 1.81 \times 0.001) \times 21600$$

$$V = 1467 \text{ m}^3$$

	Project	Job No.	Date	Page No.	Rev.
	MANOR FARM SOUTHERN SITE		02.04.13		
		Member/Location	Engineer	Checked	
			CP		

POST DEVELOPMENT RUNOFF

RATIONAL METHOD - $Q = 2.78 \cdot C \cdot I \cdot A$

WHERE: C - RUNOFF COEFFICIENT (1.0)
 I - RAINFALL INTENSITY ~ TOC (30 mins)
 A - IMPERMEABLE AREA (2.64 ha)
 Q - PEAK RUNOFF (l/s)

RP	D(min)	AVE I (mm/hr)	+30%
1	30	20.2	26.2
30	30	49.5	64.3
100	30	64.7	84.1
100	360	10.4	13.5

$$1 \text{ YEAR} - Q = 2.78 \times 1 \times 26.2 \times 2.64 = 192 \text{ l/s}$$

$$30 \text{ YEAR} - Q = 2.78 \times 1 \times 64.3 \times 2.64 = 472 \text{ l/s}$$

$$100 \text{ YEAR} - Q = 2.78 \times 1 \times 84.1 \times 2.64 = 617 \text{ l/s}$$

POST DEVELOPMENT VOLUME

100 year 6hr EVENT

$$V = (2.78 \times 1 \times 13.5 \times 2.64 \times 0.001) \times 21600$$

$$V = 2140 \text{ m}^3$$

APPENDIX E
GROUNDWATER MONITORING &
BOREHOLE LOCATION PLAN – WILSON BAILEY

24 March 2013

Your ref:
 Planning ref:
 Our ref: J11002/DB/c05

Mr J Jones
 Barratt David Wilson Homes Southampton
 Tollbar House
 Tollbar Way
 Hedge End
 Southampton
 Hampshire
 SO30 2UH

Dear Mr Jones,

RE: DENVILLES FARM SITE, HALLETT ROAD, HAVANT, HAMPSHIRE

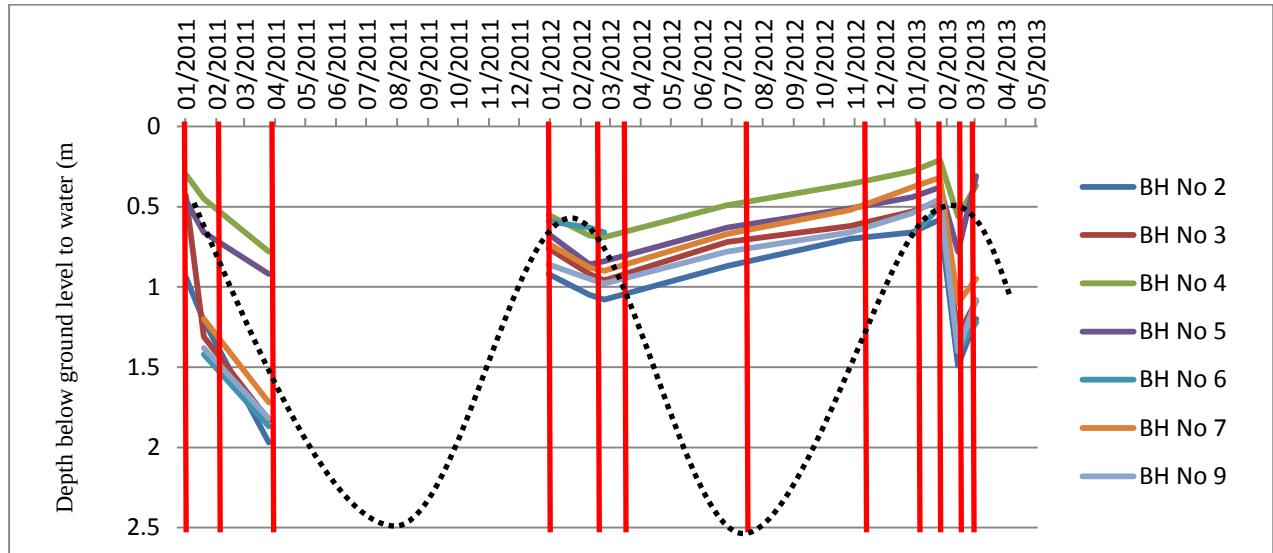
UPDATE ON GROUNDWATER LEVEL MONITORING CARRIED OUT TO DATE

Further to our meeting with the EA and Havant BC we returned to site to carry out an additional water monitoring visit and have rechecked our previously issued results; we are not able to find any error in our monitoring resulted dated 4 March 2013.

The updated results of the monitoring to date are detailed in the table below and indicated as depth below ground level in metres, together with a plot showing the data trends.

Date	BH No 2 (14.00 mOD)	BH No 3 (14.05 mOD)	BH No 4 (13.50 mOD)	BH No 5 (13.60 mOD)	BH No 6 (14.10 mOD)	BH No 7 (14.20 mOD)	BH No 9 (14.10 mOD)
21/01/2011	0.94	0.43	0.30	0.46	--	--	--
08/02/2011	1.21	1.31	0.45	0.66	1.42	1.20	1.38
14/04/2011	1.97	1.83	0.78	0.92	1.87	1.72	1.82
19/01/2012	0.92	0.76	0.55	0.67	0.59	0.73	0.86
29/02/2012	1.05	0.92	0.68	0.86	0.63	0.88	0.95
15/03/2012	1.08	0.96	0.69	0.84	0.66	0.90	0.98
16/07/2012	0.87	0.72	0.49	0.63	--	0.67	0.78
16/11/2012	0.70	0.62	0.36	0.51	--	0.52	0.66
17/01/2013	0.66	0.53	0.28	0.44	0.68	0.38	0.54
14/02/2013	0.58	0.46	0.21	0.38	0.50	0.32	0.45
04/03/2013	1.49	1.30	0.56	0.78	1.40	1.10	1.40
22/03/2013	1.20	1.09	0.37	0.31	1.22	0.95	1.08

Fig 1: Plot showing depth to ground water below ground level from Jan 2011 to March 2013.
(Red lines indicate actual timing of each monitoring visit, black dashed line indicates a typical seasonal variation)



From the above plot it is apparent that there is a general rising trend of groundwater during 2012, which is consistent with the unusually consistent heavy rainfall experienced throughout the year.

The summer rainfall has prevented the summer trough in water levels from occurring during 2012, although the peak levels during the winter of 2012 to 2013 are not shown to be significantly higher than those measured on site during previous winters. This considered to be due to the ability of the existing surface water drainage network to adequately drain the site, albeit causing surface water drainage issues further down-stream.

These results would therefore support the view that even during sustained periods of heavy rainfall the site does not become flooded.

New surface water attenuation features that are to be constructed as part of the revised surface water management scheme for the proposed development. These attenuation features would be expected to alleviate the off-site down-stream surface water management issues that have been highlighted by the Environment Agency.

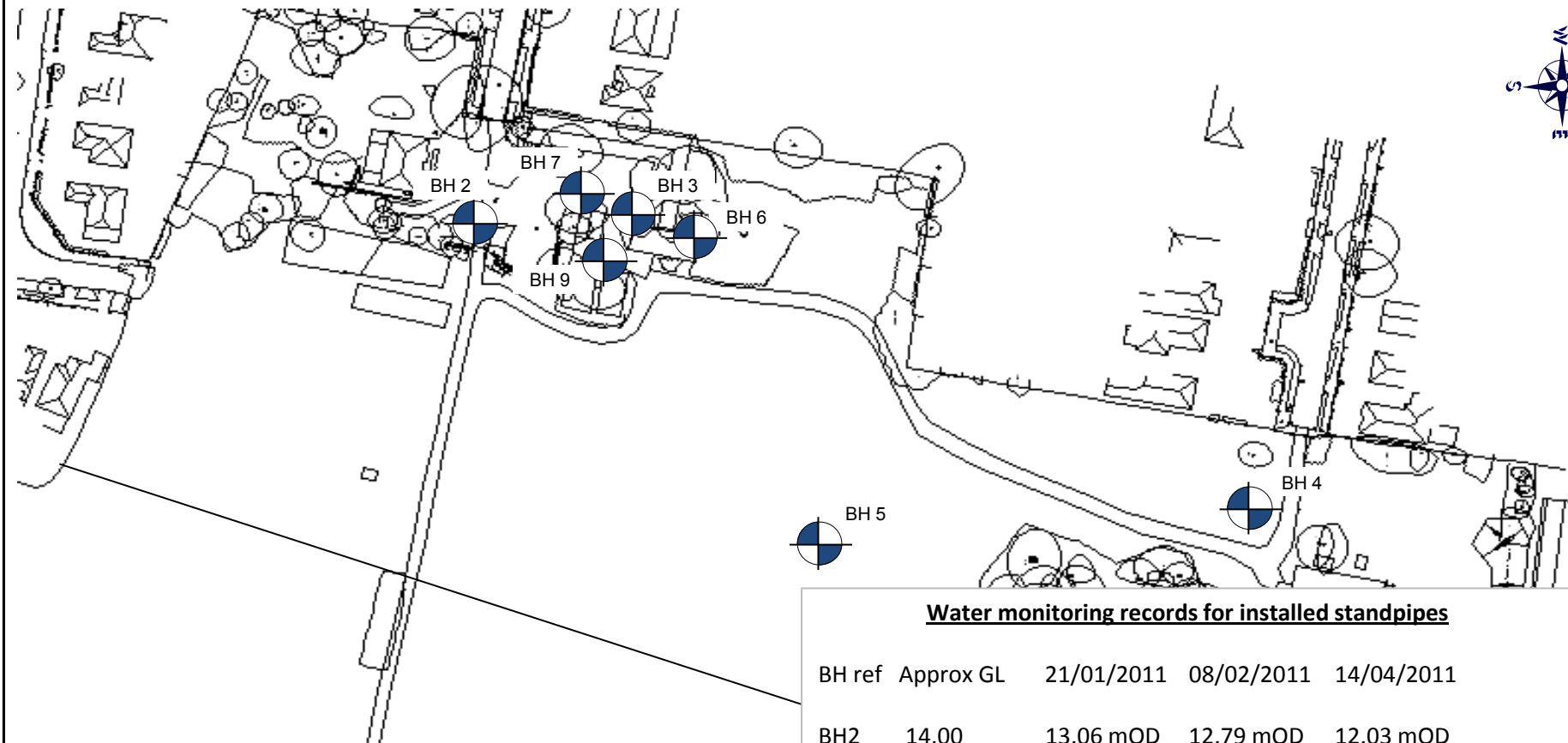
We trust that this letter provides a useful update to the existing monitoring data.

Yours sincerely
Wilson Bailey Partnership

Dominic Brightman
BSc MSc DIC FGS CGeol ARSM

Site Manor Farm, Denvilles

Client BDW Southampton



Water monitoring records for installed standpipes

BH ref	Approx GL	21/01/2011	08/02/2011	14/04/2011
BH2	14.00	13.06 mOD	12.79 mOD	12.03 mOD
BH3	14.05	13.62 mOD	12.74 mOD	12.22 mOD
BH4	13.50	13.20 mOD	13.05 mOD	12.72 mOD
BH5	13.60	13.14 mOD	12.94 mOD	12.68 mOD
BH6	14.10	--	12.68 mOD	12.23 mOD
BH7	14.20	--	13.00 mOD	12.48 mOD
BH9	14.10	--	12.72 mOD	12.28 mOD

Approximate Scale in metres

APPENDIX F
SUDS MANAGEMENT & MAINTENANCE PLAN

**PROPOSED RESIDENTIAL DEVELOPMENT
AT**

**MANOR FARM
DENVILLES
HAVANT
HAMPSHIRE**

**SUDS MANAGEMENT
&
MAINTENANCE PLAN**

MJA Consulting
58-62 Ock Street
Abingdon
Oxon
OX14 5BZ

Tel: 01235 555173
Fax: 01235 523226
www.mjaconsulting.co.uk

Client:
Barratts (Southampton)



DOCUMENT CONTROL RECORD

Document Issue:

Rev	Issue Status	Prepared by	Checked by
A	Draft for comment	C.Pendle	A.McShane

1 Introduction

- 1.1 This document sets out the principles for the long term management and maintenance of the surface water Sustainable Urban Drainage Systems (SuDS) within the proposed development.
- 1.2 This management and maintenance plan has been put together using the latest technical SuDS guidance within the CIRIA Report C697 The SuDS Manual and other relevant guides.
- 1.3 The document is laid out in specific sections pertinent to SuDS type detailing:
- A description of the SuDS component and its use
 - Maintenance requirements and frequencies
 - Inspection requirements and frequencies
- 1.4 The activities listed are generic to SuDS types and represent the minimum maintenance and inspection requirements, however additional tasks or varied maintenance frequency may be instructed by the maintenance company for specific sites as required.

This may include:

- Measurement and recording of sediment levels
- Photographic recording of problem areas
- Increased frequency of litter removal in areas identified as litter hotspots
- Adjusted timescales of maintenance activities to minimise impact on wildlife (e.g. great crested newts, birds, voles, etc)
- The use of manual methods of maintenance to limit impact on wildlife habitat (e.g. management of emergent vegetation in ponds)

2 SuDS Layout & Design

- 2.1 The housing development sustainable urban drainage systems (SuDS) consists of cellular soakaways, permeable paved road / parking areas and infiltration / attenuation basins.
- 2.2 All SuDS structures are designed to accommodate 1 in 100year +30% climate change storm events

The surface water drainage strategy for the site will follow the principals as outlined below:

2.3 Residential Areas - Cellular Soakaways

Roof drainage will drain via traditional rainwater down pipes discharging to shallow cellular crate soakaways (rear of properties) or sub base of permeable block paving (front of properties).

Where feasible, high level overflows will connect the soakaways to the permeable block paving sub-base.

A catch pit manhole is to be installed upstream of soakaway unit to capture any silt any debris.

2.4 Driveways and Parking Courts - Permeable Block Paving with permeable sub-base

Parking courts will be constructed using a mixture of permeable block paving in the parking bays and tarmac surfacing on the running areas. Runoff from both areas will drain through the block paving to the permeable sub base below.

As runoff percolates through the structure, pollutants and contaminates are filtered out by the bedding layer providing an improvement in water quality.

2.5 Residential Access Road - Permeable Block Paving with permeable sub-base

The adoptable roads will drain via a permeable surface of either permeable block paving or permeable macadam. The sub base for both will be designed to attenuate the 1:100 year + 30% climate change event.

An overflow system consisting of collector cells located within the permeable paving sub-base will collect excess runoff discharging into an infiltration /attenuation ponds.

2.6 Attenuation Ponds

The two attenuation ponds are designed to collect excess runoff from the permeable paved road systems.

These ponds are to be unlined to allow for additional infiltration.

The outflow from the ponds will discharge into the existing Nore Farm stream at a maximum controlled rate of 28l /s (Greenfield Runoff rate QBar) via a flow control structure.

The control structure will be a brick built or precast concrete manhole ring control chamber containing a hydraulic vortex flow control device, i.e Hydrobrake or similar.

3 SUDs Management & Maintenance

3.1 Cellular Soakaways

- 3.1.1 The catch pit manhole upstream of the soakaway unit can be inspected and accessed for removal of silt/debris build up, as and when required.
The responsibility of inspecting the catch pit and identifying any soakaway areas that are not operating properly lies with the property owner.
Where a soakaway serves more than one property and catch pits are accessible, maintenance and repair responsibility lies with the management company.
Where a soakaway serves an individual property, maintenance and repair responsibility lies with the individual property owner.

3.2 Permeable Block Paving

- 3.2.1 To ensure the performance of the permeable paving, it is recommended that the following maintenance should be carried out as outlined below:
- 3.2.2 The maintenance of the pavement is to ensure the infiltration of the paving is not compromised. The following guidelines are offered as an initial regime, but maybe either increased or decreased depending on pavings local environment and any external contributing factors.
1. A visual inspection of the paving may be carried out on a regular basis.
This will confirm the effectiveness of the agitation maintenance due to variations between sites and allow any refinement of the regular agitation activity if necessary.
 2. The paving should be agitated (e.g. brushed, vacuumed, etc.) at least twice a year. This is to ensure no vegetation of any sort is allowed to grow and develop in the joints. Ideally, this activity should be carried out in the spring and autumn seasons.
 3. The paving should be inspected after any heavy precipitation to ensure no displacement of any organic matter onto the surface of the pavement.
 4. For winter maintenance, the controlled use of de-icing may be used without causing significant detrimental effects towards the permeable pavements performance. When used carefully, the use of these chlorides will not result in an increase in the chloride levels in the local ground.
 5. Where non-infiltration systems have been employed, the inspection of the outfalls should be undertaken initially on a twice-yearly basis.
 6. Weed growth – when sedimentation occurs in areas of permeable paving then there is the potential for weed growth, this will typically occur where there are overhanging trees or soft landscaping slopes down on to the paving or in areas which do not receive over run from vehicles particularly frequently. Weeds can be removed from the surface through the application of weed killers containing Glyphosate are the most suitable.

- 3.2.3 Glyphosate based weed killers are the most common for general-purpose use, they are most effective on grasses and perennial weeds with non-woody stems. Weeds should be sprayed when they are actively growing so that the Glyphosate will go down to the root and kill the weed completely.
- 3.2.4 Glyphosate will be neutralized upon contact with the ground, which makes it safe to plant in the area soon after treatment. It is available ready mixed or as a concentrate. With the ready mix you will be paying a lot for the water that it is diluted with, but if you only have a small plot or if you don't have a safe chemical storage cupboard, then ready mix is the best option.
- Depending on the amount of usage and the environment the permeable pavement has received and been exposed to, the laying course material may require either cleaning after a 25 to 30 year period. This would be evident if the infiltration rate of the paving became prolonged, allowing ponding to develop. Should this occur, the uplifting and cleaning (or replacing, depending on the costings of the activity,) of the laying course may be considered. The laying course material, jointing and blocks may be reused, minimising costs.

3.3 Attenuation / Infiltration Pond

- 3.3.1 The attenuation / infiltration pond is designed as a mainly dry feature except during and immediately after storm events.
- 3.3.2 The basin will be grass seeded and will have side slope of 1:4 - 1:3.
- 3.3.3 Flows to and from the attenuation basin will be via a headwall.

MAINTENANCE REQUIREMENTS:

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Litter and debris removal.	Litter & debris to be removed prior to any grass cutting activity to minimise risk of shredding litter. Particular attention should be paid to inlet/outlet chamber, pipes and grilles (if in place).	Monthly.
	Grass cutting: landscaped areas, spillways & access routes.	Maintain to amenity grass specification. All cuttings to be removed from SUDS component.	Monthly (during growing season) or as required.
	Grass cutting: base & side slopes.	Manage meadow grass specification. All cuttings to be removed from SUDS component.	Half yearly (Spring before nesting season, and Autumn).
	Manage other vegetation and remove nuisance plants.	Weeding should be conducted by hand or use non-toxic and Biodegradable weedkiller. Invasive species should be removed in accordance with best practice.	Monthly (at implementation) then as required.
Infrequent Maintenance	Re-seed areas of poor vegetation growth. Prune & trim trees/shrubs and remove cuttings.		As required.
	Remove sediment from inlets, outlets, and control structures		Annually or as required.
Corrective Maintenance	Repair erosion or other damage by re-turfing or re-seeding.		As required.
	Remove sediment from base of structures.		As required.
	Re-level uneven surfaces and reinstate design levels.		As required.
	Repair / rehabilitation of inlets, outlets and overflows.		As required.

INSPECTION & FREQUENCY:

Inspection Activity	Comments	Frequency
Inspect inlets and outlets for blockages.		Monthly.
Inspect banksides, structures, pipework etc for evidence of physical damage.		Monthly.
Check control devices within chambers.	Includes cracking of seals on penstocks, testing Hydro-Brake by-pass door.	Half yearly.
Safety signage and safety equipment inspection.	Basins designed as dual purpose areas should have permanent safety signs in place. Where applicable safety equipment should be inspected to ensure it available and in good repair.	Monthly.

APPENDIX G
ATTENUATION PONDS CALCULATIONS



Project

ATTENUATION
PONDS

Job No.

Date

02-04-13

Page No.

Rev.

Member/Location

Engineer

CP

Checked

NORTHERN POND (16 1/5)

YEAR	MAX Q (1/s)	MAX Depth (mm)
2	6.8	138
10	9.4	189
30	11.4	233
100	13.8	295
100+30%	16	382

SOUTHERN POND (12 1/5)

YEAR	MAX Q (1/s)	MAX Depth (mm)
2	8.5	189
10	9.1	262
30	9.4	327
100	10.6	414
100+30%	12	533



Project

ATTENUATION
PONDS

Job No.

Date

02 04 13

Page No.

Rev.

Member/Location

Engineer

CP

Checked

NORTHERN POND

IMP A = 1.81 ha

MAX Q = 16 l/s

MAX V REQUIRED = 1112 m³

MAX WL = 0.382 m

VOLUME

BASE	-	0 m ³
+ 100 mm	-	277 m ³
200 mm	-	556 m ³
300 mm	-	856 m ³
400 mm	-	1169 m ³
500 mm	-	1495 m ³
600 mm	-	1838 m ³
700 mm	-	2194 m ³

SOUTHERN POND

IMP A = 2.64 ha

MAX Q = 12 l/s

MAX V REQUIRED = 1916 m³

MAX WL = 0.533 m

VOLUME

BASE	-	0 m ³
+ 100 mm	-	307 m ³
200 mm	-	639 m ³
300 mm	-	994 m ³
400 mm	-	1374 m ³
500 mm	-	1778 m ³
600 mm	-	2207 m ³
700 mm	-	2661 m ³

Michael A Jennings Associates				Page 1	
58-62 Ock Street Abingdon Oxon OX14 5BZ		Northern Attenuation Pond 1:2 year Max Discharge =16 l/s			
Date 19.03.13 File Northern Attenuation Pond - ...		Designed by C.Pendle Checked by			
Micro Drainage		Source Control 2013.1			
Summary of Results for 2 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	99.346	0.046	2.0	124.3	O K
30 min Summer	99.361	0.061	2.7	163.3	O K
60 min Summer	99.376	0.076	3.5	205.5	O K
120 min Summer	99.392	0.092	4.4	249.8	O K
180 min Summer	99.401	0.101	4.9	275.2	O K
240 min Summer	99.407	0.107	5.2	291.9	O K
360 min Summer	99.414	0.114	5.5	310.1	O K
480 min Summer	99.417	0.117	5.7	320.1	O K
600 min Summer	99.420	0.120	5.9	327.9	O K
720 min Summer	99.422	0.122	6.0	333.9	O K
960 min Summer	99.425	0.125	6.1	342.2	O K
1440 min Summer	99.428	0.128	6.3	348.6	O K
2160 min Summer	99.427	0.127	6.2	346.1	O K
2880 min Summer	99.424	0.124	6.1	338.0	O K
4320 min Summer	99.417	0.117	5.7	317.6	O K
5760 min Summer	99.409	0.109	5.3	297.9	O K
7200 min Summer	99.403	0.103	5.0	280.3	O K
8640 min Summer	99.398	0.098	4.7	264.6	O K
10080 min Summer	99.393	0.093	4.4	250.9	O K
15 min Winter	99.352	0.052	2.2	139.2	O K
30 min Winter	99.368	0.068	3.1	182.9	O K
60 min Winter	99.385	0.085	4.0	230.3	O K
120 min Winter	99.403	0.103	5.0	280.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	37.154	0.0	87.9	30	
30 min Summer	24.581	0.0	119.1	44	
60 min Summer	15.691	0.0	192.3	72	
120 min Summer	9.821	0.0	242.3	130	
180 min Summer	7.430	0.0	275.6	186	
240 min Summer	6.089	0.0	301.4	244	
360 min Summer	4.578	0.0	339.9	360	
480 min Summer	3.735	0.0	369.1	414	
600 min Summer	3.190	0.0	393.0	474	
720 min Summer	2.803	0.0	413.0	534	
960 min Summer	2.286	0.0	445.4	666	
1440 min Summer	1.716	0.0	489.5	940	
2160 min Summer	1.287	0.0	615.3	1348	
2880 min Summer	1.049	0.0	665.2	1744	
4320 min Summer	0.787	0.0	731.9	2516	
5760 min Summer	0.642	0.0	833.6	3288	
7200 min Summer	0.548	0.0	888.0	4040	
8640 min Summer	0.481	0.0	931.5	4760	
10080 min Summer	0.431	0.0	964.1	5544	
15 min Winter	37.154	0.0	99.5	30	
30 min Winter	24.581	0.0	134.6	43	
60 min Winter	15.691	0.0	216.3	72	
120 min Winter	9.821	0.0	272.5	128	
©1982-2012 Micro Drainage Ltd					

Michael A Jennings Associates			Page 2		
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:2 year Max Discharge =16 l/s				
Date 19.03.13 File Northern Attenuation Pond - ...	Designed by C.Pendle Checked by				
Micro Drainage		Source Control 2013.1			
Summary of Results for 2 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	99.413	0.113	5.5	309.0	O K
240 min Winter	99.420	0.120	5.9	328.1	O K
360 min Winter	99.428	0.128	6.3	349.5	O K
480 min Winter	99.431	0.131	6.5	359.8	O K
600 min Winter	99.434	0.134	6.6	366.9	O K
720 min Winter	99.436	0.136	6.7	372.7	O K
960 min Winter	99.438	0.138	6.8	378.7	O K
1440 min Winter	99.438	0.138	6.8	378.5	O K
2160 min Winter	99.434	0.134	6.6	365.9	O K
2880 min Winter	99.428	0.128	6.3	349.1	O K
4320 min Winter	99.416	0.116	5.6	316.0	O K
5760 min Winter	99.406	0.106	5.1	287.7	O K
7200 min Winter	99.397	0.097	4.6	264.4	O K
8640 min Winter	99.390	0.090	4.3	244.6	O K
10080 min Winter	99.384	0.084	3.9	228.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
180 min Winter	7.430	0.0	309.9	184	
240 min Winter	6.089	0.0	338.9	240	
360 min Winter	4.578	0.0	382.1	350	
480 min Winter	3.735	0.0	414.9	452	
600 min Winter	3.190	0.0	441.7	484	
720 min Winter	2.803	0.0	464.2	558	
960 min Winter	2.286	0.0	500.6	712	
1440 min Winter	1.716	0.0	550.3	1010	
2160 min Winter	1.287	0.0	690.0	1440	
2880 min Winter	1.049	0.0	746.0	1852	
4320 min Winter	0.787	0.0	821.3	2648	
5760 min Winter	0.642	0.0	933.9	3416	
7200 min Winter	0.548	0.0	995.0	4184	
8640 min Winter	0.481	0.0	1044.0	4936	
10080 min Winter	0.431	0.0	1081.5	5664	
©1982-2012 Micro Drainage Ltd					

Michael A Jennings Associates		Page 3
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:2 year Max Discharge =16 l/s	
Date 19.03.13 File Northern Attenuation Pond - ...	Designed by C.Pendle Checked by	
Micro Drainage Source Control 2013.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.810

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.500	4 8	0.500	8 12	0.500	12 16	0.310

©1982-2012 Micro Drainage Ltd

Michael A Jennings Associates		Page 4
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:2 year Max Discharge =16 l/s	
Date 19.03.13 File Northern Attenuation Pond - ...	Designed by C.Pendle Checked by	
Micro Drainage Source Control 2013.1		

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.300

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2646.0	0.700	3632.0	1.400	0.0	2.100	0.0
0.100	2784.0	0.701	0.0	1.500	0.0	2.200	0.0
0.200	2923.0	0.900	0.0	1.600	0.0	2.300	0.0
0.300	3063.0	1.000	0.0	1.700	0.0	2.400	0.0
0.400	3204.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	3346.0	1.200	0.0	1.900	0.0		
0.600	3488.0	1.300	0.0	2.000	0.0		

Hydro-Brake® Outflow Control

Design Head (m) 0.380 Hydro-Brake® Type Md8 Invert Level (m) 99.300
Design Flow (l/s) 16.0 Diameter (mm) 200

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.8	1.200	27.0	3.000	42.4	7.000	64.8
0.200	9.9	1.400	29.0	3.500	45.8	7.500	67.1
0.300	14.0	1.600	31.0	4.000	49.0	8.000	69.3
0.400	16.4	1.800	32.9	4.500	52.0	8.500	71.4
0.500	18.1	2.000	34.6	5.000	54.8	9.000	73.5
0.600	19.7	2.200	36.3	5.500	57.4	9.500	75.5
0.800	22.3	2.400	37.9	6.000	60.0		
1.000	24.7	2.600	39.5	6.500	62.4		

©1982-2012 Micro Drainage Ltd

Michael A Jennings Associates				Page 1																																																																																																																																																																																																																																																																										
58-62 Ock Street Abingdon Oxon OX14 5BZ		Northern Attenuation Pond 1:10 year Max Discharge =16 l/s																																																																																																																																																																																																																																																																												
Date 19.03.13 File Northern Attenuation Pond - ...		Designed by C.Pendle Checked by																																																																																																																																																																																																																																																																												
Micro Drainage		Source Control 2013.1																																																																																																																																																																																																																																																																												
Summary of Results for 10 year Return Period <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>99.369</td><td>0.069</td><td>3.1</td><td>185.9</td><td>O K</td></tr><tr><td>30 min Summer</td><td>99.390</td><td>0.090</td><td>4.2</td><td>243.5</td><td>O K</td></tr><tr><td>60 min Summer</td><td>99.412</td><td>0.112</td><td>5.4</td><td>304.3</td><td>O K</td></tr><tr><td>120 min Summer</td><td>99.434</td><td>0.134</td><td>6.6</td><td>365.5</td><td>O K</td></tr><tr><td>180 min Summer</td><td>99.445</td><td>0.145</td><td>7.2</td><td>398.5</td><td>O K</td></tr><tr><td>240 min Summer</td><td>99.452</td><td>0.152</td><td>7.6</td><td>418.7</td><td>O K</td></tr><tr><td>360 min Summer</td><td>99.460</td><td>0.160</td><td>7.9</td><td>440.5</td><td>O K</td></tr><tr><td>480 min Summer</td><td>99.464</td><td>0.164</td><td>8.2</td><td>451.7</td><td>O K</td></tr><tr><td>600 min Summer</td><td>99.467</td><td>0.167</td><td>8.3</td><td>460.1</td><td>O K</td></tr><tr><td>720 min Summer</td><td>99.469</td><td>0.169</td><td>8.4</td><td>466.4</td><td>O K</td></tr><tr><td>960 min Summer</td><td>99.471</td><td>0.171</td><td>8.5</td><td>474.0</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>99.472</td><td>0.172</td><td>8.6</td><td>476.9</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>99.469</td><td>0.169</td><td>8.4</td><td>467.2</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>99.464</td><td>0.164</td><td>8.2</td><td>451.4</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>99.452</td><td>0.152</td><td>7.5</td><td>417.5</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>99.441</td><td>0.141</td><td>7.0</td><td>386.7</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>99.432</td><td>0.132</td><td>6.5</td><td>360.4</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>99.424</td><td>0.124</td><td>6.1</td><td>338.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>99.417</td><td>0.117</td><td>5.7</td><td>318.8</td><td>O K</td></tr><tr><td>15 min Winter</td><td>99.377</td><td>0.077</td><td>3.6</td><td>208.2</td><td>O K</td></tr><tr><td>30 min Winter</td><td>99.400</td><td>0.100</td><td>4.8</td><td>272.8</td><td>O K</td></tr><tr><td>60 min Winter</td><td>99.425</td><td>0.125</td><td>6.1</td><td>341.0</td><td>O K</td></tr><tr><td>120 min Winter</td><td>99.449</td><td>0.149</td><td>7.4</td><td>410.1</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>55.614</td><td>0.0</td><td>136.4</td><td>30</td></tr><tr><td>30 min Summer</td><td>36.694</td><td>0.0</td><td>183.6</td><td>44</td></tr><tr><td>60 min Summer</td><td>23.276</td><td>0.0</td><td>289.4</td><td>72</td></tr><tr><td>120 min Summer</td><td>14.404</td><td>0.0</td><td>360.0</td><td>130</td></tr><tr><td>180 min Summer</td><td>10.791</td><td>0.0</td><td>405.1</td><td>186</td></tr><tr><td>240 min Summer</td><td>8.764</td><td>0.0</td><td>438.8</td><td>244</td></tr><tr><td>360 min Summer</td><td>6.528</td><td>0.0</td><td>489.8</td><td>360</td></tr><tr><td>480 min Summer</td><td>5.292</td><td>0.0</td><td>528.3</td><td>414</td></tr><tr><td>600 min Summer</td><td>4.495</td><td>0.0</td><td>559.3</td><td>474</td></tr><tr><td>720 min Summer</td><td>3.932</td><td>0.0</td><td>585.1</td><td>534</td></tr><tr><td>960 min Summer</td><td>3.183</td><td>0.0</td><td>626.1</td><td>668</td></tr><tr><td>1440 min Summer</td><td>2.361</td><td>0.0</td><td>680.1</td><td>940</td></tr><tr><td>2160 min Summer</td><td>1.750</td><td>0.0</td><td>839.4</td><td>1348</td></tr><tr><td>2880 min Summer</td><td>1.414</td><td>0.0</td><td>899.9</td><td>1744</td></tr><tr><td>4320 min Summer</td><td>1.047</td><td>0.0</td><td>978.4</td><td>2520</td></tr><tr><td>5760 min Summer</td><td>0.846</td><td>0.0</td><td>1098.5</td><td>3288</td></tr><tr><td>7200 min Summer</td><td>0.716</td><td>0.0</td><td>1161.2</td><td>4040</td></tr><tr><td>8640 min Summer</td><td>0.626</td><td>0.0</td><td>1212.6</td><td>4760</td></tr><tr><td>10080 min Summer</td><td>0.558</td><td>0.0</td><td>1250.6</td><td>5544</td></tr><tr><td>15 min Winter</td><td>55.614</td><td>0.0</td><td>154.2</td><td>30</td></tr><tr><td>30 min Winter</td><td>36.694</td><td>0.0</td><td>207.3</td><td>43</td></tr><tr><td>60 min Winter</td><td>23.276</td><td>0.0</td><td>325.3</td><td>72</td></tr><tr><td>120 min Winter</td><td>14.404</td><td>0.0</td><td>404.5</td><td>126</td></tr></tbody></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	99.369	0.069	3.1	185.9	O K	30 min Summer	99.390	0.090	4.2	243.5	O K	60 min Summer	99.412	0.112	5.4	304.3	O K	120 min Summer	99.434	0.134	6.6	365.5	O K	180 min Summer	99.445	0.145	7.2	398.5	O K	240 min Summer	99.452	0.152	7.6	418.7	O K	360 min Summer	99.460	0.160	7.9	440.5	O K	480 min Summer	99.464	0.164	8.2	451.7	O K	600 min Summer	99.467	0.167	8.3	460.1	O K	720 min Summer	99.469	0.169	8.4	466.4	O K	960 min Summer	99.471	0.171	8.5	474.0	O K	1440 min Summer	99.472	0.172	8.6	476.9	O K	2160 min Summer	99.469	0.169	8.4	467.2	O K	2880 min Summer	99.464	0.164	8.2	451.4	O K	4320 min Summer	99.452	0.152	7.5	417.5	O K	5760 min Summer	99.441	0.141	7.0	386.7	O K	7200 min Summer	99.432	0.132	6.5	360.4	O K	8640 min Summer	99.424	0.124	6.1	338.0	O K	10080 min Summer	99.417	0.117	5.7	318.8	O K	15 min Winter	99.377	0.077	3.6	208.2	O K	30 min Winter	99.400	0.100	4.8	272.8	O K	60 min Winter	99.425	0.125	6.1	341.0	O K	120 min Winter	99.449	0.149	7.4	410.1	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	55.614	0.0	136.4	30	30 min Summer	36.694	0.0	183.6	44	60 min Summer	23.276	0.0	289.4	72	120 min Summer	14.404	0.0	360.0	130	180 min Summer	10.791	0.0	405.1	186	240 min Summer	8.764	0.0	438.8	244	360 min Summer	6.528	0.0	489.8	360	480 min Summer	5.292	0.0	528.3	414	600 min Summer	4.495	0.0	559.3	474	720 min Summer	3.932	0.0	585.1	534	960 min Summer	3.183	0.0	626.1	668	1440 min Summer	2.361	0.0	680.1	940	2160 min Summer	1.750	0.0	839.4	1348	2880 min Summer	1.414	0.0	899.9	1744	4320 min Summer	1.047	0.0	978.4	2520	5760 min Summer	0.846	0.0	1098.5	3288	7200 min Summer	0.716	0.0	1161.2	4040	8640 min Summer	0.626	0.0	1212.6	4760	10080 min Summer	0.558	0.0	1250.6	5544	15 min Winter	55.614	0.0	154.2	30	30 min Winter	36.694	0.0	207.3	43	60 min Winter	23.276	0.0	325.3	72	120 min Winter	14.404	0.0	404.5	126
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																									
15 min Summer	99.369	0.069	3.1	185.9	O K																																																																																																																																																																																																																																																																									
30 min Summer	99.390	0.090	4.2	243.5	O K																																																																																																																																																																																																																																																																									
60 min Summer	99.412	0.112	5.4	304.3	O K																																																																																																																																																																																																																																																																									
120 min Summer	99.434	0.134	6.6	365.5	O K																																																																																																																																																																																																																																																																									
180 min Summer	99.445	0.145	7.2	398.5	O K																																																																																																																																																																																																																																																																									
240 min Summer	99.452	0.152	7.6	418.7	O K																																																																																																																																																																																																																																																																									
360 min Summer	99.460	0.160	7.9	440.5	O K																																																																																																																																																																																																																																																																									
480 min Summer	99.464	0.164	8.2	451.7	O K																																																																																																																																																																																																																																																																									
600 min Summer	99.467	0.167	8.3	460.1	O K																																																																																																																																																																																																																																																																									
720 min Summer	99.469	0.169	8.4	466.4	O K																																																																																																																																																																																																																																																																									
960 min Summer	99.471	0.171	8.5	474.0	O K																																																																																																																																																																																																																																																																									
1440 min Summer	99.472	0.172	8.6	476.9	O K																																																																																																																																																																																																																																																																									
2160 min Summer	99.469	0.169	8.4	467.2	O K																																																																																																																																																																																																																																																																									
2880 min Summer	99.464	0.164	8.2	451.4	O K																																																																																																																																																																																																																																																																									
4320 min Summer	99.452	0.152	7.5	417.5	O K																																																																																																																																																																																																																																																																									
5760 min Summer	99.441	0.141	7.0	386.7	O K																																																																																																																																																																																																																																																																									
7200 min Summer	99.432	0.132	6.5	360.4	O K																																																																																																																																																																																																																																																																									
8640 min Summer	99.424	0.124	6.1	338.0	O K																																																																																																																																																																																																																																																																									
10080 min Summer	99.417	0.117	5.7	318.8	O K																																																																																																																																																																																																																																																																									
15 min Winter	99.377	0.077	3.6	208.2	O K																																																																																																																																																																																																																																																																									
30 min Winter	99.400	0.100	4.8	272.8	O K																																																																																																																																																																																																																																																																									
60 min Winter	99.425	0.125	6.1	341.0	O K																																																																																																																																																																																																																																																																									
120 min Winter	99.449	0.149	7.4	410.1	O K																																																																																																																																																																																																																																																																									
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																										
15 min Summer	55.614	0.0	136.4	30																																																																																																																																																																																																																																																																										
30 min Summer	36.694	0.0	183.6	44																																																																																																																																																																																																																																																																										
60 min Summer	23.276	0.0	289.4	72																																																																																																																																																																																																																																																																										
120 min Summer	14.404	0.0	360.0	130																																																																																																																																																																																																																																																																										
180 min Summer	10.791	0.0	405.1	186																																																																																																																																																																																																																																																																										
240 min Summer	8.764	0.0	438.8	244																																																																																																																																																																																																																																																																										
360 min Summer	6.528	0.0	489.8	360																																																																																																																																																																																																																																																																										
480 min Summer	5.292	0.0	528.3	414																																																																																																																																																																																																																																																																										
600 min Summer	4.495	0.0	559.3	474																																																																																																																																																																																																																																																																										
720 min Summer	3.932	0.0	585.1	534																																																																																																																																																																																																																																																																										
960 min Summer	3.183	0.0	626.1	668																																																																																																																																																																																																																																																																										
1440 min Summer	2.361	0.0	680.1	940																																																																																																																																																																																																																																																																										
2160 min Summer	1.750	0.0	839.4	1348																																																																																																																																																																																																																																																																										
2880 min Summer	1.414	0.0	899.9	1744																																																																																																																																																																																																																																																																										
4320 min Summer	1.047	0.0	978.4	2520																																																																																																																																																																																																																																																																										
5760 min Summer	0.846	0.0	1098.5	3288																																																																																																																																																																																																																																																																										
7200 min Summer	0.716	0.0	1161.2	4040																																																																																																																																																																																																																																																																										
8640 min Summer	0.626	0.0	1212.6	4760																																																																																																																																																																																																																																																																										
10080 min Summer	0.558	0.0	1250.6	5544																																																																																																																																																																																																																																																																										
15 min Winter	55.614	0.0	154.2	30																																																																																																																																																																																																																																																																										
30 min Winter	36.694	0.0	207.3	43																																																																																																																																																																																																																																																																										
60 min Winter	23.276	0.0	325.3	72																																																																																																																																																																																																																																																																										
120 min Winter	14.404	0.0	404.5	126																																																																																																																																																																																																																																																																										
©1982-2012 Micro Drainage Ltd																																																																																																																																																																																																																																																																														

Michael A Jennings Associates			Page 2		
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:10 year Max Discharge =16 l/s				
Date 19.03.13 File Northern Attenuation Pond - ...	Designed by C.Pendle Checked by				
Micro Drainage	Source Control 2013.1				
Summary of Results for 10 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	99.462	0.162	8.1	447.7	O K
240 min Winter	99.470	0.170	8.5	471.0	O K
360 min Winter	99.479	0.179	8.9	497.0	O K
480 min Winter	99.483	0.183	9.1	508.5	O K
600 min Winter	99.486	0.186	9.2	515.4	O K
720 min Winter	99.488	0.188	9.3	521.1	O K
960 min Winter	99.489	0.189	9.4	525.2	O K
1440 min Winter	99.487	0.187	9.3	518.3	O K
2160 min Winter	99.478	0.178	8.9	494.2	O K
2880 min Winter	99.469	0.169	8.4	466.4	O K
4320 min Winter	99.451	0.151	7.5	415.0	O K
5760 min Winter	99.436	0.136	6.7	372.9	O K
7200 min Winter	99.424	0.124	6.1	339.0	O K
8640 min Winter	99.414	0.114	5.6	311.4	O K
10080 min Winter	99.406	0.106	5.1	288.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
180 min Winter	10.791	0.0	455.1	184	
240 min Winter	8.764	0.0	493.0	240	
360 min Winter	6.528	0.0	550.1	350	
480 min Winter	5.292	0.0	593.3	452	
600 min Winter	4.495	0.0	628.0	486	
720 min Winter	3.932	0.0	657.0	560	
960 min Winter	3.183	0.0	703.0	712	
1440 min Winter	2.361	0.0	763.5	1012	
2160 min Winter	1.750	0.0	941.0	1444	
2880 min Winter	1.414	0.0	1008.9	1856	
4320 min Winter	1.047	0.0	1097.4	2648	
5760 min Winter	0.846	0.0	1230.6	3416	
7200 min Winter	0.716	0.0	1301.0	4184	
8640 min Winter	0.626	0.0	1359.0	4936	
10080 min Winter	0.558	0.0	1402.8	5656	
©1982-2012 Micro Drainage Ltd					

Michael A Jennings Associates		Page 3
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:10 year Max Discharge =16 l/s	
Date 19.03.13 File Northern Attenuation Pond - ...	Designed by C.Pendle Checked by	
Micro Drainage Source Control 2013.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	10	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.810

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:	From:	To:
0	4	4	8	8	12	12	16
	0.500		0.500		0.500		0.310

©1982-2012 Micro Drainage Ltd

Michael A Jennings Associates		Page 4
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:10 year Max Discharge =16 l/s	
Date 19.03.13 File Northern Attenuation Pond - ...	Designed by C.Pendle Checked by	
Micro Drainage Source Control 2013.1		

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.300

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2646.0	0.700	3632.0	1.400	0.0	2.100	0.0
0.100	2784.0	0.701	0.0	1.500	0.0	2.200	0.0
0.200	2923.0	0.900	0.0	1.600	0.0	2.300	0.0
0.300	3063.0	1.000	0.0	1.700	0.0	2.400	0.0
0.400	3204.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	3346.0	1.200	0.0	1.900	0.0		
0.600	3488.0	1.300	0.0	2.000	0.0		

Hydro-Brake® Outflow Control

Design Head (m) 0.380 Hydro-Brake® Type Md8 Invert Level (m) 99.300
Design Flow (l/s) 16.0 Diameter (mm) 200

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.8	1.200	27.0	3.000	42.4	7.000	64.8
0.200	9.9	1.400	29.0	3.500	45.8	7.500	67.1
0.300	14.0	1.600	31.0	4.000	49.0	8.000	69.3
0.400	16.4	1.800	32.9	4.500	52.0	8.500	71.4
0.500	18.1	2.000	34.6	5.000	54.8	9.000	73.5
0.600	19.7	2.200	36.3	5.500	57.4	9.500	75.5
0.800	22.3	2.400	37.9	6.000	60.0		
1.000	24.7	2.600	39.5	6.500	62.4		

©1982-2012 Micro Drainage Ltd

Michael A Jennings Associates				Page 1																																																																																																																																																																																																																																																																										
58-62 Ock Street Abingdon Oxon OX14 5BZ		Northern Attenuation Pond 1:30year Max Discharge =16 l/s																																																																																																																																																																																																																																																																												
Date 19.03.13 File Northern Attenuation Pond - ...		Designed by C.Pendle Checked by																																																																																																																																																																																																																																																																												
Micro Drainage		Source Control 2013.1																																																																																																																																																																																																																																																																												
Summary of Results for 30 year Return Period																																																																																																																																																																																																																																																																														
<table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>99.387</td><td>0.087</td><td>4.1</td><td>235.1</td><td>O K</td></tr><tr><td>30 min Summer</td><td>99.414</td><td>0.114</td><td>5.6</td><td>310.6</td><td>O K</td></tr><tr><td>60 min Summer</td><td>99.442</td><td>0.142</td><td>7.0</td><td>390.2</td><td>O K</td></tr><tr><td>120 min Summer</td><td>99.470</td><td>0.170</td><td>8.5</td><td>468.7</td><td>O K</td></tr><tr><td>180 min Summer</td><td>99.484</td><td>0.184</td><td>9.1</td><td>509.3</td><td>O K</td></tr><tr><td>240 min Summer</td><td>99.492</td><td>0.192</td><td>9.5</td><td>532.9</td><td>O K</td></tr><tr><td>360 min Summer</td><td>99.500</td><td>0.200</td><td>9.9</td><td>557.6</td><td>O K</td></tr><tr><td>480 min Summer</td><td>99.504</td><td>0.204</td><td>10.1</td><td>569.3</td><td>O K</td></tr><tr><td>600 min Summer</td><td>99.507</td><td>0.207</td><td>10.3</td><td>577.9</td><td>O K</td></tr><tr><td>720 min Summer</td><td>99.509</td><td>0.209</td><td>10.4</td><td>583.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>99.511</td><td>0.211</td><td>10.5</td><td>590.3</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>99.511</td><td>0.211</td><td>10.5</td><td>589.2</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>99.505</td><td>0.205</td><td>10.2</td><td>572.1</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>99.497</td><td>0.197</td><td>9.8</td><td>549.0</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>99.481</td><td>0.181</td><td>9.0</td><td>501.9</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>99.467</td><td>0.167</td><td>8.3</td><td>460.9</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>99.455</td><td>0.155</td><td>7.7</td><td>426.6</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>99.445</td><td>0.145</td><td>7.2</td><td>397.9</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>99.436</td><td>0.136</td><td>6.7</td><td>373.5</td><td>O K</td></tr><tr><td>15 min Winter</td><td>99.397</td><td>0.097</td><td>4.6</td><td>263.3</td><td>O K</td></tr><tr><td>30 min Winter</td><td>99.427</td><td>0.127</td><td>6.2</td><td>348.0</td><td>O K</td></tr><tr><td>60 min Winter</td><td>99.459</td><td>0.159</td><td>7.9</td><td>437.4</td><td>O K</td></tr><tr><td>120 min Winter</td><td>99.489</td><td>0.189</td><td>9.4</td><td>526.1</td><td>O K</td></tr><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>70.373</td><td>0.0</td><td>175.9</td><td>30</td></tr><tr><td>30 min Summer</td><td>46.843</td><td>0.0</td><td>238.3</td><td>44</td></tr><tr><td>60 min Summer</td><td>29.868</td><td>0.0</td><td>374.3</td><td>72</td></tr><tr><td>120 min Summer</td><td>18.484</td><td>0.0</td><td>465.2</td><td>130</td></tr><tr><td>180 min Summer</td><td>13.799</td><td>0.0</td><td>521.4</td><td>186</td></tr><tr><td>240 min Summer</td><td>11.157</td><td>0.0</td><td>562.1</td><td>244</td></tr><tr><td>360 min Summer</td><td>8.261</td><td>0.0</td><td>623.3</td><td>360</td></tr><tr><td>480 min Summer</td><td>6.668</td><td>0.0</td><td>669.2</td><td>416</td></tr><tr><td>600 min Summer</td><td>5.644</td><td>0.0</td><td>705.8</td><td>476</td></tr><tr><td>720 min Summer</td><td>4.923</td><td>0.0</td><td>736.0</td><td>538</td></tr><tr><td>960 min Summer</td><td>3.965</td><td>0.0</td><td>783.5</td><td>670</td></tr><tr><td>1440 min Summer</td><td>2.919</td><td>0.0</td><td>844.4</td><td>944</td></tr><tr><td>2160 min Summer</td><td>2.146</td><td>0.0</td><td>1031.0</td><td>1352</td></tr><tr><td>2880 min Summer</td><td>1.724</td><td>0.0</td><td>1098.7</td><td>1756</td></tr><tr><td>4320 min Summer</td><td>1.264</td><td>0.0</td><td>1184.3</td><td>2520</td></tr><tr><td>5760 min Summer</td><td>1.014</td><td>0.0</td><td>1317.3</td><td>3288</td></tr><tr><td>7200 min Summer</td><td>0.854</td><td>0.0</td><td>1384.9</td><td>4040</td></tr><tr><td>8640 min Summer</td><td>0.743</td><td>0.0</td><td>1440.5</td><td>4760</td></tr><tr><td>10080 min Summer</td><td>0.660</td><td>0.0</td><td>1480.9</td><td>5544</td></tr><tr><td>15 min Winter</td><td>70.373</td><td>0.0</td><td>198.6</td><td>30</td></tr><tr><td>30 min Winter</td><td>46.843</td><td>0.0</td><td>268.8</td><td>43</td></tr><tr><td>60 min Winter</td><td>29.868</td><td>0.0</td><td>420.6</td><td>70</td></tr><tr><td>120 min Winter</td><td>18.484</td><td>0.0</td><td>522.4</td><td>128</td></tr></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	99.387	0.087	4.1	235.1	O K	30 min Summer	99.414	0.114	5.6	310.6	O K	60 min Summer	99.442	0.142	7.0	390.2	O K	120 min Summer	99.470	0.170	8.5	468.7	O K	180 min Summer	99.484	0.184	9.1	509.3	O K	240 min Summer	99.492	0.192	9.5	532.9	O K	360 min Summer	99.500	0.200	9.9	557.6	O K	480 min Summer	99.504	0.204	10.1	569.3	O K	600 min Summer	99.507	0.207	10.3	577.9	O K	720 min Summer	99.509	0.209	10.4	583.8	O K	960 min Summer	99.511	0.211	10.5	590.3	O K	1440 min Summer	99.511	0.211	10.5	589.2	O K	2160 min Summer	99.505	0.205	10.2	572.1	O K	2880 min Summer	99.497	0.197	9.8	549.0	O K	4320 min Summer	99.481	0.181	9.0	501.9	O K	5760 min Summer	99.467	0.167	8.3	460.9	O K	7200 min Summer	99.455	0.155	7.7	426.6	O K	8640 min Summer	99.445	0.145	7.2	397.9	O K	10080 min Summer	99.436	0.136	6.7	373.5	O K	15 min Winter	99.397	0.097	4.6	263.3	O K	30 min Winter	99.427	0.127	6.2	348.0	O K	60 min Winter	99.459	0.159	7.9	437.4	O K	120 min Winter	99.489	0.189	9.4	526.1	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	70.373	0.0	175.9	30	30 min Summer	46.843	0.0	238.3	44	60 min Summer	29.868	0.0	374.3	72	120 min Summer	18.484	0.0	465.2	130	180 min Summer	13.799	0.0	521.4	186	240 min Summer	11.157	0.0	562.1	244	360 min Summer	8.261	0.0	623.3	360	480 min Summer	6.668	0.0	669.2	416	600 min Summer	5.644	0.0	705.8	476	720 min Summer	4.923	0.0	736.0	538	960 min Summer	3.965	0.0	783.5	670	1440 min Summer	2.919	0.0	844.4	944	2160 min Summer	2.146	0.0	1031.0	1352	2880 min Summer	1.724	0.0	1098.7	1756	4320 min Summer	1.264	0.0	1184.3	2520	5760 min Summer	1.014	0.0	1317.3	3288	7200 min Summer	0.854	0.0	1384.9	4040	8640 min Summer	0.743	0.0	1440.5	4760	10080 min Summer	0.660	0.0	1480.9	5544	15 min Winter	70.373	0.0	198.6	30	30 min Winter	46.843	0.0	268.8	43	60 min Winter	29.868	0.0	420.6	70	120 min Winter	18.484	0.0	522.4	128
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																									
15 min Summer	99.387	0.087	4.1	235.1	O K																																																																																																																																																																																																																																																																									
30 min Summer	99.414	0.114	5.6	310.6	O K																																																																																																																																																																																																																																																																									
60 min Summer	99.442	0.142	7.0	390.2	O K																																																																																																																																																																																																																																																																									
120 min Summer	99.470	0.170	8.5	468.7	O K																																																																																																																																																																																																																																																																									
180 min Summer	99.484	0.184	9.1	509.3	O K																																																																																																																																																																																																																																																																									
240 min Summer	99.492	0.192	9.5	532.9	O K																																																																																																																																																																																																																																																																									
360 min Summer	99.500	0.200	9.9	557.6	O K																																																																																																																																																																																																																																																																									
480 min Summer	99.504	0.204	10.1	569.3	O K																																																																																																																																																																																																																																																																									
600 min Summer	99.507	0.207	10.3	577.9	O K																																																																																																																																																																																																																																																																									
720 min Summer	99.509	0.209	10.4	583.8	O K																																																																																																																																																																																																																																																																									
960 min Summer	99.511	0.211	10.5	590.3	O K																																																																																																																																																																																																																																																																									
1440 min Summer	99.511	0.211	10.5	589.2	O K																																																																																																																																																																																																																																																																									
2160 min Summer	99.505	0.205	10.2	572.1	O K																																																																																																																																																																																																																																																																									
2880 min Summer	99.497	0.197	9.8	549.0	O K																																																																																																																																																																																																																																																																									
4320 min Summer	99.481	0.181	9.0	501.9	O K																																																																																																																																																																																																																																																																									
5760 min Summer	99.467	0.167	8.3	460.9	O K																																																																																																																																																																																																																																																																									
7200 min Summer	99.455	0.155	7.7	426.6	O K																																																																																																																																																																																																																																																																									
8640 min Summer	99.445	0.145	7.2	397.9	O K																																																																																																																																																																																																																																																																									
10080 min Summer	99.436	0.136	6.7	373.5	O K																																																																																																																																																																																																																																																																									
15 min Winter	99.397	0.097	4.6	263.3	O K																																																																																																																																																																																																																																																																									
30 min Winter	99.427	0.127	6.2	348.0	O K																																																																																																																																																																																																																																																																									
60 min Winter	99.459	0.159	7.9	437.4	O K																																																																																																																																																																																																																																																																									
120 min Winter	99.489	0.189	9.4	526.1	O K																																																																																																																																																																																																																																																																									
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																										
15 min Summer	70.373	0.0	175.9	30																																																																																																																																																																																																																																																																										
30 min Summer	46.843	0.0	238.3	44																																																																																																																																																																																																																																																																										
60 min Summer	29.868	0.0	374.3	72																																																																																																																																																																																																																																																																										
120 min Summer	18.484	0.0	465.2	130																																																																																																																																																																																																																																																																										
180 min Summer	13.799	0.0	521.4	186																																																																																																																																																																																																																																																																										
240 min Summer	11.157	0.0	562.1	244																																																																																																																																																																																																																																																																										
360 min Summer	8.261	0.0	623.3	360																																																																																																																																																																																																																																																																										
480 min Summer	6.668	0.0	669.2	416																																																																																																																																																																																																																																																																										
600 min Summer	5.644	0.0	705.8	476																																																																																																																																																																																																																																																																										
720 min Summer	4.923	0.0	736.0	538																																																																																																																																																																																																																																																																										
960 min Summer	3.965	0.0	783.5	670																																																																																																																																																																																																																																																																										
1440 min Summer	2.919	0.0	844.4	944																																																																																																																																																																																																																																																																										
2160 min Summer	2.146	0.0	1031.0	1352																																																																																																																																																																																																																																																																										
2880 min Summer	1.724	0.0	1098.7	1756																																																																																																																																																																																																																																																																										
4320 min Summer	1.264	0.0	1184.3	2520																																																																																																																																																																																																																																																																										
5760 min Summer	1.014	0.0	1317.3	3288																																																																																																																																																																																																																																																																										
7200 min Summer	0.854	0.0	1384.9	4040																																																																																																																																																																																																																																																																										
8640 min Summer	0.743	0.0	1440.5	4760																																																																																																																																																																																																																																																																										
10080 min Summer	0.660	0.0	1480.9	5544																																																																																																																																																																																																																																																																										
15 min Winter	70.373	0.0	198.6	30																																																																																																																																																																																																																																																																										
30 min Winter	46.843	0.0	268.8	43																																																																																																																																																																																																																																																																										
60 min Winter	29.868	0.0	420.6	70																																																																																																																																																																																																																																																																										
120 min Winter	18.484	0.0	522.4	128																																																																																																																																																																																																																																																																										
©1982-2012 Micro Drainage Ltd																																																																																																																																																																																																																																																																														

Michael A Jennings Associates			Page 2		
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:30year Max Discharge =16 l/s				
Date 19.03.13 File Northern Attenuation Pond - ...	Designed by C.Pendle Checked by				
Micro Drainage	Source Control 2013.1				
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	99.505	0.205	10.2	572.5	O K
240 min Winter	99.515	0.215	10.6	599.9	O K
360 min Winter	99.525	0.225	11.1	629.8	O K
480 min Winter	99.529	0.229	11.3	642.2	O K
600 min Winter	99.531	0.231	11.3	648.1	O K
720 min Winter	99.533	0.233	11.4	653.2	O K
960 min Winter	99.533	0.233	11.4	655.4	O K
1440 min Winter	99.529	0.229	11.2	641.9	O K
2160 min Winter	99.517	0.217	10.7	606.4	O K
2880 min Winter	99.504	0.204	10.1	568.0	O K
4320 min Winter	99.480	0.180	9.0	499.3	O K
5760 min Winter	99.461	0.161	8.0	444.2	O K
7200 min Winter	99.446	0.146	7.2	400.7	O K
8640 min Winter	99.434	0.134	6.6	365.9	O K
10080 min Winter	99.424	0.124	6.1	337.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
180 min Winter	13.799	0.0	585.5	184	
240 min Winter	11.157	0.0	631.0	240	
360 min Winter	8.261	0.0	699.7	350	
480 min Winter	6.668	0.0	751.1	454	
600 min Winter	5.644	0.0	792.0	490	
720 min Winter	4.923	0.0	825.9	562	
960 min Winter	3.965	0.0	879.0	716	
1440 min Winter	2.919	0.0	947.0	1016	
2160 min Winter	2.146	0.0	1155.6	1452	
2880 min Winter	1.724	0.0	1231.7	1860	
4320 min Winter	1.264	0.0	1328.1	2652	
5760 min Winter	1.014	0.0	1475.7	3456	
7200 min Winter	0.854	0.0	1551.6	4184	
8640 min Winter	0.743	0.0	1614.4	4936	
10080 min Winter	0.660	0.0	1661.1	5656	
©1982-2012 Micro Drainage Ltd					

Michael A Jennings Associates		Page 3
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:30year Max Discharge =16 l/s	
Date 19.03.13 File Northern Attenuation Pond - ...	Designed by C.Pendle Checked by	
Micro Drainage Source Control 2013.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.810

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.500	4 8	0.500	8 12	0.500	12 16	0.310

©1982-2012 Micro Drainage Ltd

Michael A Jennings Associates		Page 4																																																																																																																																								
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:30year Max Discharge =16 l/s																																																																																																																																									
Date 19.03.13 File Northern Attenuation Pond - ...	Designed by C.Pendle Checked by																																																																																																																																									
Micro Drainage	Source Control 2013.1																																																																																																																																									
Model Details Storage is Online Cover Level (m) 100.000 Tank or Pond Structure Invert Level (m) 99.300 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>2646.0</td><td>0.700</td><td>3632.0</td><td>1.400</td><td>0.0</td><td>2.100</td><td>0.0</td></tr><tr><td>0.100</td><td>2784.0</td><td>0.701</td><td>0.0</td><td>1.500</td><td>0.0</td><td>2.200</td><td>0.0</td></tr><tr><td>0.200</td><td>2923.0</td><td>0.900</td><td>0.0</td><td>1.600</td><td>0.0</td><td>2.300</td><td>0.0</td></tr><tr><td>0.300</td><td>3063.0</td><td>1.000</td><td>0.0</td><td>1.700</td><td>0.0</td><td>2.400</td><td>0.0</td></tr><tr><td>0.400</td><td>3204.0</td><td>1.100</td><td>0.0</td><td>1.800</td><td>0.0</td><td>2.500</td><td>0.0</td></tr><tr><td>0.500</td><td>3346.0</td><td>1.200</td><td>0.0</td><td>1.900</td><td>0.0</td><td></td><td></td></tr><tr><td>0.600</td><td>3488.0</td><td>1.300</td><td>0.0</td><td>2.000</td><td>0.0</td><td></td><td></td></tr></tbody></table> Hydro-Brake® Outflow Control Design Head (m) 0.380 Hydro-Brake® Type Md8 Invert Level (m) 99.300 Design Flow (l/s) 16.0 Diameter (mm) 200 <table><thead><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>0.100</td><td>4.8</td><td>1.200</td><td>27.0</td><td>3.000</td><td>42.4</td><td>7.000</td><td>64.8</td></tr><tr><td>0.200</td><td>9.9</td><td>1.400</td><td>29.0</td><td>3.500</td><td>45.8</td><td>7.500</td><td>67.1</td></tr><tr><td>0.300</td><td>14.0</td><td>1.600</td><td>31.0</td><td>4.000</td><td>49.0</td><td>8.000</td><td>69.3</td></tr><tr><td>0.400</td><td>16.4</td><td>1.800</td><td>32.9</td><td>4.500</td><td>52.0</td><td>8.500</td><td>71.4</td></tr><tr><td>0.500</td><td>18.1</td><td>2.000</td><td>34.6</td><td>5.000</td><td>54.8</td><td>9.000</td><td>73.5</td></tr><tr><td>0.600</td><td>19.7</td><td>2.200</td><td>36.3</td><td>5.500</td><td>57.4</td><td>9.500</td><td>75.5</td></tr><tr><td>0.800</td><td>22.3</td><td>2.400</td><td>37.9</td><td>6.000</td><td>60.0</td><td></td><td></td></tr><tr><td>1.000</td><td>24.7</td><td>2.600</td><td>39.5</td><td>6.500</td><td>62.4</td><td></td><td></td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	2646.0	0.700	3632.0	1.400	0.0	2.100	0.0	0.100	2784.0	0.701	0.0	1.500	0.0	2.200	0.0	0.200	2923.0	0.900	0.0	1.600	0.0	2.300	0.0	0.300	3063.0	1.000	0.0	1.700	0.0	2.400	0.0	0.400	3204.0	1.100	0.0	1.800	0.0	2.500	0.0	0.500	3346.0	1.200	0.0	1.900	0.0			0.600	3488.0	1.300	0.0	2.000	0.0			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	4.8	1.200	27.0	3.000	42.4	7.000	64.8	0.200	9.9	1.400	29.0	3.500	45.8	7.500	67.1	0.300	14.0	1.600	31.0	4.000	49.0	8.000	69.3	0.400	16.4	1.800	32.9	4.500	52.0	8.500	71.4	0.500	18.1	2.000	34.6	5.000	54.8	9.000	73.5	0.600	19.7	2.200	36.3	5.500	57.4	9.500	75.5	0.800	22.3	2.400	37.9	6.000	60.0			1.000	24.7	2.600	39.5	6.500	62.4		
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																																																																																			
0.000	2646.0	0.700	3632.0	1.400	0.0	2.100	0.0																																																																																																																																			
0.100	2784.0	0.701	0.0	1.500	0.0	2.200	0.0																																																																																																																																			
0.200	2923.0	0.900	0.0	1.600	0.0	2.300	0.0																																																																																																																																			
0.300	3063.0	1.000	0.0	1.700	0.0	2.400	0.0																																																																																																																																			
0.400	3204.0	1.100	0.0	1.800	0.0	2.500	0.0																																																																																																																																			
0.500	3346.0	1.200	0.0	1.900	0.0																																																																																																																																					
0.600	3488.0	1.300	0.0	2.000	0.0																																																																																																																																					
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																																																																																			
0.100	4.8	1.200	27.0	3.000	42.4	7.000	64.8																																																																																																																																			
0.200	9.9	1.400	29.0	3.500	45.8	7.500	67.1																																																																																																																																			
0.300	14.0	1.600	31.0	4.000	49.0	8.000	69.3																																																																																																																																			
0.400	16.4	1.800	32.9	4.500	52.0	8.500	71.4																																																																																																																																			
0.500	18.1	2.000	34.6	5.000	54.8	9.000	73.5																																																																																																																																			
0.600	19.7	2.200	36.3	5.500	57.4	9.500	75.5																																																																																																																																			
0.800	22.3	2.400	37.9	6.000	60.0																																																																																																																																					
1.000	24.7	2.600	39.5	6.500	62.4																																																																																																																																					
©1982-2012 Micro Drainage Ltd																																																																																																																																										

Michael A Jennings Associates			Page 1																																																																																																																																																																																																																																																																											
58-62 Ock Street Abingdon Oxon OX14 5BZ		Northern Attenuation Pond 1:100 year Max Discharge =16l/s																																																																																																																																																																																																																																																																												
Date 19.03.13 File NORTHERN ATTENUATION PO...		Designed by C.Pendle Checked by																																																																																																																																																																																																																																																																												
Micro Drainage		Source Control 2013.1																																																																																																																																																																																																																																																																												
Summary of Results for 100 year Return Period <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>99.412</td><td>0.112</td><td>5.4</td><td>304.2</td><td>O K</td></tr><tr><td>30 min Summer</td><td>99.448</td><td>0.148</td><td>7.3</td><td>405.7</td><td>O K</td></tr><tr><td>60 min Summer</td><td>99.485</td><td>0.185</td><td>9.2</td><td>512.7</td><td>O K</td></tr><tr><td>120 min Summer</td><td>99.520</td><td>0.220</td><td>10.9</td><td>616.2</td><td>O K</td></tr><tr><td>180 min Summer</td><td>99.538</td><td>0.238</td><td>11.6</td><td>667.7</td><td>O K</td></tr><tr><td>240 min Summer</td><td>99.547</td><td>0.247</td><td>12.0</td><td>695.8</td><td>O K</td></tr><tr><td>360 min Summer</td><td>99.557</td><td>0.257</td><td>12.4</td><td>725.0</td><td>O K</td></tr><tr><td>480 min Summer</td><td>99.561</td><td>0.261</td><td>12.6</td><td>736.7</td><td>O K</td></tr><tr><td>600 min Summer</td><td>99.563</td><td>0.263</td><td>12.7</td><td>744.7</td><td>O K</td></tr><tr><td>720 min Summer</td><td>99.565</td><td>0.265</td><td>12.7</td><td>749.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>99.566</td><td>0.266</td><td>12.8</td><td>753.9</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>99.564</td><td>0.264</td><td>12.7</td><td>746.3</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>99.554</td><td>0.254</td><td>12.3</td><td>717.9</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>99.543</td><td>0.243</td><td>11.8</td><td>683.7</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>99.521</td><td>0.221</td><td>10.9</td><td>617.4</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>99.502</td><td>0.202</td><td>10.0</td><td>561.3</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>99.486</td><td>0.186</td><td>9.2</td><td>515.2</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>99.473</td><td>0.173</td><td>8.6</td><td>477.6</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>99.462</td><td>0.162</td><td>8.0</td><td>446.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>99.425</td><td>0.125</td><td>6.1</td><td>340.7</td><td>O K</td></tr><tr><td>30 min Winter</td><td>99.465</td><td>0.165</td><td>8.2</td><td>454.6</td><td>O K</td></tr><tr><td>60 min Winter</td><td>99.506</td><td>0.206</td><td>10.2</td><td>574.8</td><td>O K</td></tr><tr><td>120 min Winter</td><td>99.546</td><td>0.246</td><td>12.0</td><td>692.0</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>91.083</td><td>0.0</td><td>231.8</td><td>30</td></tr><tr><td>30 min Summer</td><td>61.215</td><td>0.0</td><td>316.3</td><td>44</td></tr><tr><td>60 min Summer</td><td>39.255</td><td>0.0</td><td>495.5</td><td>72</td></tr><tr><td>120 min Summer</td><td>24.293</td><td>0.0</td><td>615.1</td><td>130</td></tr><tr><td>180 min Summer</td><td>18.068</td><td>0.0</td><td>686.5</td><td>188</td></tr><tr><td>240 min Summer</td><td>14.537</td><td>0.0</td><td>736.0</td><td>244</td></tr><tr><td>360 min Summer</td><td>10.694</td><td>0.0</td><td>810.5</td><td>360</td></tr><tr><td>480 min Summer</td><td>8.592</td><td>0.0</td><td>865.7</td><td>424</td></tr><tr><td>600 min Summer</td><td>7.244</td><td>0.0</td><td>909.1</td><td>484</td></tr><tr><td>720 min Summer</td><td>6.298</td><td>0.0</td><td>944.7</td><td>546</td></tr><tr><td>960 min Summer</td><td>5.045</td><td>0.0</td><td>999.6</td><td>676</td></tr><tr><td>1440 min Summer</td><td>3.684</td><td>0.0</td><td>1067.4</td><td>950</td></tr><tr><td>2160 min Summer</td><td>2.684</td><td>0.0</td><td>1291.1</td><td>1364</td></tr><tr><td>2880 min Summer</td><td>2.141</td><td>0.0</td><td>1366.9</td><td>1760</td></tr><tr><td>4320 min Summer</td><td>1.554</td><td>0.0</td><td>1459.2</td><td>2552</td></tr><tr><td>5760 min Summer</td><td>1.237</td><td>0.0</td><td>1607.5</td><td>3296</td></tr><tr><td>7200 min Summer</td><td>1.035</td><td>0.0</td><td>1679.9</td><td>4040</td></tr><tr><td>8640 min Summer</td><td>0.896</td><td>0.0</td><td>1739.6</td><td>4768</td></tr><tr><td>10080 min Summer</td><td>0.793</td><td>0.0</td><td>1782.2</td><td>5544</td></tr><tr><td>15 min Winter</td><td>91.083</td><td>0.0</td><td>261.5</td><td>30</td></tr><tr><td>30 min Winter</td><td>61.215</td><td>0.0</td><td>356.3</td><td>43</td></tr><tr><td>60 min Winter</td><td>39.255</td><td>0.0</td><td>556.4</td><td>72</td></tr><tr><td>120 min Winter</td><td>24.293</td><td>0.0</td><td>690.4</td><td>128</td></tr></tbody></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	99.412	0.112	5.4	304.2	O K	30 min Summer	99.448	0.148	7.3	405.7	O K	60 min Summer	99.485	0.185	9.2	512.7	O K	120 min Summer	99.520	0.220	10.9	616.2	O K	180 min Summer	99.538	0.238	11.6	667.7	O K	240 min Summer	99.547	0.247	12.0	695.8	O K	360 min Summer	99.557	0.257	12.4	725.0	O K	480 min Summer	99.561	0.261	12.6	736.7	O K	600 min Summer	99.563	0.263	12.7	744.7	O K	720 min Summer	99.565	0.265	12.7	749.8	O K	960 min Summer	99.566	0.266	12.8	753.9	O K	1440 min Summer	99.564	0.264	12.7	746.3	O K	2160 min Summer	99.554	0.254	12.3	717.9	O K	2880 min Summer	99.543	0.243	11.8	683.7	O K	4320 min Summer	99.521	0.221	10.9	617.4	O K	5760 min Summer	99.502	0.202	10.0	561.3	O K	7200 min Summer	99.486	0.186	9.2	515.2	O K	8640 min Summer	99.473	0.173	8.6	477.6	O K	10080 min Summer	99.462	0.162	8.0	446.0	O K	15 min Winter	99.425	0.125	6.1	340.7	O K	30 min Winter	99.465	0.165	8.2	454.6	O K	60 min Winter	99.506	0.206	10.2	574.8	O K	120 min Winter	99.546	0.246	12.0	692.0	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	91.083	0.0	231.8	30	30 min Summer	61.215	0.0	316.3	44	60 min Summer	39.255	0.0	495.5	72	120 min Summer	24.293	0.0	615.1	130	180 min Summer	18.068	0.0	686.5	188	240 min Summer	14.537	0.0	736.0	244	360 min Summer	10.694	0.0	810.5	360	480 min Summer	8.592	0.0	865.7	424	600 min Summer	7.244	0.0	909.1	484	720 min Summer	6.298	0.0	944.7	546	960 min Summer	5.045	0.0	999.6	676	1440 min Summer	3.684	0.0	1067.4	950	2160 min Summer	2.684	0.0	1291.1	1364	2880 min Summer	2.141	0.0	1366.9	1760	4320 min Summer	1.554	0.0	1459.2	2552	5760 min Summer	1.237	0.0	1607.5	3296	7200 min Summer	1.035	0.0	1679.9	4040	8640 min Summer	0.896	0.0	1739.6	4768	10080 min Summer	0.793	0.0	1782.2	5544	15 min Winter	91.083	0.0	261.5	30	30 min Winter	61.215	0.0	356.3	43	60 min Winter	39.255	0.0	556.4	72	120 min Winter	24.293	0.0	690.4	128
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																									
15 min Summer	99.412	0.112	5.4	304.2	O K																																																																																																																																																																																																																																																																									
30 min Summer	99.448	0.148	7.3	405.7	O K																																																																																																																																																																																																																																																																									
60 min Summer	99.485	0.185	9.2	512.7	O K																																																																																																																																																																																																																																																																									
120 min Summer	99.520	0.220	10.9	616.2	O K																																																																																																																																																																																																																																																																									
180 min Summer	99.538	0.238	11.6	667.7	O K																																																																																																																																																																																																																																																																									
240 min Summer	99.547	0.247	12.0	695.8	O K																																																																																																																																																																																																																																																																									
360 min Summer	99.557	0.257	12.4	725.0	O K																																																																																																																																																																																																																																																																									
480 min Summer	99.561	0.261	12.6	736.7	O K																																																																																																																																																																																																																																																																									
600 min Summer	99.563	0.263	12.7	744.7	O K																																																																																																																																																																																																																																																																									
720 min Summer	99.565	0.265	12.7	749.8	O K																																																																																																																																																																																																																																																																									
960 min Summer	99.566	0.266	12.8	753.9	O K																																																																																																																																																																																																																																																																									
1440 min Summer	99.564	0.264	12.7	746.3	O K																																																																																																																																																																																																																																																																									
2160 min Summer	99.554	0.254	12.3	717.9	O K																																																																																																																																																																																																																																																																									
2880 min Summer	99.543	0.243	11.8	683.7	O K																																																																																																																																																																																																																																																																									
4320 min Summer	99.521	0.221	10.9	617.4	O K																																																																																																																																																																																																																																																																									
5760 min Summer	99.502	0.202	10.0	561.3	O K																																																																																																																																																																																																																																																																									
7200 min Summer	99.486	0.186	9.2	515.2	O K																																																																																																																																																																																																																																																																									
8640 min Summer	99.473	0.173	8.6	477.6	O K																																																																																																																																																																																																																																																																									
10080 min Summer	99.462	0.162	8.0	446.0	O K																																																																																																																																																																																																																																																																									
15 min Winter	99.425	0.125	6.1	340.7	O K																																																																																																																																																																																																																																																																									
30 min Winter	99.465	0.165	8.2	454.6	O K																																																																																																																																																																																																																																																																									
60 min Winter	99.506	0.206	10.2	574.8	O K																																																																																																																																																																																																																																																																									
120 min Winter	99.546	0.246	12.0	692.0	O K																																																																																																																																																																																																																																																																									
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																										
15 min Summer	91.083	0.0	231.8	30																																																																																																																																																																																																																																																																										
30 min Summer	61.215	0.0	316.3	44																																																																																																																																																																																																																																																																										
60 min Summer	39.255	0.0	495.5	72																																																																																																																																																																																																																																																																										
120 min Summer	24.293	0.0	615.1	130																																																																																																																																																																																																																																																																										
180 min Summer	18.068	0.0	686.5	188																																																																																																																																																																																																																																																																										
240 min Summer	14.537	0.0	736.0	244																																																																																																																																																																																																																																																																										
360 min Summer	10.694	0.0	810.5	360																																																																																																																																																																																																																																																																										
480 min Summer	8.592	0.0	865.7	424																																																																																																																																																																																																																																																																										
600 min Summer	7.244	0.0	909.1	484																																																																																																																																																																																																																																																																										
720 min Summer	6.298	0.0	944.7	546																																																																																																																																																																																																																																																																										
960 min Summer	5.045	0.0	999.6	676																																																																																																																																																																																																																																																																										
1440 min Summer	3.684	0.0	1067.4	950																																																																																																																																																																																																																																																																										
2160 min Summer	2.684	0.0	1291.1	1364																																																																																																																																																																																																																																																																										
2880 min Summer	2.141	0.0	1366.9	1760																																																																																																																																																																																																																																																																										
4320 min Summer	1.554	0.0	1459.2	2552																																																																																																																																																																																																																																																																										
5760 min Summer	1.237	0.0	1607.5	3296																																																																																																																																																																																																																																																																										
7200 min Summer	1.035	0.0	1679.9	4040																																																																																																																																																																																																																																																																										
8640 min Summer	0.896	0.0	1739.6	4768																																																																																																																																																																																																																																																																										
10080 min Summer	0.793	0.0	1782.2	5544																																																																																																																																																																																																																																																																										
15 min Winter	91.083	0.0	261.5	30																																																																																																																																																																																																																																																																										
30 min Winter	61.215	0.0	356.3	43																																																																																																																																																																																																																																																																										
60 min Winter	39.255	0.0	556.4	72																																																																																																																																																																																																																																																																										
120 min Winter	24.293	0.0	690.4	128																																																																																																																																																																																																																																																																										
©1982-2012 Micro Drainage Ltd																																																																																																																																																																																																																																																																														

Michael A Jennings Associates			Page 2																																																																																																																																																																																	
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:100 year Max Discharge =16l/s																																																																																																																																																																																			
Date 19.03.13 File NORTHERN ATTENUATION PO...	Designed by C.Pendle Checked by																																																																																																																																																																																			
Micro Drainage	Source Control 2013.1																																																																																																																																																																																			
<u>Summary of Results for 100 year Return Period</u> <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>180 min Winter</td><td>99.565</td><td>0.265</td><td>12.7</td><td>751.2</td><td>O K</td></tr><tr><td>240 min Winter</td><td>99.576</td><td>0.276</td><td>13.1</td><td>784.1</td><td>O K</td></tr><tr><td>360 min Winter</td><td>99.588</td><td>0.288</td><td>13.6</td><td>820.1</td><td>O K</td></tr><tr><td>480 min Winter</td><td>99.593</td><td>0.293</td><td>13.7</td><td>834.1</td><td>O K</td></tr><tr><td>600 min Winter</td><td>99.594</td><td>0.294</td><td>13.7</td><td>837.3</td><td>O K</td></tr><tr><td>720 min Winter</td><td>99.595</td><td>0.295</td><td>13.8</td><td>841.3</td><td>O K</td></tr><tr><td>960 min Winter</td><td>99.595</td><td>0.295</td><td>13.8</td><td>840.1</td><td>O K</td></tr><tr><td>1440 min Winter</td><td>99.587</td><td>0.287</td><td>13.5</td><td>816.8</td><td>O K</td></tr><tr><td>2160 min Winter</td><td>99.570</td><td>0.270</td><td>12.9</td><td>764.5</td><td>O K</td></tr><tr><td>2880 min Winter</td><td>99.552</td><td>0.252</td><td>12.2</td><td>710.3</td><td>O K</td></tr><tr><td>4320 min Winter</td><td>99.520</td><td>0.220</td><td>10.9</td><td>615.6</td><td>O K</td></tr><tr><td>5760 min Winter</td><td>99.495</td><td>0.195</td><td>9.7</td><td>541.5</td><td>O K</td></tr><tr><td>7200 min Winter</td><td>99.475</td><td>0.175</td><td>8.7</td><td>483.9</td><td>O K</td></tr><tr><td>8640 min Winter</td><td>99.459</td><td>0.159</td><td>7.9</td><td>438.7</td><td>O K</td></tr><tr><td>10080 min Winter</td><td>99.446</td><td>0.146</td><td>7.2</td><td>402.0</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>180 min Winter</td><td>18.068</td><td>0.0</td><td>770.3</td><td>184</td></tr><tr><td>240 min Winter</td><td>14.537</td><td>0.0</td><td>825.7</td><td>240</td></tr><tr><td>360 min Winter</td><td>10.694</td><td>0.0</td><td>909.0</td><td>352</td></tr><tr><td>480 min Winter</td><td>8.592</td><td>0.0</td><td>970.6</td><td>458</td></tr><tr><td>600 min Winter</td><td>7.244</td><td>0.0</td><td>1019.1</td><td>506</td></tr><tr><td>720 min Winter</td><td>6.298</td><td>0.0</td><td>1058.8</td><td>570</td></tr><tr><td>960 min Winter</td><td>5.045</td><td>0.0</td><td>1119.9</td><td>724</td></tr><tr><td>1440 min Winter</td><td>3.684</td><td>0.0</td><td>1195.0</td><td>1024</td></tr><tr><td>2160 min Winter</td><td>2.684</td><td>0.0</td><td>1446.9</td><td>1456</td></tr><tr><td>2880 min Winter</td><td>2.141</td><td>0.0</td><td>1531.9</td><td>1876</td></tr><tr><td>4320 min Winter</td><td>1.554</td><td>0.0</td><td>1636.0</td><td>2684</td></tr><tr><td>5760 min Winter</td><td>1.237</td><td>0.0</td><td>1800.8</td><td>3456</td></tr><tr><td>7200 min Winter</td><td>1.035</td><td>0.0</td><td>1882.0</td><td>4192</td></tr><tr><td>8640 min Winter</td><td>0.896</td><td>0.0</td><td>1949.5</td><td>4936</td></tr><tr><td>10080 min Winter</td><td>0.793</td><td>0.0</td><td>1998.9</td><td>5664</td></tr></tbody></table>					Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	180 min Winter	99.565	0.265	12.7	751.2	O K	240 min Winter	99.576	0.276	13.1	784.1	O K	360 min Winter	99.588	0.288	13.6	820.1	O K	480 min Winter	99.593	0.293	13.7	834.1	O K	600 min Winter	99.594	0.294	13.7	837.3	O K	720 min Winter	99.595	0.295	13.8	841.3	O K	960 min Winter	99.595	0.295	13.8	840.1	O K	1440 min Winter	99.587	0.287	13.5	816.8	O K	2160 min Winter	99.570	0.270	12.9	764.5	O K	2880 min Winter	99.552	0.252	12.2	710.3	O K	4320 min Winter	99.520	0.220	10.9	615.6	O K	5760 min Winter	99.495	0.195	9.7	541.5	O K	7200 min Winter	99.475	0.175	8.7	483.9	O K	8640 min Winter	99.459	0.159	7.9	438.7	O K	10080 min Winter	99.446	0.146	7.2	402.0	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	180 min Winter	18.068	0.0	770.3	184	240 min Winter	14.537	0.0	825.7	240	360 min Winter	10.694	0.0	909.0	352	480 min Winter	8.592	0.0	970.6	458	600 min Winter	7.244	0.0	1019.1	506	720 min Winter	6.298	0.0	1058.8	570	960 min Winter	5.045	0.0	1119.9	724	1440 min Winter	3.684	0.0	1195.0	1024	2160 min Winter	2.684	0.0	1446.9	1456	2880 min Winter	2.141	0.0	1531.9	1876	4320 min Winter	1.554	0.0	1636.0	2684	5760 min Winter	1.237	0.0	1800.8	3456	7200 min Winter	1.035	0.0	1882.0	4192	8640 min Winter	0.896	0.0	1949.5	4936	10080 min Winter	0.793	0.0	1998.9	5664
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status																																																																																																																																																																															
180 min Winter	99.565	0.265	12.7	751.2	O K																																																																																																																																																																															
240 min Winter	99.576	0.276	13.1	784.1	O K																																																																																																																																																																															
360 min Winter	99.588	0.288	13.6	820.1	O K																																																																																																																																																																															
480 min Winter	99.593	0.293	13.7	834.1	O K																																																																																																																																																																															
600 min Winter	99.594	0.294	13.7	837.3	O K																																																																																																																																																																															
720 min Winter	99.595	0.295	13.8	841.3	O K																																																																																																																																																																															
960 min Winter	99.595	0.295	13.8	840.1	O K																																																																																																																																																																															
1440 min Winter	99.587	0.287	13.5	816.8	O K																																																																																																																																																																															
2160 min Winter	99.570	0.270	12.9	764.5	O K																																																																																																																																																																															
2880 min Winter	99.552	0.252	12.2	710.3	O K																																																																																																																																																																															
4320 min Winter	99.520	0.220	10.9	615.6	O K																																																																																																																																																																															
5760 min Winter	99.495	0.195	9.7	541.5	O K																																																																																																																																																																															
7200 min Winter	99.475	0.175	8.7	483.9	O K																																																																																																																																																																															
8640 min Winter	99.459	0.159	7.9	438.7	O K																																																																																																																																																																															
10080 min Winter	99.446	0.146	7.2	402.0	O K																																																																																																																																																																															
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																
180 min Winter	18.068	0.0	770.3	184																																																																																																																																																																																
240 min Winter	14.537	0.0	825.7	240																																																																																																																																																																																
360 min Winter	10.694	0.0	909.0	352																																																																																																																																																																																
480 min Winter	8.592	0.0	970.6	458																																																																																																																																																																																
600 min Winter	7.244	0.0	1019.1	506																																																																																																																																																																																
720 min Winter	6.298	0.0	1058.8	570																																																																																																																																																																																
960 min Winter	5.045	0.0	1119.9	724																																																																																																																																																																																
1440 min Winter	3.684	0.0	1195.0	1024																																																																																																																																																																																
2160 min Winter	2.684	0.0	1446.9	1456																																																																																																																																																																																
2880 min Winter	2.141	0.0	1531.9	1876																																																																																																																																																																																
4320 min Winter	1.554	0.0	1636.0	2684																																																																																																																																																																																
5760 min Winter	1.237	0.0	1800.8	3456																																																																																																																																																																																
7200 min Winter	1.035	0.0	1882.0	4192																																																																																																																																																																																
8640 min Winter	0.896	0.0	1949.5	4936																																																																																																																																																																																
10080 min Winter	0.793	0.0	1998.9	5664																																																																																																																																																																																
©1982-2012 Micro Drainage Ltd																																																																																																																																																																																				

Michael A Jennings Associates		Page 3																																																
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:100 year Max Discharge =16l/s																																																	
Date 19.03.13 File NORTHERN ATTENUATION PO...	Designed by C.Pendle Checked by																																																	
Micro Drainage Source Control 2013.1																																																		
<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>19.400</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.350</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+0</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 1.810 <table> <thead> <tr> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> </tr> <tr> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> </tr> </thead> <tbody> <tr> <td>0 4</td> <td>0.500</td> <td>4 8</td> <td>0.500</td> <td>8 12</td> <td>0.500</td> <td>12 16</td> <td>0.310</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)	19.400	Shortest Storm (mins)	15	Ratio R	0.350	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+0	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	0 4	0.500	4 8	0.500	8 12	0.500	12 16	0.310
Rainfall Model	FSR	Winter Storms	Yes																																															
Return Period (years)	100	Cv (Summer)	0.750																																															
Region	England and Wales	Cv (Winter)	0.840																																															
M5-60 (mm)	19.400	Shortest Storm (mins)	15																																															
Ratio R	0.350	Longest Storm (mins)	10080																																															
Summer Storms	Yes	Climate Change %	+0																																															
Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area																																											
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)																																											
0 4	0.500	4 8	0.500	8 12	0.500	12 16	0.310																																											
©1982-2012 Micro Drainage Ltd																																																		

Michael A Jennings Associates		Page 4
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:100 year Max Discharge =16l/s	
Date 19.03.13 File NORTHERN ATTENUATION PO...	Designed by C.Pendle Checked by	
Micro Drainage Source Control 2013.1		

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.300

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2646.0	0.700	3632.0	1.400	0.0	2.100	0.0
0.100	2784.0	0.701	0.0	1.500	0.0	2.200	0.0
0.200	2923.0	0.900	0.0	1.600	0.0	2.300	0.0
0.300	3063.0	1.000	0.0	1.700	0.0	2.400	0.0
0.400	3204.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	3346.0	1.200	0.0	1.900	0.0		
0.600	3488.0	1.300	0.0	2.000	0.0		

Hydro-Brake® Outflow Control

Design Head (m) 0.380 Hydro-Brake® Type Md8 Invert Level (m) 99.300
Design Flow (l/s) 16.0 Diameter (mm) 200

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.8	1.200	27.0	3.000	42.4	7.000	64.8
0.200	9.9	1.400	29.0	3.500	45.8	7.500	67.1
0.300	14.0	1.600	31.0	4.000	49.0	8.000	69.3
0.400	16.4	1.800	32.9	4.500	52.0	8.500	71.4
0.500	18.1	2.000	34.6	5.000	54.8	9.000	73.5
0.600	19.7	2.200	36.3	5.500	57.4	9.500	75.5
0.800	22.3	2.400	37.9	6.000	60.0		
1.000	24.7	2.600	39.5	6.500	62.4		

©1982-2012 Micro Drainage Ltd

Michael A Jennings Associates			Page 1																																																																																																																																																																																																																																																																											
58-62 Ock Street Abingdon Oxon OX14 5BZ		Northern Attenuation Pond 1:100year + 30% Max Discharge =16 l/s																																																																																																																																																																																																																																																																												
Date 19.03.13 File NORTHERN ATTENUATION PO...		Designed by C.Pendle Checked by																																																																																																																																																																																																																																																																												
Micro Drainage		Source Control 2013.1																																																																																																																																																																																																																																																																												
Summary of Results for 100 year Return Period (+30%) <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>99.444</td><td>0.144</td><td>7.1</td><td>395.3</td><td>O K</td></tr><tr><td>30 min Summer</td><td>99.490</td><td>0.190</td><td>9.4</td><td>527.4</td><td>O K</td></tr><tr><td>60 min Summer</td><td>99.537</td><td>0.237</td><td>11.6</td><td>666.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>99.583</td><td>0.283</td><td>13.4</td><td>802.8</td><td>O K</td></tr><tr><td>180 min Summer</td><td>99.605</td><td>0.305</td><td>14.1</td><td>871.5</td><td>O K</td></tr><tr><td>240 min Summer</td><td>99.618</td><td>0.318</td><td>14.5</td><td>910.1</td><td>O K</td></tr><tr><td>360 min Summer</td><td>99.631</td><td>0.331</td><td>14.9</td><td>952.6</td><td>O K</td></tr><tr><td>480 min Summer</td><td>99.637</td><td>0.337</td><td>15.0</td><td>969.4</td><td>O K</td></tr><tr><td>600 min Summer</td><td>99.640</td><td>0.340</td><td>15.1</td><td>979.6</td><td>O K</td></tr><tr><td>720 min Summer</td><td>99.642</td><td>0.342</td><td>15.1</td><td>986.2</td><td>O K</td></tr><tr><td>960 min Summer</td><td>99.644</td><td>0.344</td><td>15.2</td><td>991.9</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>99.641</td><td>0.341</td><td>15.1</td><td>983.1</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>99.629</td><td>0.329</td><td>14.8</td><td>946.8</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>99.615</td><td>0.315</td><td>14.4</td><td>901.5</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>99.586</td><td>0.286</td><td>13.5</td><td>812.6</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>99.560</td><td>0.260</td><td>12.5</td><td>735.9</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>99.539</td><td>0.239</td><td>11.7</td><td>673.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>99.522</td><td>0.222</td><td>10.9</td><td>621.9</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>99.508</td><td>0.208</td><td>10.3</td><td>579.5</td><td>O K</td></tr><tr><td>15 min Winter</td><td>99.461</td><td>0.161</td><td>8.0</td><td>442.8</td><td>O K</td></tr><tr><td>30 min Winter</td><td>99.512</td><td>0.212</td><td>10.5</td><td>591.0</td><td>O K</td></tr><tr><td>60 min Winter</td><td>99.564</td><td>0.264</td><td>12.7</td><td>747.9</td><td>O K</td></tr><tr><td>120 min Winter</td><td>99.615</td><td>0.315</td><td>14.4</td><td>902.1</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>118.408</td><td>0.0</td><td>306.1</td><td>30</td></tr><tr><td>30 min Summer</td><td>79.579</td><td>0.0</td><td>416.0</td><td>44</td></tr><tr><td>60 min Summer</td><td>51.031</td><td>0.0</td><td>647.8</td><td>72</td></tr><tr><td>120 min Summer</td><td>31.581</td><td>0.0</td><td>803.2</td><td>130</td></tr><tr><td>180 min Summer</td><td>23.488</td><td>0.0</td><td>895.7</td><td>188</td></tr><tr><td>240 min Summer</td><td>18.897</td><td>0.0</td><td>959.8</td><td>246</td></tr><tr><td>360 min Summer</td><td>13.902</td><td>0.0</td><td>1055.9</td><td>362</td></tr><tr><td>480 min Summer</td><td>11.169</td><td>0.0</td><td>1127.0</td><td>452</td></tr><tr><td>600 min Summer</td><td>9.417</td><td>0.0</td><td>1182.7</td><td>506</td></tr><tr><td>720 min Summer</td><td>8.187</td><td>0.0</td><td>1228.2</td><td>566</td></tr><tr><td>960 min Summer</td><td>6.558</td><td>0.0</td><td>1297.9</td><td>692</td></tr><tr><td>1440 min Summer</td><td>4.789</td><td>0.0</td><td>1382.2</td><td>966</td></tr><tr><td>2160 min Summer</td><td>3.489</td><td>0.0</td><td>1680.3</td><td>1372</td></tr><tr><td>2880 min Summer</td><td>2.783</td><td>0.0</td><td>1779.2</td><td>1772</td></tr><tr><td>4320 min Summer</td><td>2.020</td><td>0.0</td><td>1900.4</td><td>2556</td></tr><tr><td>5760 min Summer</td><td>1.607</td><td>0.0</td><td>2090.5</td><td>3336</td></tr><tr><td>7200 min Summer</td><td>1.346</td><td>0.0</td><td>2184.9</td><td>4048</td></tr><tr><td>8640 min Summer</td><td>1.165</td><td>0.0</td><td>2263.4</td><td>4832</td></tr><tr><td>10080 min Summer</td><td>1.032</td><td>0.0</td><td>2320.2</td><td>5552</td></tr><tr><td>15 min Winter</td><td>118.408</td><td>0.0</td><td>344.8</td><td>30</td></tr><tr><td>30 min Winter</td><td>79.579</td><td>0.0</td><td>467.6</td><td>43</td></tr><tr><td>60 min Winter</td><td>51.031</td><td>0.0</td><td>726.9</td><td>72</td></tr><tr><td>120 min Winter</td><td>31.581</td><td>0.0</td><td>900.7</td><td>128</td></tr></tbody></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	99.444	0.144	7.1	395.3	O K	30 min Summer	99.490	0.190	9.4	527.4	O K	60 min Summer	99.537	0.237	11.6	666.9	O K	120 min Summer	99.583	0.283	13.4	802.8	O K	180 min Summer	99.605	0.305	14.1	871.5	O K	240 min Summer	99.618	0.318	14.5	910.1	O K	360 min Summer	99.631	0.331	14.9	952.6	O K	480 min Summer	99.637	0.337	15.0	969.4	O K	600 min Summer	99.640	0.340	15.1	979.6	O K	720 min Summer	99.642	0.342	15.1	986.2	O K	960 min Summer	99.644	0.344	15.2	991.9	O K	1440 min Summer	99.641	0.341	15.1	983.1	O K	2160 min Summer	99.629	0.329	14.8	946.8	O K	2880 min Summer	99.615	0.315	14.4	901.5	O K	4320 min Summer	99.586	0.286	13.5	812.6	O K	5760 min Summer	99.560	0.260	12.5	735.9	O K	7200 min Summer	99.539	0.239	11.7	673.1	O K	8640 min Summer	99.522	0.222	10.9	621.9	O K	10080 min Summer	99.508	0.208	10.3	579.5	O K	15 min Winter	99.461	0.161	8.0	442.8	O K	30 min Winter	99.512	0.212	10.5	591.0	O K	60 min Winter	99.564	0.264	12.7	747.9	O K	120 min Winter	99.615	0.315	14.4	902.1	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	118.408	0.0	306.1	30	30 min Summer	79.579	0.0	416.0	44	60 min Summer	51.031	0.0	647.8	72	120 min Summer	31.581	0.0	803.2	130	180 min Summer	23.488	0.0	895.7	188	240 min Summer	18.897	0.0	959.8	246	360 min Summer	13.902	0.0	1055.9	362	480 min Summer	11.169	0.0	1127.0	452	600 min Summer	9.417	0.0	1182.7	506	720 min Summer	8.187	0.0	1228.2	566	960 min Summer	6.558	0.0	1297.9	692	1440 min Summer	4.789	0.0	1382.2	966	2160 min Summer	3.489	0.0	1680.3	1372	2880 min Summer	2.783	0.0	1779.2	1772	4320 min Summer	2.020	0.0	1900.4	2556	5760 min Summer	1.607	0.0	2090.5	3336	7200 min Summer	1.346	0.0	2184.9	4048	8640 min Summer	1.165	0.0	2263.4	4832	10080 min Summer	1.032	0.0	2320.2	5552	15 min Winter	118.408	0.0	344.8	30	30 min Winter	79.579	0.0	467.6	43	60 min Winter	51.031	0.0	726.9	72	120 min Winter	31.581	0.0	900.7	128
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																									
15 min Summer	99.444	0.144	7.1	395.3	O K																																																																																																																																																																																																																																																																									
30 min Summer	99.490	0.190	9.4	527.4	O K																																																																																																																																																																																																																																																																									
60 min Summer	99.537	0.237	11.6	666.9	O K																																																																																																																																																																																																																																																																									
120 min Summer	99.583	0.283	13.4	802.8	O K																																																																																																																																																																																																																																																																									
180 min Summer	99.605	0.305	14.1	871.5	O K																																																																																																																																																																																																																																																																									
240 min Summer	99.618	0.318	14.5	910.1	O K																																																																																																																																																																																																																																																																									
360 min Summer	99.631	0.331	14.9	952.6	O K																																																																																																																																																																																																																																																																									
480 min Summer	99.637	0.337	15.0	969.4	O K																																																																																																																																																																																																																																																																									
600 min Summer	99.640	0.340	15.1	979.6	O K																																																																																																																																																																																																																																																																									
720 min Summer	99.642	0.342	15.1	986.2	O K																																																																																																																																																																																																																																																																									
960 min Summer	99.644	0.344	15.2	991.9	O K																																																																																																																																																																																																																																																																									
1440 min Summer	99.641	0.341	15.1	983.1	O K																																																																																																																																																																																																																																																																									
2160 min Summer	99.629	0.329	14.8	946.8	O K																																																																																																																																																																																																																																																																									
2880 min Summer	99.615	0.315	14.4	901.5	O K																																																																																																																																																																																																																																																																									
4320 min Summer	99.586	0.286	13.5	812.6	O K																																																																																																																																																																																																																																																																									
5760 min Summer	99.560	0.260	12.5	735.9	O K																																																																																																																																																																																																																																																																									
7200 min Summer	99.539	0.239	11.7	673.1	O K																																																																																																																																																																																																																																																																									
8640 min Summer	99.522	0.222	10.9	621.9	O K																																																																																																																																																																																																																																																																									
10080 min Summer	99.508	0.208	10.3	579.5	O K																																																																																																																																																																																																																																																																									
15 min Winter	99.461	0.161	8.0	442.8	O K																																																																																																																																																																																																																																																																									
30 min Winter	99.512	0.212	10.5	591.0	O K																																																																																																																																																																																																																																																																									
60 min Winter	99.564	0.264	12.7	747.9	O K																																																																																																																																																																																																																																																																									
120 min Winter	99.615	0.315	14.4	902.1	O K																																																																																																																																																																																																																																																																									
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																										
15 min Summer	118.408	0.0	306.1	30																																																																																																																																																																																																																																																																										
30 min Summer	79.579	0.0	416.0	44																																																																																																																																																																																																																																																																										
60 min Summer	51.031	0.0	647.8	72																																																																																																																																																																																																																																																																										
120 min Summer	31.581	0.0	803.2	130																																																																																																																																																																																																																																																																										
180 min Summer	23.488	0.0	895.7	188																																																																																																																																																																																																																																																																										
240 min Summer	18.897	0.0	959.8	246																																																																																																																																																																																																																																																																										
360 min Summer	13.902	0.0	1055.9	362																																																																																																																																																																																																																																																																										
480 min Summer	11.169	0.0	1127.0	452																																																																																																																																																																																																																																																																										
600 min Summer	9.417	0.0	1182.7	506																																																																																																																																																																																																																																																																										
720 min Summer	8.187	0.0	1228.2	566																																																																																																																																																																																																																																																																										
960 min Summer	6.558	0.0	1297.9	692																																																																																																																																																																																																																																																																										
1440 min Summer	4.789	0.0	1382.2	966																																																																																																																																																																																																																																																																										
2160 min Summer	3.489	0.0	1680.3	1372																																																																																																																																																																																																																																																																										
2880 min Summer	2.783	0.0	1779.2	1772																																																																																																																																																																																																																																																																										
4320 min Summer	2.020	0.0	1900.4	2556																																																																																																																																																																																																																																																																										
5760 min Summer	1.607	0.0	2090.5	3336																																																																																																																																																																																																																																																																										
7200 min Summer	1.346	0.0	2184.9	4048																																																																																																																																																																																																																																																																										
8640 min Summer	1.165	0.0	2263.4	4832																																																																																																																																																																																																																																																																										
10080 min Summer	1.032	0.0	2320.2	5552																																																																																																																																																																																																																																																																										
15 min Winter	118.408	0.0	344.8	30																																																																																																																																																																																																																																																																										
30 min Winter	79.579	0.0	467.6	43																																																																																																																																																																																																																																																																										
60 min Winter	51.031	0.0	726.9	72																																																																																																																																																																																																																																																																										
120 min Winter	31.581	0.0	900.7	128																																																																																																																																																																																																																																																																										
©1982-2012 Micro Drainage Ltd																																																																																																																																																																																																																																																																														

Michael A Jennings Associates			Page 2																																																																																																																																																																																																	
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:100year + 30% Max Discharge =16 l/s																																																																																																																																																																																																			
Date 19.03.13 File NORTHERN ATTENUATION PO...	Designed by C.Pendle Checked by																																																																																																																																																																																																			
Micro Drainage	Source Control 2013.1																																																																																																																																																																																																			
<u>Summary of Results for 100 year Return Period (+30%)</u> <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>180 min Winter</td><td>99.641</td><td>0.341</td><td>15.1</td><td>981.4</td><td>O K</td></tr><tr><td>240 min Winter</td><td>99.655</td><td>0.355</td><td>15.4</td><td>1027.0</td><td>O K</td></tr><tr><td>360 min Winter</td><td>99.672</td><td>0.372</td><td>15.8</td><td>1079.5</td><td>O K</td></tr><tr><td>480 min Winter</td><td>99.679</td><td>0.379</td><td>15.9</td><td>1103.1</td><td>O K</td></tr><tr><td>600 min Winter</td><td>99.682</td><td>0.382</td><td>16.0</td><td>1110.7</td><td>O K</td></tr><tr><td>720 min Winter</td><td>99.682</td><td>0.382</td><td>16.0</td><td>1111.8</td><td>O K</td></tr><tr><td>960 min Winter</td><td>99.682</td><td>0.382</td><td>16.0</td><td>1112.6</td><td>O K</td></tr><tr><td>1440 min Winter</td><td>99.674</td><td>0.374</td><td>15.8</td><td>1085.9</td><td>O K</td></tr><tr><td>2160 min Winter</td><td>99.652</td><td>0.352</td><td>15.4</td><td>1018.6</td><td>O K</td></tr><tr><td>2880 min Winter</td><td>99.629</td><td>0.329</td><td>14.8</td><td>945.7</td><td>O K</td></tr><tr><td>4320 min Winter</td><td>99.587</td><td>0.287</td><td>13.5</td><td>815.3</td><td>O K</td></tr><tr><td>5760 min Winter</td><td>99.553</td><td>0.253</td><td>12.2</td><td>712.8</td><td>O K</td></tr><tr><td>7200 min Winter</td><td>99.526</td><td>0.226</td><td>11.1</td><td>633.3</td><td>O K</td></tr><tr><td>8640 min Winter</td><td>99.505</td><td>0.205</td><td>10.2</td><td>571.2</td><td>O K</td></tr><tr><td>10080 min Winter</td><td>99.488</td><td>0.188</td><td>9.3</td><td>521.4</td><td>O K</td></tr><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th><th></th></tr><tr><td>180 min Winter</td><td>23.488</td><td>0.0</td><td>1004.0</td><td>184</td><td></td></tr><tr><td>240 min Winter</td><td>18.897</td><td>0.0</td><td>1075.5</td><td>242</td><td></td></tr><tr><td>360 min Winter</td><td>13.902</td><td>0.0</td><td>1182.5</td><td>354</td><td></td></tr><tr><td>480 min Winter</td><td>11.169</td><td>0.0</td><td>1261.5</td><td>464</td><td></td></tr><tr><td>600 min Winter</td><td>9.417</td><td>0.0</td><td>1323.3</td><td>566</td><td></td></tr><tr><td>720 min Winter</td><td>8.187</td><td>0.0</td><td>1373.5</td><td>592</td><td></td></tr><tr><td>960 min Winter</td><td>6.558</td><td>0.0</td><td>1450.2</td><td>740</td><td></td></tr><tr><td>1440 min Winter</td><td>4.789</td><td>0.0</td><td>1541.4</td><td>1044</td><td></td></tr><tr><td>2160 min Winter</td><td>3.489</td><td>0.0</td><td>1882.4</td><td>1480</td><td></td></tr><tr><td>2880 min Winter</td><td>2.783</td><td>0.0</td><td>1993.3</td><td>1904</td><td></td></tr><tr><td>4320 min Winter</td><td>2.020</td><td>0.0</td><td>2129.6</td><td>2696</td><td></td></tr><tr><td>5760 min Winter</td><td>1.607</td><td>0.0</td><td>2341.7</td><td>3464</td><td></td></tr><tr><td>7200 min Winter</td><td>1.346</td><td>0.0</td><td>2447.8</td><td>4248</td><td></td></tr><tr><td>8640 min Winter</td><td>1.165</td><td>0.0</td><td>2536.3</td><td>5008</td><td></td></tr><tr><td>10080 min Winter</td><td>1.032</td><td>0.0</td><td>2602.0</td><td>5744</td><td></td></tr></table>					Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	180 min Winter	99.641	0.341	15.1	981.4	O K	240 min Winter	99.655	0.355	15.4	1027.0	O K	360 min Winter	99.672	0.372	15.8	1079.5	O K	480 min Winter	99.679	0.379	15.9	1103.1	O K	600 min Winter	99.682	0.382	16.0	1110.7	O K	720 min Winter	99.682	0.382	16.0	1111.8	O K	960 min Winter	99.682	0.382	16.0	1112.6	O K	1440 min Winter	99.674	0.374	15.8	1085.9	O K	2160 min Winter	99.652	0.352	15.4	1018.6	O K	2880 min Winter	99.629	0.329	14.8	945.7	O K	4320 min Winter	99.587	0.287	13.5	815.3	O K	5760 min Winter	99.553	0.253	12.2	712.8	O K	7200 min Winter	99.526	0.226	11.1	633.3	O K	8640 min Winter	99.505	0.205	10.2	571.2	O K	10080 min Winter	99.488	0.188	9.3	521.4	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		180 min Winter	23.488	0.0	1004.0	184		240 min Winter	18.897	0.0	1075.5	242		360 min Winter	13.902	0.0	1182.5	354		480 min Winter	11.169	0.0	1261.5	464		600 min Winter	9.417	0.0	1323.3	566		720 min Winter	8.187	0.0	1373.5	592		960 min Winter	6.558	0.0	1450.2	740		1440 min Winter	4.789	0.0	1541.4	1044		2160 min Winter	3.489	0.0	1882.4	1480		2880 min Winter	2.783	0.0	1993.3	1904		4320 min Winter	2.020	0.0	2129.6	2696		5760 min Winter	1.607	0.0	2341.7	3464		7200 min Winter	1.346	0.0	2447.8	4248		8640 min Winter	1.165	0.0	2536.3	5008		10080 min Winter	1.032	0.0	2602.0	5744	
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status																																																																																																																																																																																															
180 min Winter	99.641	0.341	15.1	981.4	O K																																																																																																																																																																																															
240 min Winter	99.655	0.355	15.4	1027.0	O K																																																																																																																																																																																															
360 min Winter	99.672	0.372	15.8	1079.5	O K																																																																																																																																																																																															
480 min Winter	99.679	0.379	15.9	1103.1	O K																																																																																																																																																																																															
600 min Winter	99.682	0.382	16.0	1110.7	O K																																																																																																																																																																																															
720 min Winter	99.682	0.382	16.0	1111.8	O K																																																																																																																																																																																															
960 min Winter	99.682	0.382	16.0	1112.6	O K																																																																																																																																																																																															
1440 min Winter	99.674	0.374	15.8	1085.9	O K																																																																																																																																																																																															
2160 min Winter	99.652	0.352	15.4	1018.6	O K																																																																																																																																																																																															
2880 min Winter	99.629	0.329	14.8	945.7	O K																																																																																																																																																																																															
4320 min Winter	99.587	0.287	13.5	815.3	O K																																																																																																																																																																																															
5760 min Winter	99.553	0.253	12.2	712.8	O K																																																																																																																																																																																															
7200 min Winter	99.526	0.226	11.1	633.3	O K																																																																																																																																																																																															
8640 min Winter	99.505	0.205	10.2	571.2	O K																																																																																																																																																																																															
10080 min Winter	99.488	0.188	9.3	521.4	O K																																																																																																																																																																																															
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																
180 min Winter	23.488	0.0	1004.0	184																																																																																																																																																																																																
240 min Winter	18.897	0.0	1075.5	242																																																																																																																																																																																																
360 min Winter	13.902	0.0	1182.5	354																																																																																																																																																																																																
480 min Winter	11.169	0.0	1261.5	464																																																																																																																																																																																																
600 min Winter	9.417	0.0	1323.3	566																																																																																																																																																																																																
720 min Winter	8.187	0.0	1373.5	592																																																																																																																																																																																																
960 min Winter	6.558	0.0	1450.2	740																																																																																																																																																																																																
1440 min Winter	4.789	0.0	1541.4	1044																																																																																																																																																																																																
2160 min Winter	3.489	0.0	1882.4	1480																																																																																																																																																																																																
2880 min Winter	2.783	0.0	1993.3	1904																																																																																																																																																																																																
4320 min Winter	2.020	0.0	2129.6	2696																																																																																																																																																																																																
5760 min Winter	1.607	0.0	2341.7	3464																																																																																																																																																																																																
7200 min Winter	1.346	0.0	2447.8	4248																																																																																																																																																																																																
8640 min Winter	1.165	0.0	2536.3	5008																																																																																																																																																																																																
10080 min Winter	1.032	0.0	2602.0	5744																																																																																																																																																																																																
©1982-2012 Micro Drainage Ltd																																																																																																																																																																																																				

Michael A Jennings Associates		Page 3																																																
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:100year + 30% Max Discharge =16 l/s																																																	
Date 19.03.13 File NORTHERN ATTENUATION PO...	Designed by C.Pendle Checked by																																																	
Micro Drainage Source Control 2013.1																																																		
<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>19.400</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.350</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) 1.810 <table> <thead> <tr> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> </tr> <tr> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> <th>From: To:</th> <th>(ha)</th> </tr> </thead> <tbody> <tr> <td>0 4</td> <td>0.500</td> <td>4 8</td> <td>0.500</td> <td>8 12</td> <td>0.500</td> <td>12 16</td> <td>0.310</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)	19.400	Shortest Storm (mins)	15	Ratio R	0.350	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	0 4	0.500	4 8	0.500	8 12	0.500	12 16	0.310
Rainfall Model	FSR	Winter Storms	Yes																																															
Return Period (years)	100	Cv (Summer)	0.750																																															
Region	England and Wales	Cv (Winter)	0.840																																															
M5-60 (mm)	19.400	Shortest Storm (mins)	15																																															
Ratio R	0.350	Longest Storm (mins)	10080																																															
Summer Storms	Yes	Climate Change %	+30																																															
Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area																																											
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)																																											
0 4	0.500	4 8	0.500	8 12	0.500	12 16	0.310																																											
©1982-2012 Micro Drainage Ltd																																																		

Michael A Jennings Associates		Page 4																																																																																																																																								
58-62 Ock Street Abingdon Oxon OX14 5BZ	Northern Attenuation Pond 1:100year + 30% Max Discharge =16 l/s																																																																																																																																									
Date 19.03.13 File NORTHERN ATTENUATION PO...	Designed by C.Pendle Checked by																																																																																																																																									
Micro Drainage Source Control 2013.1																																																																																																																																										
Model Details Storage is Online Cover Level (m) 100.000 Tank or Pond Structure Invert Level (m) 99.300 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>2646.0</td><td>0.700</td><td>3632.0</td><td>1.400</td><td>0.0</td><td>2.100</td><td>0.0</td></tr><tr><td>0.100</td><td>2784.0</td><td>0.701</td><td>0.0</td><td>1.500</td><td>0.0</td><td>2.200</td><td>0.0</td></tr><tr><td>0.200</td><td>2923.0</td><td>0.900</td><td>0.0</td><td>1.600</td><td>0.0</td><td>2.300</td><td>0.0</td></tr><tr><td>0.300</td><td>3063.0</td><td>1.000</td><td>0.0</td><td>1.700</td><td>0.0</td><td>2.400</td><td>0.0</td></tr><tr><td>0.400</td><td>3204.0</td><td>1.100</td><td>0.0</td><td>1.800</td><td>0.0</td><td>2.500</td><td>0.0</td></tr><tr><td>0.500</td><td>3346.0</td><td>1.200</td><td>0.0</td><td>1.900</td><td>0.0</td><td></td><td></td></tr><tr><td>0.600</td><td>3488.0</td><td>1.300</td><td>0.0</td><td>2.000</td><td>0.0</td><td></td><td></td></tr></tbody></table> Hydro-Brake® Outflow Control Design Head (m) 0.380 Hydro-Brake® Type Md8 Invert Level (m) 99.300 Design Flow (l/s) 16.0 Diameter (mm) 200 <table><thead><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>0.100</td><td>4.8</td><td>1.200</td><td>27.0</td><td>3.000</td><td>42.4</td><td>7.000</td><td>64.8</td></tr><tr><td>0.200</td><td>9.9</td><td>1.400</td><td>29.0</td><td>3.500</td><td>45.8</td><td>7.500</td><td>67.1</td></tr><tr><td>0.300</td><td>14.0</td><td>1.600</td><td>31.0</td><td>4.000</td><td>49.0</td><td>8.000</td><td>69.3</td></tr><tr><td>0.400</td><td>16.4</td><td>1.800</td><td>32.9</td><td>4.500</td><td>52.0</td><td>8.500</td><td>71.4</td></tr><tr><td>0.500</td><td>18.1</td><td>2.000</td><td>34.6</td><td>5.000</td><td>54.8</td><td>9.000</td><td>73.5</td></tr><tr><td>0.600</td><td>19.7</td><td>2.200</td><td>36.3</td><td>5.500</td><td>57.4</td><td>9.500</td><td>75.5</td></tr><tr><td>0.800</td><td>22.3</td><td>2.400</td><td>37.9</td><td>6.000</td><td>60.0</td><td></td><td></td></tr><tr><td>1.000</td><td>24.7</td><td>2.600</td><td>39.5</td><td>6.500</td><td>62.4</td><td></td><td></td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	2646.0	0.700	3632.0	1.400	0.0	2.100	0.0	0.100	2784.0	0.701	0.0	1.500	0.0	2.200	0.0	0.200	2923.0	0.900	0.0	1.600	0.0	2.300	0.0	0.300	3063.0	1.000	0.0	1.700	0.0	2.400	0.0	0.400	3204.0	1.100	0.0	1.800	0.0	2.500	0.0	0.500	3346.0	1.200	0.0	1.900	0.0			0.600	3488.0	1.300	0.0	2.000	0.0			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	4.8	1.200	27.0	3.000	42.4	7.000	64.8	0.200	9.9	1.400	29.0	3.500	45.8	7.500	67.1	0.300	14.0	1.600	31.0	4.000	49.0	8.000	69.3	0.400	16.4	1.800	32.9	4.500	52.0	8.500	71.4	0.500	18.1	2.000	34.6	5.000	54.8	9.000	73.5	0.600	19.7	2.200	36.3	5.500	57.4	9.500	75.5	0.800	22.3	2.400	37.9	6.000	60.0			1.000	24.7	2.600	39.5	6.500	62.4		
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																																																																																			
0.000	2646.0	0.700	3632.0	1.400	0.0	2.100	0.0																																																																																																																																			
0.100	2784.0	0.701	0.0	1.500	0.0	2.200	0.0																																																																																																																																			
0.200	2923.0	0.900	0.0	1.600	0.0	2.300	0.0																																																																																																																																			
0.300	3063.0	1.000	0.0	1.700	0.0	2.400	0.0																																																																																																																																			
0.400	3204.0	1.100	0.0	1.800	0.0	2.500	0.0																																																																																																																																			
0.500	3346.0	1.200	0.0	1.900	0.0																																																																																																																																					
0.600	3488.0	1.300	0.0	2.000	0.0																																																																																																																																					
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																																																																																			
0.100	4.8	1.200	27.0	3.000	42.4	7.000	64.8																																																																																																																																			
0.200	9.9	1.400	29.0	3.500	45.8	7.500	67.1																																																																																																																																			
0.300	14.0	1.600	31.0	4.000	49.0	8.000	69.3																																																																																																																																			
0.400	16.4	1.800	32.9	4.500	52.0	8.500	71.4																																																																																																																																			
0.500	18.1	2.000	34.6	5.000	54.8	9.000	73.5																																																																																																																																			
0.600	19.7	2.200	36.3	5.500	57.4	9.500	75.5																																																																																																																																			
0.800	22.3	2.400	37.9	6.000	60.0																																																																																																																																					
1.000	24.7	2.600	39.5	6.500	62.4																																																																																																																																					
©1982-2012 Micro Drainage Ltd																																																																																																																																										

Michael A Jennings Associates				Page 1		
58-62 Ock Street Abingdon Oxon OX14 5BZ		Southern Attenuation Pond 1:2 year Max Discharge =12 l/s				
Date 19.03.13 File Southern Attenuation Pond - ...		Designed by C.Pendle Checked by				
Micro Drainage		Source Control 2013.1				
Summary of Results for 2 year Return Period						
Storm Event		Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer		99.360	0.060	1.7	182.7	O K
30 min Summer		99.379	0.079	2.7	240.3	O K
60 min Summer		99.399	0.099	3.9	303.2	O K
120 min Summer		99.420	0.120	5.1	370.7	O K
180 min Summer		99.432	0.132	5.8	410.8	O K
240 min Summer		99.440	0.140	6.3	438.2	O K
360 min Summer		99.450	0.150	6.9	471.4	O K
480 min Summer		99.456	0.156	7.1	489.4	O K
600 min Summer		99.460	0.160	7.3	502.5	O K
720 min Summer		99.463	0.163	7.5	513.3	O K
960 min Summer		99.468	0.168	7.7	529.8	O K
1440 min Summer		99.473	0.173	7.9	548.0	O K
2160 min Summer		99.475	0.175	8.0	554.8	O K
2880 min Summer		99.474	0.174	7.9	550.0	O K
4320 min Summer		99.467	0.167	7.7	528.1	O K
5760 min Summer		99.460	0.160	7.3	502.3	O K
7200 min Summer		99.452	0.152	7.0	477.8	O K
8640 min Summer		99.445	0.145	6.6	455.3	O K
10080 min Summer		99.440	0.140	6.3	435.7	O K
15 min Winter		99.367	0.067	2.0	204.5	O K
30 min Winter		99.388	0.088	3.2	269.0	O K
60 min Winter		99.410	0.110	4.5	339.4	O K
120 min Winter		99.433	0.133	5.9	415.1	O K
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		37.154	0.0	84.5	35	
30 min Summer		24.581	0.0	125.7	49	
60 min Summer		15.691	0.0	228.8	78	
120 min Summer		9.821	0.0	299.2	136	
180 min Summer		7.430	0.0	346.4	192	
240 min Summer		6.089	0.0	383.0	250	
360 min Summer		4.578	0.0	437.5	364	
480 min Summer		3.735	0.0	478.9	464	
600 min Summer		3.190	0.0	512.5	514	
720 min Summer		2.803	0.0	540.8	572	
960 min Summer		2.286	0.0	586.3	696	
1440 min Summer		1.716	0.0	647.9	968	
2160 min Summer		1.287	0.0	845.6	1376	
2880 min Summer		1.049	0.0	914.5	1776	
4320 min Summer		0.787	0.0	1004.1	2560	
5760 min Summer		0.642	0.0	1181.2	3336	
7200 min Summer		0.548	0.0	1255.4	4056	
8640 min Summer		0.481	0.0	1312.2	4840	
10080 min Summer		0.431	0.0	1352.0	5552	
15 min Winter		37.154	0.0	99.6	34	
30 min Winter		24.581	0.0	147.0	48	
60 min Winter		15.691	0.0	262.7	76	
120 min Winter		9.821	0.0	342.1	132	
©1982-2012 Micro Drainage Ltd						

Michael A Jennings Associates			Page 2		
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:2 year Max Discharge =12 l/s				
Date 19.03.13 File Southern Attenuation Pond - ...	Designed by C.Pendle Checked by				
Micro Drainage	Source Control 2013.1				
Summary of Results for 2 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	99.447	0.147	6.7	460.4	O K
240 min Winter	99.456	0.156	7.2	491.7	O K
360 min Winter	99.468	0.168	7.7	530.2	O K
480 min Winter	99.474	0.174	8.0	551.9	O K
600 min Winter	99.478	0.178	8.1	564.7	O K
720 min Winter	99.481	0.181	8.2	574.4	O K
960 min Winter	99.486	0.186	8.4	589.9	O K
1440 min Winter	99.489	0.189	8.5	600.9	O K
2160 min Winter	99.487	0.187	8.4	593.2	O K
2880 min Winter	99.481	0.181	8.2	574.7	O K
4320 min Winter	99.468	0.168	7.7	531.1	O K
5760 min Winter	99.456	0.156	7.2	490.7	O K
7200 min Winter	99.446	0.146	6.6	456.2	O K
8640 min Winter	99.437	0.137	6.1	427.0	O K
10080 min Winter	99.429	0.129	5.7	402.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
180 min Winter	7.430	0.0	395.3	188	
240 min Winter	6.089	0.0	436.5	244	
360 min Winter	4.578	0.0	497.7	356	
480 min Winter	3.735	0.0	544.2	466	
600 min Winter	3.190	0.0	581.9	564	
720 min Winter	2.803	0.0	613.7	588	
960 min Winter	2.286	0.0	664.6	738	
1440 min Winter	1.716	0.0	733.3	1042	
2160 min Winter	1.287	0.0	953.3	1484	
2880 min Winter	1.049	0.0	1031.2	1904	
4320 min Winter	0.787	0.0	1133.5	2696	
5760 min Winter	0.642	0.0	1327.2	3472	
7200 min Winter	0.548	0.0	1411.1	4248	
8640 min Winter	0.481	0.0	1476.0	5008	
10080 min Winter	0.431	0.0	1522.6	5752	
©1982-2012 Micro Drainage Ltd					

Michael A Jennings Associates		Page 3
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:2 year Max Discharge =12 l/s	
Date 19.03.13 File Southern Attenuation Pond - ...	Designed by C.Pendle Checked by	
Micro Drainage Source Control 2013.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 2.643

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4 0.500	8	12 0.500	16	20 0.643
4	8 0.500	12	16 0.500		

©1982-2012 Micro Drainage Ltd

Michael A Jennings Associates		Page 4
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:2 year Max Discharge =12 l/s	
Date 19.03.13 File Southern Attenuation Pond - ...	Designed by C.Pendle Checked by	
Micro Drainage	Source Control 2013.1	

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.300

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2960.0	0.700	4671.0	1.400	0.0	2.100	0.0
0.100	3194.0	0.701	0.0	1.500	0.0	2.200	0.0
0.200	3435.0	0.900	0.0	1.600	0.0	2.300	0.0
0.300	3673.0	1.000	0.0	1.700	0.0	2.400	0.0
0.400	3919.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	4167.0	1.200	0.0	1.900	0.0		
0.600	4417.0	1.300	0.0	2.000	0.0		

Hydro-Brake® Outflow Control

Design Head (m) 0.530 Hydro-Brake® Type Md7 Invert Level (m) 99.300
Design Flow (l/s) 12.0 Diameter (mm) 156

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.9	1.200	18.0	3.000	28.4	7.000	43.5
0.200	8.8	1.400	19.4	3.500	30.7	7.500	45.0
0.300	9.0	1.600	20.8	4.000	32.8	8.000	46.5
0.400	10.4	1.800	22.0	4.500	34.8	8.500	47.9
0.500	11.6	2.000	23.2	5.000	36.7	9.000	49.3
0.600	12.7	2.200	24.4	5.500	38.5	9.500	50.6
0.800	14.7	2.400	25.4	6.000	40.2		
1.000	16.4	2.600	26.5	6.500	41.9		

Michael A Jennings Associates				Page 1		
58-62 Ock Street Abingdon Oxon OX14 5BZ		Southern Attenuation Pond 1:10 year Max Discharge =12 l/s				
Date 19.03.13 File SOUTHERN ATTENUATION PO...		Designed by C.Pendle Checked by				
Micro Drainage		Source Control 2013.1				
Summary of Results for 10 year Return Period						
	Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
	15 min Summer	99.389	0.089	3.3	272.8	O K
	30 min Summer	99.416	0.116	4.9	357.5	O K
	60 min Summer	99.443	0.143	6.5	447.7	O K
	120 min Summer	99.471	0.171	7.8	540.9	O K
	180 min Summer	99.487	0.187	8.4	594.1	O K
	240 min Summer	99.497	0.197	8.7	629.2	O K
	360 min Summer	99.510	0.210	9.0	673.7	O K
	480 min Summer	99.517	0.217	9.0	699.1	O K
	600 min Summer	99.522	0.222	9.1	714.5	O K
	720 min Summer	99.525	0.225	9.1	727.2	O K
	960 min Summer	99.531	0.231	9.1	745.4	O K
	1440 min Summer	99.536	0.236	9.1	763.7	O K
	2160 min Summer	99.536	0.236	9.1	764.7	O K
	2880 min Summer	99.532	0.232	9.1	750.1	O K
	4320 min Summer	99.519	0.219	9.1	704.1	O K
	5760 min Summer	99.505	0.205	8.9	656.1	O K
	7200 min Summer	99.493	0.193	8.6	613.5	O K
	8640 min Summer	99.482	0.182	8.2	576.9	O K
	10080 min Summer	99.473	0.173	7.9	545.7	O K
	15 min Winter	99.399	0.099	3.9	305.4	O K
	30 min Winter	99.429	0.129	5.7	400.2	O K
	60 min Winter	99.459	0.159	7.3	501.6	O K
	120 min Winter	99.491	0.191	8.5	607.1	O K
	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
	15 min Summer	55.614	0.0	149.5	34	
	30 min Summer	36.694	0.0	215.5	49	
	60 min Summer	23.276	0.0	366.5	78	
	120 min Summer	14.404	0.0	467.0	134	
	180 min Summer	10.791	0.0	531.1	192	
	240 min Summer	8.764	0.0	578.9	250	
	360 min Summer	6.528	0.0	650.7	366	
	480 min Summer	5.292	0.0	704.4	482	
	600 min Summer	4.495	0.0	747.1	554	
	720 min Summer	3.932	0.0	782.3	614	
	960 min Summer	3.183	0.0	837.1	740	
	1440 min Summer	2.361	0.0	905.4	1010	
	2160 min Summer	1.750	0.0	1167.3	1420	
	2880 min Summer	1.414	0.0	1251.4	1828	
	4320 min Summer	1.047	0.0	1357.9	2608	
	5760 min Summer	0.846	0.0	1566.7	3360	
	7200 min Summer	0.716	0.0	1652.8	4112	
	8640 min Summer	0.626	0.0	1720.8	4848	
	10080 min Summer	0.558	0.0	1768.0	5560	
	15 min Winter	55.614	0.0	174.2	34	
	30 min Winter	36.694	0.0	249.1	48	
	60 min Winter	23.276	0.0	417.8	76	
	120 min Winter	14.404	0.0	530.5	132	
©1982-2012 Micro Drainage Ltd						

Michael A Jennings Associates			Page 2		
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:10 year Max Discharge =12 l/s				
Date 19.03.13 File SOUTHERN ATTENUATION PO...	Designed by C.Pendle Checked by				
Micro Drainage	Source Control 2013.1				
Summary of Results for 10 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	99.508	0.208	8.9	668.1	O K
240 min Winter	99.520	0.220	9.1	709.3	O K
360 min Winter	99.536	0.236	9.1	764.0	O K
480 min Winter	99.546	0.246	9.1	798.1	O K
600 min Winter	99.552	0.252	9.1	820.0	O K
720 min Winter	99.556	0.256	9.1	833.7	O K
960 min Winter	99.559	0.259	9.1	845.9	O K
1440 min Winter	99.562	0.262	9.1	857.0	O K
2160 min Winter	99.558	0.258	9.1	840.6	O K
2880 min Winter	99.547	0.247	9.1	804.6	O K
4320 min Winter	99.523	0.223	9.1	717.3	O K
5760 min Winter	99.501	0.201	8.8	643.0	O K
7200 min Winter	99.484	0.184	8.3	583.9	O K
8640 min Winter	99.470	0.170	7.8	537.3	O K
10080 min Winter	99.459	0.159	7.3	499.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
180 min Winter	10.791	0.0	602.2	190	
240 min Winter	8.764	0.0	655.4	246	
360 min Winter	6.528	0.0	735.0	360	
480 min Winter	5.292	0.0	793.9	472	
600 min Winter	4.495	0.0	840.4	584	
720 min Winter	3.932	0.0	878.4	692	
960 min Winter	3.183	0.0	936.5	874	
1440 min Winter	2.361	0.0	1004.9	1100	
2160 min Winter	1.750	0.0	1311.6	1560	
2880 min Winter	1.414	0.0	1406.4	1996	
4320 min Winter	1.047	0.0	1528.3	2780	
5760 min Winter	0.846	0.0	1759.1	3536	
7200 min Winter	0.716	0.0	1856.5	4272	
8640 min Winter	0.626	0.0	1934.1	5024	
10080 min Winter	0.558	0.0	1989.6	5752	
©1982-2012 Micro Drainage Ltd					

Michael A Jennings Associates		Page 3																																																
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:10 year Max Discharge =12 l/s																																																	
Date 19.03.13 File SOUTHERN ATTENUATION PO...	Designed by C.Pendle Checked by																																																	
Micro Drainage Source Control 2013.1																																																		
<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>10</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>19.400</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.350</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+0</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 2.643 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4 0.500</td> <td>8</td> <td>12 0.500</td> <td>16</td> <td>20 0.643</td> </tr> <tr> <td>4</td> <td>8 0.500</td> <td>12</td> <td>16 0.500</td> <td></td> <td></td> </tr> </tbody> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	10	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.400	Shortest Storm (mins)	15	Ratio R	0.350	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+0	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	From:	To:	From:	To:	From:	To:	0	4 0.500	8	12 0.500	16	20 0.643	4	8 0.500	12	16 0.500		
Rainfall Model	FSR	Winter Storms	Yes																																															
Return Period (years)	10	Cv (Summer)	0.750																																															
Region	England and Wales	Cv (Winter)	0.840																																															
M5-60 (mm)	19.400	Shortest Storm (mins)	15																																															
Ratio R	0.350	Longest Storm (mins)	10080																																															
Summer Storms	Yes	Climate Change %	+0																																															
Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)																																													
From:	To:	From:	To:	From:	To:																																													
0	4 0.500	8	12 0.500	16	20 0.643																																													
4	8 0.500	12	16 0.500																																															
©1982-2012 Micro Drainage Ltd																																																		

Michael A Jennings Associates		Page 4																																																																																																																																								
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:10 year Max Discharge =12 l/s																																																																																																																																									
Date 19.03.13 File SOUTHERN ATTENUATION PO...	Designed by C.Pendle Checked by																																																																																																																																									
Micro Drainage	Source Control 2013.1																																																																																																																																									
Model Details Storage is Online Cover Level (m) 100.000 Tank or Pond Structure Invert Level (m) 99.300 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>2960.0</td><td>0.700</td><td>4671.0</td><td>1.400</td><td>0.0</td><td>2.100</td><td>0.0</td></tr><tr><td>0.100</td><td>3194.0</td><td>0.701</td><td>0.0</td><td>1.500</td><td>0.0</td><td>2.200</td><td>0.0</td></tr><tr><td>0.200</td><td>3435.0</td><td>0.900</td><td>0.0</td><td>1.600</td><td>0.0</td><td>2.300</td><td>0.0</td></tr><tr><td>0.300</td><td>3673.0</td><td>1.000</td><td>0.0</td><td>1.700</td><td>0.0</td><td>2.400</td><td>0.0</td></tr><tr><td>0.400</td><td>3919.0</td><td>1.100</td><td>0.0</td><td>1.800</td><td>0.0</td><td>2.500</td><td>0.0</td></tr><tr><td>0.500</td><td>4167.0</td><td>1.200</td><td>0.0</td><td>1.900</td><td>0.0</td><td></td><td></td></tr><tr><td>0.600</td><td>4417.0</td><td>1.300</td><td>0.0</td><td>2.000</td><td>0.0</td><td></td><td></td></tr></tbody></table> Hydro-Brake® Outflow Control Design Head (m) 0.530 Hydro-Brake® Type Md7 Invert Level (m) 99.300 Design Flow (l/s) 12.0 Diameter (mm) 156 <table><thead><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>0.100</td><td>3.9</td><td>1.200</td><td>18.0</td><td>3.000</td><td>28.4</td><td>7.000</td><td>43.5</td></tr><tr><td>0.200</td><td>8.8</td><td>1.400</td><td>19.4</td><td>3.500</td><td>30.7</td><td>7.500</td><td>45.0</td></tr><tr><td>0.300</td><td>9.0</td><td>1.600</td><td>20.8</td><td>4.000</td><td>32.8</td><td>8.000</td><td>46.5</td></tr><tr><td>0.400</td><td>10.4</td><td>1.800</td><td>22.0</td><td>4.500</td><td>34.8</td><td>8.500</td><td>47.9</td></tr><tr><td>0.500</td><td>11.6</td><td>2.000</td><td>23.2</td><td>5.000</td><td>36.7</td><td>9.000</td><td>49.3</td></tr><tr><td>0.600</td><td>12.7</td><td>2.200</td><td>24.4</td><td>5.500</td><td>38.5</td><td>9.500</td><td>50.6</td></tr><tr><td>0.800</td><td>14.7</td><td>2.400</td><td>25.4</td><td>6.000</td><td>40.2</td><td></td><td></td></tr><tr><td>1.000</td><td>16.4</td><td>2.600</td><td>26.5</td><td>6.500</td><td>41.9</td><td></td><td></td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	2960.0	0.700	4671.0	1.400	0.0	2.100	0.0	0.100	3194.0	0.701	0.0	1.500	0.0	2.200	0.0	0.200	3435.0	0.900	0.0	1.600	0.0	2.300	0.0	0.300	3673.0	1.000	0.0	1.700	0.0	2.400	0.0	0.400	3919.0	1.100	0.0	1.800	0.0	2.500	0.0	0.500	4167.0	1.200	0.0	1.900	0.0			0.600	4417.0	1.300	0.0	2.000	0.0			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	3.9	1.200	18.0	3.000	28.4	7.000	43.5	0.200	8.8	1.400	19.4	3.500	30.7	7.500	45.0	0.300	9.0	1.600	20.8	4.000	32.8	8.000	46.5	0.400	10.4	1.800	22.0	4.500	34.8	8.500	47.9	0.500	11.6	2.000	23.2	5.000	36.7	9.000	49.3	0.600	12.7	2.200	24.4	5.500	38.5	9.500	50.6	0.800	14.7	2.400	25.4	6.000	40.2			1.000	16.4	2.600	26.5	6.500	41.9		
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																																																																																			
0.000	2960.0	0.700	4671.0	1.400	0.0	2.100	0.0																																																																																																																																			
0.100	3194.0	0.701	0.0	1.500	0.0	2.200	0.0																																																																																																																																			
0.200	3435.0	0.900	0.0	1.600	0.0	2.300	0.0																																																																																																																																			
0.300	3673.0	1.000	0.0	1.700	0.0	2.400	0.0																																																																																																																																			
0.400	3919.0	1.100	0.0	1.800	0.0	2.500	0.0																																																																																																																																			
0.500	4167.0	1.200	0.0	1.900	0.0																																																																																																																																					
0.600	4417.0	1.300	0.0	2.000	0.0																																																																																																																																					
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																																																																																			
0.100	3.9	1.200	18.0	3.000	28.4	7.000	43.5																																																																																																																																			
0.200	8.8	1.400	19.4	3.500	30.7	7.500	45.0																																																																																																																																			
0.300	9.0	1.600	20.8	4.000	32.8	8.000	46.5																																																																																																																																			
0.400	10.4	1.800	22.0	4.500	34.8	8.500	47.9																																																																																																																																			
0.500	11.6	2.000	23.2	5.000	36.7	9.000	49.3																																																																																																																																			
0.600	12.7	2.200	24.4	5.500	38.5	9.500	50.6																																																																																																																																			
0.800	14.7	2.400	25.4	6.000	40.2																																																																																																																																					
1.000	16.4	2.600	26.5	6.500	41.9																																																																																																																																					
©1982-2012 Micro Drainage Ltd																																																																																																																																										

Michael A Jennings Associates				Page 1		
58-62 Ock Street Abingdon Oxon OX14 5BZ		Southern Attenuation Pond 1:30 year Max Discharge =12 l/s				
Date 19.03.13 File Southern Attenuation Pond - ...		Designed by C.Pendle Checked by				
Micro Drainage		Source Control 2013.1				
<u>Summary of Results for 30 year Return Period</u>						
	Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
	15 min Summer	99.412	0.112	4.7	344.7	O K
	30 min Summer	99.446	0.146	6.6	455.6	O K
	60 min Summer	99.481	0.181	8.2	574.0	O K
	120 min Summer	99.516	0.216	9.0	695.4	O K
	180 min Summer	99.536	0.236	9.1	764.6	O K
	240 min Summer	99.549	0.249	9.1	810.6	O K
	360 min Summer	99.566	0.266	9.1	872.4	O K
	480 min Summer	99.577	0.277	9.1	910.1	O K
	600 min Summer	99.583	0.283	9.1	933.1	O K
	720 min Summer	99.587	0.287	9.1	946.4	O K
	960 min Summer	99.591	0.291	9.1	961.7	O K
	1440 min Summer	99.595	0.295	9.1	976.2	O K
	2160 min Summer	99.594	0.294	9.1	973.2	O K
	2880 min Summer	99.589	0.289	9.1	953.7	O K
	4320 min Summer	99.572	0.272	9.1	893.3	O K
	5760 min Summer	99.552	0.252	9.1	820.9	O K
	7200 min Summer	99.532	0.232	9.1	749.5	O K
	8640 min Summer	99.515	0.215	9.0	692.1	O K
	10080 min Summer	99.502	0.202	8.8	646.3	O K
	15 min Winter	99.424	0.124	5.4	385.9	O K
	30 min Winter	99.462	0.162	7.4	510.3	O K
	60 min Winter	99.501	0.201	8.8	643.6	O K
	120 min Winter	99.541	0.241	9.1	782.5	O K
	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
	15 min Summer	70.373	0.0	204.6	34	
	30 min Summer	46.843	0.0	293.3	49	
	60 min Summer	29.868	0.0	487.6	78	
	120 min Summer	18.484	0.0	616.5	136	
	180 min Summer	13.799	0.0	695.3	194	
	240 min Summer	11.157	0.0	751.4	252	
	360 min Summer	8.261	0.0	834.2	368	
	480 min Summer	6.668	0.0	894.6	486	
	600 min Summer	5.644	0.0	941.4	602	
	720 min Summer	4.923	0.0	978.8	720	
	960 min Summer	3.965	0.0	1033.6	824	
	1440 min Summer	2.919	0.0	1087.4	1070	
	2160 min Summer	2.146	0.0	1437.2	1476	
	2880 min Summer	1.724	0.0	1529.0	1888	
	4320 min Summer	1.264	0.0	1641.0	2696	
	5760 min Summer	1.014	0.0	1884.9	3472	
	7200 min Summer	0.854	0.0	1978.2	4192	
	8640 min Summer	0.743	0.0	2052.2	4936	
	10080 min Summer	0.660	0.0	2102.7	5648	
	15 min Winter	70.373	0.0	236.8	34	
	30 min Winter	46.843	0.0	336.7	48	
	60 min Winter	29.868	0.0	553.5	76	
	120 min Winter	18.484	0.0	696.9	134	
©1982-2012 Micro Drainage Ltd						

Michael A Jennings Associates			Page 2		
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:30 year Max Discharge =12 l/s				
Date 19.03.13 File Southern Attenuation Pond - ...	Designed by C.Pendle Checked by				
Micro Drainage	Source Control 2013.1				
<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	99.564	0.264	9.1	862.9	O K
240 min Winter	99.579	0.279	9.1	916.1	O K
360 min Winter	99.598	0.298	9.1	986.9	O K
480 min Winter	99.610	0.310	9.1	1030.6	O K
600 min Winter	99.617	0.317	9.3	1058.3	O K
720 min Winter	99.622	0.322	9.3	1075.8	O K
960 min Winter	99.626	0.326	9.4	1091.2	O K
1440 min Winter	99.627	0.327	9.4	1095.0	O K
2160 min Winter	99.622	0.322	9.3	1076.5	O K
2880 min Winter	99.612	0.312	9.2	1037.5	O K
4320 min Winter	99.584	0.284	9.1	936.3	O K
5760 min Winter	99.552	0.252	9.1	821.3	O K
7200 min Winter	99.522	0.222	9.1	715.9	O K
8640 min Winter	99.501	0.201	8.8	643.3	O K
10080 min Winter	99.485	0.185	8.4	588.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
180 min Winter	13.799	0.0	783.6	190	
240 min Winter	11.157	0.0	845.1	248	
360 min Winter	8.261	0.0	935.8	362	
480 min Winter	6.668	0.0	1001.5	476	
600 min Winter	5.644	0.0	1051.9	590	
720 min Winter	4.923	0.0	1091.4	700	
960 min Winter	3.965	0.0	1147.2	910	
1440 min Winter	2.919	0.0	1192.3	1134	
2160 min Winter	2.146	0.0	1613.1	1596	
2880 min Winter	1.724	0.0	1714.4	2052	
4320 min Winter	1.264	0.0	1835.8	2912	
5760 min Winter	1.014	0.0	2115.3	3712	
7200 min Winter	0.854	0.0	2221.1	4408	
8640 min Winter	0.743	0.0	2305.7	5112	
10080 min Winter	0.660	0.0	2365.3	5848	
©1982-2012 Micro Drainage Ltd					

Michael A Jennings Associates		Page 3
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:30 year Max Discharge =12 l/s	
Date 19.03.13 File Southern Attenuation Pond - ...	Designed by C.Pendle Checked by	
Micro Drainage Source Control 2013.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 2.643

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4 0.500	8	12 0.500	16	20 0.643
4	8 0.500	12	16 0.500		

©1982-2012 Micro Drainage Ltd

Michael A Jennings Associates		Page 4
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:30 year Max Discharge =12 l/s	
Date 19.03.13 File Southern Attenuation Pond - ...	Designed by C.Pendle Checked by	
Micro Drainage Source Control 2013.1		

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.300

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2960.0	0.700	4671.0	1.400	0.0	2.100	0.0
0.100	3194.0	0.701	0.0	1.500	0.0	2.200	0.0
0.200	3435.0	0.900	0.0	1.600	0.0	2.300	0.0
0.300	3673.0	1.000	0.0	1.700	0.0	2.400	0.0
0.400	3919.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	4167.0	1.200	0.0	1.900	0.0		
0.600	4417.0	1.300	0.0	2.000	0.0		

Hydro-Brake® Outflow Control

Design Head (m) 0.530 Hydro-Brake® Type Md7 Invert Level (m) 99.300
Design Flow (l/s) 12.0 Diameter (mm) 156

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.9	1.200	18.0	3.000	28.4	7.000	43.5
0.200	8.8	1.400	19.4	3.500	30.7	7.500	45.0
0.300	9.0	1.600	20.8	4.000	32.8	8.000	46.5
0.400	10.4	1.800	22.0	4.500	34.8	8.500	47.9
0.500	11.6	2.000	23.2	5.000	36.7	9.000	49.3
0.600	12.7	2.200	24.4	5.500	38.5	9.500	50.6
0.800	14.7	2.400	25.4	6.000	40.2		
1.000	16.4	2.600	26.5	6.500	41.9		

©1982-2012 Micro Drainage Ltd

Michael A Jennings Associates		Page 1																																																																																																																																																																																																																																																																																																
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:100 year Max Discharge =12 l/s																																																																																																																																																																																																																																																																																																	
Date 19.03.13 File SOUTHERN ATTENUATION PO...	Designed by C.Pendle Checked by																																																																																																																																																																																																																																																																																																	
Micro Drainage	Source Control 2013.1																																																																																																																																																																																																																																																																																																	
Summary of Results for 100 year Return Period <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>99.443</td><td>0.143</td><td>6.5</td><td>445.6</td><td>O K</td></tr><tr><td>30 min Summer</td><td>99.487</td><td>0.187</td><td>8.4</td><td>595.1</td><td>O K</td></tr><tr><td>60 min Summer</td><td>99.534</td><td>0.234</td><td>9.1</td><td>756.1</td><td>O K</td></tr><tr><td>120 min Summer</td><td>99.580</td><td>0.280</td><td>9.1</td><td>922.6</td><td>O K</td></tr><tr><td>180 min Summer</td><td>99.605</td><td>0.305</td><td>9.1</td><td>1014.3</td><td>O K</td></tr><tr><td>240 min Summer</td><td>99.621</td><td>0.321</td><td>9.3</td><td>1071.9</td><td>O K</td></tr><tr><td>360 min Summer</td><td>99.641</td><td>0.341</td><td>9.6</td><td>1148.6</td><td>O K</td></tr><tr><td>480 min Summer</td><td>99.654</td><td>0.354</td><td>9.8</td><td>1195.4</td><td>O K</td></tr><tr><td>600 min Summer</td><td>99.661</td><td>0.361</td><td>9.9</td><td>1224.2</td><td>O K</td></tr><tr><td>720 min Summer</td><td>99.666</td><td>0.366</td><td>9.9</td><td>1241.3</td><td>O K</td></tr><tr><td>960 min Summer</td><td>99.669</td><td>0.369</td><td>10.0</td><td>1254.4</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>99.671</td><td>0.371</td><td>10.0</td><td>1262.0</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>99.668</td><td>0.368</td><td>10.0</td><td>1250.0</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>99.661</td><td>0.361</td><td>9.9</td><td>1221.8</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>99.641</td><td>0.341</td><td>9.6</td><td>1145.9</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>99.619</td><td>0.319</td><td>9.3</td><td>1062.7</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>99.597</td><td>0.297</td><td>9.1</td><td>981.8</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>99.575</td><td>0.275</td><td>9.1</td><td>904.5</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>99.554</td><td>0.254</td><td>9.1</td><td>827.5</td><td>O K</td></tr><tr><td>15 min Winter</td><td>99.459</td><td>0.159</td><td>7.3</td><td>499.0</td><td>O K</td></tr><tr><td>30 min Winter</td><td>99.508</td><td>0.208</td><td>8.9</td><td>667.0</td><td>O K</td></tr><tr><td>60 min Winter</td><td>99.560</td><td>0.260</td><td>9.1</td><td>849.2</td><td>O K</td></tr><tr><td>120 min Winter</td><td>99.611</td><td>0.311</td><td>9.2</td><td>1036.7</td><td>O K</td></tr><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th><th></th></tr><tr><td>15 min Summer</td><td>91.083</td><td>0.0</td><td>284.0</td><td>34</td><td></td></tr><tr><td>30 min Summer</td><td>61.215</td><td>0.0</td><td>403.5</td><td>49</td><td></td></tr><tr><td>60 min Summer</td><td>39.255</td><td>0.0</td><td>659.4</td><td>78</td><td></td></tr><tr><td>120 min Summer</td><td>24.293</td><td>0.0</td><td>824.0</td><td>136</td><td></td></tr><tr><td>180 min Summer</td><td>18.068</td><td>0.0</td><td>919.5</td><td>196</td><td></td></tr><tr><td>240 min Summer</td><td>14.537</td><td>0.0</td><td>984.3</td><td>254</td><td></td></tr><tr><td>360 min Summer</td><td>10.694</td><td>0.0</td><td>1078.3</td><td>370</td><td></td></tr><tr><td>480 min Summer</td><td>8.592</td><td>0.0</td><td>1144.2</td><td>488</td><td></td></tr><tr><td>600 min Summer</td><td>7.244</td><td>0.0</td><td>1192.5</td><td>606</td><td></td></tr><tr><td>720 min Summer</td><td>6.298</td><td>0.0</td><td>1228.3</td><td>722</td><td></td></tr><tr><td>960 min Summer</td><td>5.045</td><td>0.0</td><td>1272.8</td><td>894</td><td></td></tr><tr><td>1440 min Summer</td><td>3.684</td><td>0.0</td><td>1283.7</td><td>1126</td><td></td></tr><tr><td>2160 min Summer</td><td>2.684</td><td>0.0</td><td>1801.5</td><td>1516</td><td></td></tr><tr><td>2880 min Summer</td><td>2.141</td><td>0.0</td><td>1898.3</td><td>1928</td><td></td></tr><tr><td>4320 min Summer</td><td>1.554</td><td>0.0</td><td>1994.6</td><td>2740</td><td></td></tr><tr><td>5760 min Summer</td><td>1.237</td><td>0.0</td><td>2305.6</td><td>3544</td><td></td></tr><tr><td>7200 min Summer</td><td>1.035</td><td>0.0</td><td>2406.0</td><td>4336</td><td></td></tr><tr><td>8640 min Summer</td><td>0.896</td><td>0.0</td><td>2486.2</td><td>5112</td><td></td></tr><tr><td>10080 min Summer</td><td>0.793</td><td>0.0</td><td>2540.0</td><td>5856</td><td></td></tr><tr><td>15 min Winter</td><td>91.083</td><td>0.0</td><td>326.2</td><td>34</td><td></td></tr><tr><td>30 min Winter</td><td>61.215</td><td>0.0</td><td>458.4</td><td>48</td><td></td></tr><tr><td>60 min Winter</td><td>39.255</td><td>0.0</td><td>744.0</td><td>78</td><td></td></tr><tr><td>120 min Winter</td><td>24.293</td><td>0.0</td><td>925.2</td><td>134</td><td></td></tr></tbody></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	99.443	0.143	6.5	445.6	O K	30 min Summer	99.487	0.187	8.4	595.1	O K	60 min Summer	99.534	0.234	9.1	756.1	O K	120 min Summer	99.580	0.280	9.1	922.6	O K	180 min Summer	99.605	0.305	9.1	1014.3	O K	240 min Summer	99.621	0.321	9.3	1071.9	O K	360 min Summer	99.641	0.341	9.6	1148.6	O K	480 min Summer	99.654	0.354	9.8	1195.4	O K	600 min Summer	99.661	0.361	9.9	1224.2	O K	720 min Summer	99.666	0.366	9.9	1241.3	O K	960 min Summer	99.669	0.369	10.0	1254.4	O K	1440 min Summer	99.671	0.371	10.0	1262.0	O K	2160 min Summer	99.668	0.368	10.0	1250.0	O K	2880 min Summer	99.661	0.361	9.9	1221.8	O K	4320 min Summer	99.641	0.341	9.6	1145.9	O K	5760 min Summer	99.619	0.319	9.3	1062.7	O K	7200 min Summer	99.597	0.297	9.1	981.8	O K	8640 min Summer	99.575	0.275	9.1	904.5	O K	10080 min Summer	99.554	0.254	9.1	827.5	O K	15 min Winter	99.459	0.159	7.3	499.0	O K	30 min Winter	99.508	0.208	8.9	667.0	O K	60 min Winter	99.560	0.260	9.1	849.2	O K	120 min Winter	99.611	0.311	9.2	1036.7	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		15 min Summer	91.083	0.0	284.0	34		30 min Summer	61.215	0.0	403.5	49		60 min Summer	39.255	0.0	659.4	78		120 min Summer	24.293	0.0	824.0	136		180 min Summer	18.068	0.0	919.5	196		240 min Summer	14.537	0.0	984.3	254		360 min Summer	10.694	0.0	1078.3	370		480 min Summer	8.592	0.0	1144.2	488		600 min Summer	7.244	0.0	1192.5	606		720 min Summer	6.298	0.0	1228.3	722		960 min Summer	5.045	0.0	1272.8	894		1440 min Summer	3.684	0.0	1283.7	1126		2160 min Summer	2.684	0.0	1801.5	1516		2880 min Summer	2.141	0.0	1898.3	1928		4320 min Summer	1.554	0.0	1994.6	2740		5760 min Summer	1.237	0.0	2305.6	3544		7200 min Summer	1.035	0.0	2406.0	4336		8640 min Summer	0.896	0.0	2486.2	5112		10080 min Summer	0.793	0.0	2540.0	5856		15 min Winter	91.083	0.0	326.2	34		30 min Winter	61.215	0.0	458.4	48		60 min Winter	39.255	0.0	744.0	78		120 min Winter	24.293	0.0	925.2	134	
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																																													
15 min Summer	99.443	0.143	6.5	445.6	O K																																																																																																																																																																																																																																																																																													
30 min Summer	99.487	0.187	8.4	595.1	O K																																																																																																																																																																																																																																																																																													
60 min Summer	99.534	0.234	9.1	756.1	O K																																																																																																																																																																																																																																																																																													
120 min Summer	99.580	0.280	9.1	922.6	O K																																																																																																																																																																																																																																																																																													
180 min Summer	99.605	0.305	9.1	1014.3	O K																																																																																																																																																																																																																																																																																													
240 min Summer	99.621	0.321	9.3	1071.9	O K																																																																																																																																																																																																																																																																																													
360 min Summer	99.641	0.341	9.6	1148.6	O K																																																																																																																																																																																																																																																																																													
480 min Summer	99.654	0.354	9.8	1195.4	O K																																																																																																																																																																																																																																																																																													
600 min Summer	99.661	0.361	9.9	1224.2	O K																																																																																																																																																																																																																																																																																													
720 min Summer	99.666	0.366	9.9	1241.3	O K																																																																																																																																																																																																																																																																																													
960 min Summer	99.669	0.369	10.0	1254.4	O K																																																																																																																																																																																																																																																																																													
1440 min Summer	99.671	0.371	10.0	1262.0	O K																																																																																																																																																																																																																																																																																													
2160 min Summer	99.668	0.368	10.0	1250.0	O K																																																																																																																																																																																																																																																																																													
2880 min Summer	99.661	0.361	9.9	1221.8	O K																																																																																																																																																																																																																																																																																													
4320 min Summer	99.641	0.341	9.6	1145.9	O K																																																																																																																																																																																																																																																																																													
5760 min Summer	99.619	0.319	9.3	1062.7	O K																																																																																																																																																																																																																																																																																													
7200 min Summer	99.597	0.297	9.1	981.8	O K																																																																																																																																																																																																																																																																																													
8640 min Summer	99.575	0.275	9.1	904.5	O K																																																																																																																																																																																																																																																																																													
10080 min Summer	99.554	0.254	9.1	827.5	O K																																																																																																																																																																																																																																																																																													
15 min Winter	99.459	0.159	7.3	499.0	O K																																																																																																																																																																																																																																																																																													
30 min Winter	99.508	0.208	8.9	667.0	O K																																																																																																																																																																																																																																																																																													
60 min Winter	99.560	0.260	9.1	849.2	O K																																																																																																																																																																																																																																																																																													
120 min Winter	99.611	0.311	9.2	1036.7	O K																																																																																																																																																																																																																																																																																													
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																																														
15 min Summer	91.083	0.0	284.0	34																																																																																																																																																																																																																																																																																														
30 min Summer	61.215	0.0	403.5	49																																																																																																																																																																																																																																																																																														
60 min Summer	39.255	0.0	659.4	78																																																																																																																																																																																																																																																																																														
120 min Summer	24.293	0.0	824.0	136																																																																																																																																																																																																																																																																																														
180 min Summer	18.068	0.0	919.5	196																																																																																																																																																																																																																																																																																														
240 min Summer	14.537	0.0	984.3	254																																																																																																																																																																																																																																																																																														
360 min Summer	10.694	0.0	1078.3	370																																																																																																																																																																																																																																																																																														
480 min Summer	8.592	0.0	1144.2	488																																																																																																																																																																																																																																																																																														
600 min Summer	7.244	0.0	1192.5	606																																																																																																																																																																																																																																																																																														
720 min Summer	6.298	0.0	1228.3	722																																																																																																																																																																																																																																																																																														
960 min Summer	5.045	0.0	1272.8	894																																																																																																																																																																																																																																																																																														
1440 min Summer	3.684	0.0	1283.7	1126																																																																																																																																																																																																																																																																																														
2160 min Summer	2.684	0.0	1801.5	1516																																																																																																																																																																																																																																																																																														
2880 min Summer	2.141	0.0	1898.3	1928																																																																																																																																																																																																																																																																																														
4320 min Summer	1.554	0.0	1994.6	2740																																																																																																																																																																																																																																																																																														
5760 min Summer	1.237	0.0	2305.6	3544																																																																																																																																																																																																																																																																																														
7200 min Summer	1.035	0.0	2406.0	4336																																																																																																																																																																																																																																																																																														
8640 min Summer	0.896	0.0	2486.2	5112																																																																																																																																																																																																																																																																																														
10080 min Summer	0.793	0.0	2540.0	5856																																																																																																																																																																																																																																																																																														
15 min Winter	91.083	0.0	326.2	34																																																																																																																																																																																																																																																																																														
30 min Winter	61.215	0.0	458.4	48																																																																																																																																																																																																																																																																																														
60 min Winter	39.255	0.0	744.0	78																																																																																																																																																																																																																																																																																														
120 min Winter	24.293	0.0	925.2	134																																																																																																																																																																																																																																																																																														
©1982-2012 Micro Drainage Ltd																																																																																																																																																																																																																																																																																																		

Michael A Jennings Associates		Page 2																																																																																																																																																																																
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:100 year Max Discharge =12 l/s																																																																																																																																																																																	
Date 19.03.13 File SOUTHERN ATTENUATION PO...	Designed by C.Pendle Checked by																																																																																																																																																																																	
Micro Drainage	Source Control 2013.1																																																																																																																																																																																	
Summary of Results for 100 year Return Period <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>180 min Winter</td><td>99.639</td><td>0.339</td><td>9.6</td><td>1140.2</td><td>O K</td></tr><tr><td>240 min Winter</td><td>99.657</td><td>0.357</td><td>9.8</td><td>1205.9</td><td>O K</td></tr><tr><td>360 min Winter</td><td>99.680</td><td>0.380</td><td>10.1</td><td>1294.4</td><td>O K</td></tr><tr><td>480 min Winter</td><td>99.694</td><td>0.394</td><td>10.3</td><td>1349.6</td><td>O K</td></tr><tr><td>600 min Winter</td><td>99.703</td><td>0.403</td><td>10.4</td><td>1384.8</td><td>Flood Risk</td></tr><tr><td>720 min Winter</td><td>99.708</td><td>0.408</td><td>10.5</td><td>1407.2</td><td>Flood Risk</td></tr><tr><td>960 min Winter</td><td>99.714</td><td>0.414</td><td>10.6</td><td>1427.7</td><td>Flood Risk</td></tr><tr><td>1440 min Winter</td><td>99.712</td><td>0.412</td><td>10.5</td><td>1421.7</td><td>Flood Risk</td></tr><tr><td>2160 min Winter</td><td>99.705</td><td>0.405</td><td>10.5</td><td>1395.3</td><td>Flood Risk</td></tr><tr><td>2880 min Winter</td><td>99.693</td><td>0.393</td><td>10.3</td><td>1346.2</td><td>O K</td></tr><tr><td>4320 min Winter</td><td>99.661</td><td>0.361</td><td>9.9</td><td>1224.7</td><td>O K</td></tr><tr><td>5760 min Winter</td><td>99.628</td><td>0.328</td><td>9.4</td><td>1099.1</td><td>O K</td></tr><tr><td>7200 min Winter</td><td>99.596</td><td>0.296</td><td>9.1</td><td>978.4</td><td>O K</td></tr><tr><td>8640 min Winter</td><td>99.563</td><td>0.263</td><td>9.1</td><td>859.6</td><td>O K</td></tr><tr><td>10080 min Winter</td><td>99.530</td><td>0.230</td><td>9.1</td><td>744.6</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>180 min Winter</td><td>18.068</td><td>0.0</td><td>1029.8</td><td>192</td></tr><tr><td>240 min Winter</td><td>14.537</td><td>0.0</td><td>1100.1</td><td>248</td></tr><tr><td>360 min Winter</td><td>10.694</td><td>0.0</td><td>1200.5</td><td>364</td></tr><tr><td>480 min Winter</td><td>8.592</td><td>0.0</td><td>1268.8</td><td>478</td></tr><tr><td>600 min Winter</td><td>7.244</td><td>0.0</td><td>1316.7</td><td>592</td></tr><tr><td>720 min Winter</td><td>6.298</td><td>0.0</td><td>1350.1</td><td>704</td></tr><tr><td>960 min Winter</td><td>5.045</td><td>0.0</td><td>1385.0</td><td>922</td></tr><tr><td>1440 min Winter</td><td>3.684</td><td>0.0</td><td>1368.8</td><td>1180</td></tr><tr><td>2160 min Winter</td><td>2.684</td><td>0.0</td><td>2018.2</td><td>1628</td></tr><tr><td>2880 min Winter</td><td>2.141</td><td>0.0</td><td>2123.3</td><td>2084</td></tr><tr><td>4320 min Winter</td><td>1.554</td><td>0.0</td><td>2213.0</td><td>2980</td></tr><tr><td>5760 min Winter</td><td>1.237</td><td>0.0</td><td>2585.8</td><td>3816</td></tr><tr><td>7200 min Winter</td><td>1.035</td><td>0.0</td><td>2699.5</td><td>4624</td></tr><tr><td>8640 min Winter</td><td>0.896</td><td>0.0</td><td>2791.7</td><td>5448</td></tr><tr><td>10080 min Winter</td><td>0.793</td><td>0.0</td><td>2856.2</td><td>6056</td></tr></tbody></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	180 min Winter	99.639	0.339	9.6	1140.2	O K	240 min Winter	99.657	0.357	9.8	1205.9	O K	360 min Winter	99.680	0.380	10.1	1294.4	O K	480 min Winter	99.694	0.394	10.3	1349.6	O K	600 min Winter	99.703	0.403	10.4	1384.8	Flood Risk	720 min Winter	99.708	0.408	10.5	1407.2	Flood Risk	960 min Winter	99.714	0.414	10.6	1427.7	Flood Risk	1440 min Winter	99.712	0.412	10.5	1421.7	Flood Risk	2160 min Winter	99.705	0.405	10.5	1395.3	Flood Risk	2880 min Winter	99.693	0.393	10.3	1346.2	O K	4320 min Winter	99.661	0.361	9.9	1224.7	O K	5760 min Winter	99.628	0.328	9.4	1099.1	O K	7200 min Winter	99.596	0.296	9.1	978.4	O K	8640 min Winter	99.563	0.263	9.1	859.6	O K	10080 min Winter	99.530	0.230	9.1	744.6	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	180 min Winter	18.068	0.0	1029.8	192	240 min Winter	14.537	0.0	1100.1	248	360 min Winter	10.694	0.0	1200.5	364	480 min Winter	8.592	0.0	1268.8	478	600 min Winter	7.244	0.0	1316.7	592	720 min Winter	6.298	0.0	1350.1	704	960 min Winter	5.045	0.0	1385.0	922	1440 min Winter	3.684	0.0	1368.8	1180	2160 min Winter	2.684	0.0	2018.2	1628	2880 min Winter	2.141	0.0	2123.3	2084	4320 min Winter	1.554	0.0	2213.0	2980	5760 min Winter	1.237	0.0	2585.8	3816	7200 min Winter	1.035	0.0	2699.5	4624	8640 min Winter	0.896	0.0	2791.7	5448	10080 min Winter	0.793	0.0	2856.2	6056
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status																																																																																																																																																																													
180 min Winter	99.639	0.339	9.6	1140.2	O K																																																																																																																																																																													
240 min Winter	99.657	0.357	9.8	1205.9	O K																																																																																																																																																																													
360 min Winter	99.680	0.380	10.1	1294.4	O K																																																																																																																																																																													
480 min Winter	99.694	0.394	10.3	1349.6	O K																																																																																																																																																																													
600 min Winter	99.703	0.403	10.4	1384.8	Flood Risk																																																																																																																																																																													
720 min Winter	99.708	0.408	10.5	1407.2	Flood Risk																																																																																																																																																																													
960 min Winter	99.714	0.414	10.6	1427.7	Flood Risk																																																																																																																																																																													
1440 min Winter	99.712	0.412	10.5	1421.7	Flood Risk																																																																																																																																																																													
2160 min Winter	99.705	0.405	10.5	1395.3	Flood Risk																																																																																																																																																																													
2880 min Winter	99.693	0.393	10.3	1346.2	O K																																																																																																																																																																													
4320 min Winter	99.661	0.361	9.9	1224.7	O K																																																																																																																																																																													
5760 min Winter	99.628	0.328	9.4	1099.1	O K																																																																																																																																																																													
7200 min Winter	99.596	0.296	9.1	978.4	O K																																																																																																																																																																													
8640 min Winter	99.563	0.263	9.1	859.6	O K																																																																																																																																																																													
10080 min Winter	99.530	0.230	9.1	744.6	O K																																																																																																																																																																													
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																														
180 min Winter	18.068	0.0	1029.8	192																																																																																																																																																																														
240 min Winter	14.537	0.0	1100.1	248																																																																																																																																																																														
360 min Winter	10.694	0.0	1200.5	364																																																																																																																																																																														
480 min Winter	8.592	0.0	1268.8	478																																																																																																																																																																														
600 min Winter	7.244	0.0	1316.7	592																																																																																																																																																																														
720 min Winter	6.298	0.0	1350.1	704																																																																																																																																																																														
960 min Winter	5.045	0.0	1385.0	922																																																																																																																																																																														
1440 min Winter	3.684	0.0	1368.8	1180																																																																																																																																																																														
2160 min Winter	2.684	0.0	2018.2	1628																																																																																																																																																																														
2880 min Winter	2.141	0.0	2123.3	2084																																																																																																																																																																														
4320 min Winter	1.554	0.0	2213.0	2980																																																																																																																																																																														
5760 min Winter	1.237	0.0	2585.8	3816																																																																																																																																																																														
7200 min Winter	1.035	0.0	2699.5	4624																																																																																																																																																																														
8640 min Winter	0.896	0.0	2791.7	5448																																																																																																																																																																														
10080 min Winter	0.793	0.0	2856.2	6056																																																																																																																																																																														
©1982-2012 Micro Drainage Ltd																																																																																																																																																																																		

Michael A Jennings Associates		Page 3																																																
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:100 year Max Discharge =12 l/s																																																	
Date 19.03.13 File SOUTHERN ATTENUATION PO...	Designed by C.Pendle Checked by																																																	
Micro Drainage Source Control 2013.1																																																		
<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>19.400</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.350</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+0</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 2.643 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4 0.500</td> <td>8</td> <td>12 0.500</td> <td>16</td> <td>20 0.643</td> </tr> <tr> <td>4</td> <td>8 0.500</td> <td>12</td> <td>16 0.500</td> <td></td> <td></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)	19.400	Shortest Storm (mins)	15	Ratio R	0.350	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+0	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	From:	To:	From:	To:	From:	To:	0	4 0.500	8	12 0.500	16	20 0.643	4	8 0.500	12	16 0.500		
Rainfall Model	FSR	Winter Storms	Yes																																															
Return Period (years)	100	Cv (Summer)	0.750																																															
Region	England and Wales	Cv (Winter)	0.840																																															
M5-60 (mm)	19.400	Shortest Storm (mins)	15																																															
Ratio R	0.350	Longest Storm (mins)	10080																																															
Summer Storms	Yes	Climate Change %	+0																																															
Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)																																													
From:	To:	From:	To:	From:	To:																																													
0	4 0.500	8	12 0.500	16	20 0.643																																													
4	8 0.500	12	16 0.500																																															
©1982-2012 Micro Drainage Ltd																																																		

Michael A Jennings Associates		Page 4
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:100 year Max Discharge =12 l/s	
Date 19.03.13 File SOUTHERN ATTENUATION PO...	Designed by C.Pendle Checked by	
Micro Drainage	Source Control 2013.1	

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 99.300

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2960.0	0.700	4671.0	1.400	0.0	2.100	0.0
0.100	3194.0	0.701	0.0	1.500	0.0	2.200	0.0
0.200	3435.0	0.900	0.0	1.600	0.0	2.300	0.0
0.300	3673.0	1.000	0.0	1.700	0.0	2.400	0.0
0.400	3919.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	4167.0	1.200	0.0	1.900	0.0		
0.600	4417.0	1.300	0.0	2.000	0.0		

Hydro-Brake® Outflow Control

Design Head (m) 0.530 Hydro-Brake® Type Md7 Invert Level (m) 99.300
Design Flow (l/s) 12.0 Diameter (mm) 156

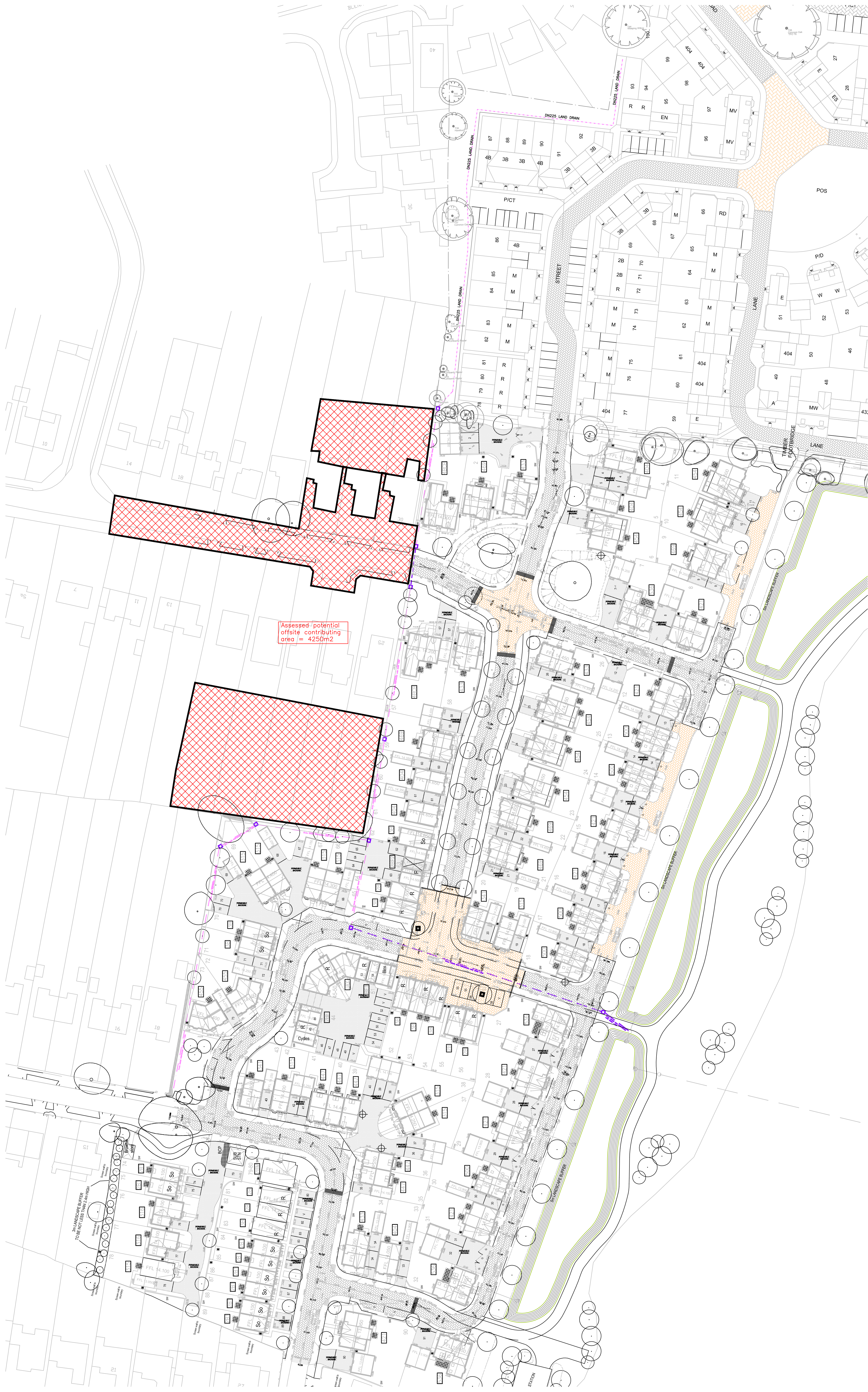
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.9	1.200	18.0	3.000	28.4	7.000	43.5
0.200	8.8	1.400	19.4	3.500	30.7	7.500	45.0
0.300	9.0	1.600	20.8	4.000	32.8	8.000	46.5
0.400	10.4	1.800	22.0	4.500	34.8	8.500	47.9
0.500	11.6	2.000	23.2	5.000	36.7	9.000	49.3
0.600	12.7	2.200	24.4	5.500	38.5	9.500	50.6
0.800	14.7	2.400	25.4	6.000	40.2		
1.000	16.4	2.600	26.5	6.500	41.9		

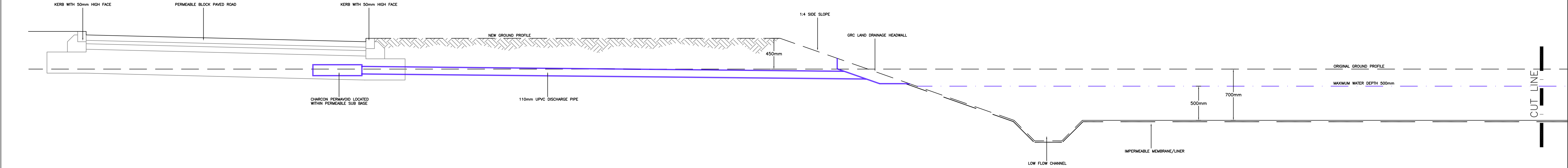
Michael A Jennings Associates				Page 1																																																																																																																																																																																																																																																																									
58-62 Ock Street Abingdon Oxon OX14 5BZ		Southern Attenuation Pond 1:100 + 30% year Max Discharge =12 l/s																																																																																																																																																																																																																																																																											
Date 19.03.13 File Southern Attenuation Pond - ...		Designed by C.Pendle Checked by																																																																																																																																																																																																																																																																											
Micro Drainage		Source Control 2013.1																																																																																																																																																																																																																																																																											
<u>Summary of Results for 100 year Return Period (+30%)</u> <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>99.482</td><td>0.182</td><td>8.3</td><td>578.9</td><td>O K</td></tr><tr><td>30 min Summer</td><td>99.539</td><td>0.239</td><td>9.1</td><td>774.9</td><td>O K</td></tr><tr><td>60 min Summer</td><td>99.598</td><td>0.298</td><td>9.1</td><td>987.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>99.657</td><td>0.357</td><td>9.8</td><td>1206.2</td><td>O K</td></tr><tr><td>180 min Summer</td><td>99.688</td><td>0.388</td><td>10.2</td><td>1327.8</td><td>O K</td></tr><tr><td>240 min Summer</td><td>99.708</td><td>0.408</td><td>10.5</td><td>1405.4</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>99.735</td><td>0.435</td><td>10.8</td><td>1510.8</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>99.751</td><td>0.451</td><td>11.0</td><td>1577.5</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>99.762</td><td>0.462</td><td>11.2</td><td>1621.1</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>99.769</td><td>0.469</td><td>11.2</td><td>1649.4</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>99.775</td><td>0.475</td><td>11.3</td><td>1676.5</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>99.778</td><td>0.478</td><td>11.4</td><td>1686.0</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>99.775</td><td>0.475</td><td>11.3</td><td>1674.8</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>99.768</td><td>0.468</td><td>11.2</td><td>1645.1</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>99.747</td><td>0.447</td><td>11.0</td><td>1558.9</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>99.722</td><td>0.422</td><td>10.7</td><td>1462.4</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>99.698</td><td>0.398</td><td>10.4</td><td>1367.5</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>99.676</td><td>0.376</td><td>10.1</td><td>1280.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>99.655</td><td>0.355</td><td>9.8</td><td>1198.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>99.503</td><td>0.203</td><td>8.8</td><td>648.6</td><td>O K</td></tr><tr><td>30 min Winter</td><td>99.566</td><td>0.266</td><td>9.1</td><td>869.3</td><td>O K</td></tr><tr><td>60 min Winter</td><td>99.631</td><td>0.331</td><td>9.4</td><td>1108.1</td><td>O K</td></tr><tr><td>120 min Winter</td><td>99.695</td><td>0.395</td><td>10.3</td><td>1354.1</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>118.408</td><td>0.0</td><td>389.2</td><td>34</td></tr><tr><td>30 min Summer</td><td>79.579</td><td>0.0</td><td>536.3</td><td>49</td></tr><tr><td>60 min Summer</td><td>51.031</td><td>0.0</td><td>868.4</td><td>78</td></tr><tr><td>120 min Summer</td><td>31.581</td><td>0.0</td><td>1072.9</td><td>138</td></tr><tr><td>180 min Summer</td><td>23.488</td><td>0.0</td><td>1188.5</td><td>196</td></tr><tr><td>240 min Summer</td><td>18.897</td><td>0.0</td><td>1264.4</td><td>254</td></tr><tr><td>360 min Summer</td><td>13.902</td><td>0.0</td><td>1368.1</td><td>372</td></tr><tr><td>480 min Summer</td><td>11.169</td><td>0.0</td><td>1433.1</td><td>490</td></tr><tr><td>600 min Summer</td><td>9.417</td><td>0.0</td><td>1473.0</td><td>608</td></tr><tr><td>720 min Summer</td><td>8.187</td><td>0.0</td><td>1495.4</td><td>724</td></tr><tr><td>960 min Summer</td><td>6.558</td><td>0.0</td><td>1504.3</td><td>960</td></tr><tr><td>1440 min Summer</td><td>4.789</td><td>0.0</td><td>1460.7</td><td>1198</td></tr><tr><td>2160 min Summer</td><td>3.489</td><td>0.0</td><td>2335.0</td><td>1568</td></tr><tr><td>2880 min Summer</td><td>2.783</td><td>0.0</td><td>2445.2</td><td>1976</td></tr><tr><td>4320 min Summer</td><td>2.020</td><td>0.0</td><td>2488.0</td><td>2808</td></tr><tr><td>5760 min Summer</td><td>1.607</td><td>0.0</td><td>3004.3</td><td>3632</td></tr><tr><td>7200 min Summer</td><td>1.346</td><td>0.0</td><td>3136.0</td><td>4408</td></tr><tr><td>8640 min Summer</td><td>1.165</td><td>0.0</td><td>3243.0</td><td>5200</td></tr><tr><td>10080 min Summer</td><td>1.032</td><td>0.0</td><td>3316.2</td><td>5968</td></tr><tr><td>15 min Winter</td><td>118.408</td><td>0.0</td><td>442.8</td><td>34</td></tr><tr><td>30 min Winter</td><td>79.579</td><td>0.0</td><td>596.2</td><td>49</td></tr><tr><td>60 min Winter</td><td>51.031</td><td>0.0</td><td>974.1</td><td>78</td></tr><tr><td>120 min Winter</td><td>31.581</td><td>0.0</td><td>1196.3</td><td>134</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	99.482	0.182	8.3	578.9	O K	30 min Summer	99.539	0.239	9.1	774.9	O K	60 min Summer	99.598	0.298	9.1	987.9	O K	120 min Summer	99.657	0.357	9.8	1206.2	O K	180 min Summer	99.688	0.388	10.2	1327.8	O K	240 min Summer	99.708	0.408	10.5	1405.4	Flood Risk	360 min Summer	99.735	0.435	10.8	1510.8	Flood Risk	480 min Summer	99.751	0.451	11.0	1577.5	Flood Risk	600 min Summer	99.762	0.462	11.2	1621.1	Flood Risk	720 min Summer	99.769	0.469	11.2	1649.4	Flood Risk	960 min Summer	99.775	0.475	11.3	1676.5	Flood Risk	1440 min Summer	99.778	0.478	11.4	1686.0	Flood Risk	2160 min Summer	99.775	0.475	11.3	1674.8	Flood Risk	2880 min Summer	99.768	0.468	11.2	1645.1	Flood Risk	4320 min Summer	99.747	0.447	11.0	1558.9	Flood Risk	5760 min Summer	99.722	0.422	10.7	1462.4	Flood Risk	7200 min Summer	99.698	0.398	10.4	1367.5	O K	8640 min Summer	99.676	0.376	10.1	1280.0	O K	10080 min Summer	99.655	0.355	9.8	1198.2	O K	15 min Winter	99.503	0.203	8.8	648.6	O K	30 min Winter	99.566	0.266	9.1	869.3	O K	60 min Winter	99.631	0.331	9.4	1108.1	O K	120 min Winter	99.695	0.395	10.3	1354.1	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	118.408	0.0	389.2	34	30 min Summer	79.579	0.0	536.3	49	60 min Summer	51.031	0.0	868.4	78	120 min Summer	31.581	0.0	1072.9	138	180 min Summer	23.488	0.0	1188.5	196	240 min Summer	18.897	0.0	1264.4	254	360 min Summer	13.902	0.0	1368.1	372	480 min Summer	11.169	0.0	1433.1	490	600 min Summer	9.417	0.0	1473.0	608	720 min Summer	8.187	0.0	1495.4	724	960 min Summer	6.558	0.0	1504.3	960	1440 min Summer	4.789	0.0	1460.7	1198	2160 min Summer	3.489	0.0	2335.0	1568	2880 min Summer	2.783	0.0	2445.2	1976	4320 min Summer	2.020	0.0	2488.0	2808	5760 min Summer	1.607	0.0	3004.3	3632	7200 min Summer	1.346	0.0	3136.0	4408	8640 min Summer	1.165	0.0	3243.0	5200	10080 min Summer	1.032	0.0	3316.2	5968	15 min Winter	118.408	0.0	442.8	34	30 min Winter	79.579	0.0	596.2	49	60 min Winter	51.031	0.0	974.1	78	120 min Winter	31.581	0.0	1196.3	134
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																								
15 min Summer	99.482	0.182	8.3	578.9	O K																																																																																																																																																																																																																																																																								
30 min Summer	99.539	0.239	9.1	774.9	O K																																																																																																																																																																																																																																																																								
60 min Summer	99.598	0.298	9.1	987.9	O K																																																																																																																																																																																																																																																																								
120 min Summer	99.657	0.357	9.8	1206.2	O K																																																																																																																																																																																																																																																																								
180 min Summer	99.688	0.388	10.2	1327.8	O K																																																																																																																																																																																																																																																																								
240 min Summer	99.708	0.408	10.5	1405.4	Flood Risk																																																																																																																																																																																																																																																																								
360 min Summer	99.735	0.435	10.8	1510.8	Flood Risk																																																																																																																																																																																																																																																																								
480 min Summer	99.751	0.451	11.0	1577.5	Flood Risk																																																																																																																																																																																																																																																																								
600 min Summer	99.762	0.462	11.2	1621.1	Flood Risk																																																																																																																																																																																																																																																																								
720 min Summer	99.769	0.469	11.2	1649.4	Flood Risk																																																																																																																																																																																																																																																																								
960 min Summer	99.775	0.475	11.3	1676.5	Flood Risk																																																																																																																																																																																																																																																																								
1440 min Summer	99.778	0.478	11.4	1686.0	Flood Risk																																																																																																																																																																																																																																																																								
2160 min Summer	99.775	0.475	11.3	1674.8	Flood Risk																																																																																																																																																																																																																																																																								
2880 min Summer	99.768	0.468	11.2	1645.1	Flood Risk																																																																																																																																																																																																																																																																								
4320 min Summer	99.747	0.447	11.0	1558.9	Flood Risk																																																																																																																																																																																																																																																																								
5760 min Summer	99.722	0.422	10.7	1462.4	Flood Risk																																																																																																																																																																																																																																																																								
7200 min Summer	99.698	0.398	10.4	1367.5	O K																																																																																																																																																																																																																																																																								
8640 min Summer	99.676	0.376	10.1	1280.0	O K																																																																																																																																																																																																																																																																								
10080 min Summer	99.655	0.355	9.8	1198.2	O K																																																																																																																																																																																																																																																																								
15 min Winter	99.503	0.203	8.8	648.6	O K																																																																																																																																																																																																																																																																								
30 min Winter	99.566	0.266	9.1	869.3	O K																																																																																																																																																																																																																																																																								
60 min Winter	99.631	0.331	9.4	1108.1	O K																																																																																																																																																																																																																																																																								
120 min Winter	99.695	0.395	10.3	1354.1	O K																																																																																																																																																																																																																																																																								
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																									
15 min Summer	118.408	0.0	389.2	34																																																																																																																																																																																																																																																																									
30 min Summer	79.579	0.0	536.3	49																																																																																																																																																																																																																																																																									
60 min Summer	51.031	0.0	868.4	78																																																																																																																																																																																																																																																																									
120 min Summer	31.581	0.0	1072.9	138																																																																																																																																																																																																																																																																									
180 min Summer	23.488	0.0	1188.5	196																																																																																																																																																																																																																																																																									
240 min Summer	18.897	0.0	1264.4	254																																																																																																																																																																																																																																																																									
360 min Summer	13.902	0.0	1368.1	372																																																																																																																																																																																																																																																																									
480 min Summer	11.169	0.0	1433.1	490																																																																																																																																																																																																																																																																									
600 min Summer	9.417	0.0	1473.0	608																																																																																																																																																																																																																																																																									
720 min Summer	8.187	0.0	1495.4	724																																																																																																																																																																																																																																																																									
960 min Summer	6.558	0.0	1504.3	960																																																																																																																																																																																																																																																																									
1440 min Summer	4.789	0.0	1460.7	1198																																																																																																																																																																																																																																																																									
2160 min Summer	3.489	0.0	2335.0	1568																																																																																																																																																																																																																																																																									
2880 min Summer	2.783	0.0	2445.2	1976																																																																																																																																																																																																																																																																									
4320 min Summer	2.020	0.0	2488.0	2808																																																																																																																																																																																																																																																																									
5760 min Summer	1.607	0.0	3004.3	3632																																																																																																																																																																																																																																																																									
7200 min Summer	1.346	0.0	3136.0	4408																																																																																																																																																																																																																																																																									
8640 min Summer	1.165	0.0	3243.0	5200																																																																																																																																																																																																																																																																									
10080 min Summer	1.032	0.0	3316.2	5968																																																																																																																																																																																																																																																																									
15 min Winter	118.408	0.0	442.8	34																																																																																																																																																																																																																																																																									
30 min Winter	79.579	0.0	596.2	49																																																																																																																																																																																																																																																																									
60 min Winter	51.031	0.0	974.1	78																																																																																																																																																																																																																																																																									
120 min Winter	31.581	0.0	1196.3	134																																																																																																																																																																																																																																																																									
©1982-2012 Micro Drainage Ltd																																																																																																																																																																																																																																																																													

Michael A Jennings Associates		Page 2																																																																																																																																																																																
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:100 + 30% year Max Discharge =12 l/s																																																																																																																																																																																	
Date 19.03.13 File Southern Attenuation Pond - ...	Designed by C.Pendle Checked by																																																																																																																																																																																	
Micro Drainage	Source Control 2013.1																																																																																																																																																																																	
<u>Summary of Results for 100 year Return Period (+30%)</u> <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>180 min Winter</td><td>99.730</td><td>0.430</td><td>10.8</td><td>1491.7</td><td>Flood Risk</td></tr><tr><td>240 min Winter</td><td>99.752</td><td>0.452</td><td>11.0</td><td>1580.3</td><td>Flood Risk</td></tr><tr><td>360 min Winter</td><td>99.782</td><td>0.482</td><td>11.4</td><td>1701.8</td><td>Flood Risk</td></tr><tr><td>480 min Winter</td><td>99.801</td><td>0.501</td><td>11.6</td><td>1780.2</td><td>Flood Risk</td></tr><tr><td>600 min Winter</td><td>99.813</td><td>0.513</td><td>11.8</td><td>1832.9</td><td>Flood Risk</td></tr><tr><td>720 min Winter</td><td>99.822</td><td>0.522</td><td>11.9</td><td>1868.6</td><td>Flood Risk</td></tr><tr><td>960 min Winter</td><td>99.831</td><td>0.531</td><td>12.0</td><td>1907.8</td><td>Flood Risk</td></tr><tr><td>1440 min Winter</td><td>99.833</td><td>0.533</td><td>12.0</td><td>1915.8</td><td>Flood Risk</td></tr><tr><td>2160 min Winter</td><td>99.826</td><td>0.526</td><td>11.9</td><td>1886.8</td><td>Flood Risk</td></tr><tr><td>2880 min Winter</td><td>99.814</td><td>0.514</td><td>11.8</td><td>1837.4</td><td>Flood Risk</td></tr><tr><td>4320 min Winter</td><td>99.782</td><td>0.482</td><td>11.4</td><td>1702.8</td><td>Flood Risk</td></tr><tr><td>5760 min Winter</td><td>99.746</td><td>0.446</td><td>11.0</td><td>1557.2</td><td>Flood Risk</td></tr><tr><td>7200 min Winter</td><td>99.711</td><td>0.411</td><td>10.5</td><td>1417.7</td><td>Flood Risk</td></tr><tr><td>8640 min Winter</td><td>99.679</td><td>0.379</td><td>10.1</td><td>1290.5</td><td>O K</td></tr><tr><td>10080 min Winter</td><td>99.648</td><td>0.348</td><td>9.7</td><td>1173.9</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>180 min Winter</td><td>23.488</td><td>0.0</td><td>1318.7</td><td>192</td></tr><tr><td>240 min Winter</td><td>18.897</td><td>0.0</td><td>1396.4</td><td>250</td></tr><tr><td>360 min Winter</td><td>13.902</td><td>0.0</td><td>1496.8</td><td>366</td></tr><tr><td>480 min Winter</td><td>11.169</td><td>0.0</td><td>1552.7</td><td>480</td></tr><tr><td>600 min Winter</td><td>9.417</td><td>0.0</td><td>1581.1</td><td>596</td></tr><tr><td>720 min Winter</td><td>8.187</td><td>0.0</td><td>1592.2</td><td>708</td></tr><tr><td>960 min Winter</td><td>6.558</td><td>0.0</td><td>1588.3</td><td>932</td></tr><tr><td>1440 min Winter</td><td>4.789</td><td>0.0</td><td>1563.4</td><td>1348</td></tr><tr><td>2160 min Winter</td><td>3.489</td><td>0.0</td><td>2604.2</td><td>1672</td></tr><tr><td>2880 min Winter</td><td>2.783</td><td>0.0</td><td>2713.6</td><td>2136</td></tr><tr><td>4320 min Winter</td><td>2.020</td><td>0.0</td><td>2699.2</td><td>3036</td></tr><tr><td>5760 min Winter</td><td>1.607</td><td>0.0</td><td>3367.6</td><td>3920</td></tr><tr><td>7200 min Winter</td><td>1.346</td><td>0.0</td><td>3514.6</td><td>4760</td></tr><tr><td>8640 min Winter</td><td>1.165</td><td>0.0</td><td>3635.5</td><td>5544</td></tr><tr><td>10080 min Winter</td><td>1.032</td><td>0.0</td><td>3721.3</td><td>6360</td></tr></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	180 min Winter	99.730	0.430	10.8	1491.7	Flood Risk	240 min Winter	99.752	0.452	11.0	1580.3	Flood Risk	360 min Winter	99.782	0.482	11.4	1701.8	Flood Risk	480 min Winter	99.801	0.501	11.6	1780.2	Flood Risk	600 min Winter	99.813	0.513	11.8	1832.9	Flood Risk	720 min Winter	99.822	0.522	11.9	1868.6	Flood Risk	960 min Winter	99.831	0.531	12.0	1907.8	Flood Risk	1440 min Winter	99.833	0.533	12.0	1915.8	Flood Risk	2160 min Winter	99.826	0.526	11.9	1886.8	Flood Risk	2880 min Winter	99.814	0.514	11.8	1837.4	Flood Risk	4320 min Winter	99.782	0.482	11.4	1702.8	Flood Risk	5760 min Winter	99.746	0.446	11.0	1557.2	Flood Risk	7200 min Winter	99.711	0.411	10.5	1417.7	Flood Risk	8640 min Winter	99.679	0.379	10.1	1290.5	O K	10080 min Winter	99.648	0.348	9.7	1173.9	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	180 min Winter	23.488	0.0	1318.7	192	240 min Winter	18.897	0.0	1396.4	250	360 min Winter	13.902	0.0	1496.8	366	480 min Winter	11.169	0.0	1552.7	480	600 min Winter	9.417	0.0	1581.1	596	720 min Winter	8.187	0.0	1592.2	708	960 min Winter	6.558	0.0	1588.3	932	1440 min Winter	4.789	0.0	1563.4	1348	2160 min Winter	3.489	0.0	2604.2	1672	2880 min Winter	2.783	0.0	2713.6	2136	4320 min Winter	2.020	0.0	2699.2	3036	5760 min Winter	1.607	0.0	3367.6	3920	7200 min Winter	1.346	0.0	3514.6	4760	8640 min Winter	1.165	0.0	3635.5	5544	10080 min Winter	1.032	0.0	3721.3	6360
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status																																																																																																																																																																													
180 min Winter	99.730	0.430	10.8	1491.7	Flood Risk																																																																																																																																																																													
240 min Winter	99.752	0.452	11.0	1580.3	Flood Risk																																																																																																																																																																													
360 min Winter	99.782	0.482	11.4	1701.8	Flood Risk																																																																																																																																																																													
480 min Winter	99.801	0.501	11.6	1780.2	Flood Risk																																																																																																																																																																													
600 min Winter	99.813	0.513	11.8	1832.9	Flood Risk																																																																																																																																																																													
720 min Winter	99.822	0.522	11.9	1868.6	Flood Risk																																																																																																																																																																													
960 min Winter	99.831	0.531	12.0	1907.8	Flood Risk																																																																																																																																																																													
1440 min Winter	99.833	0.533	12.0	1915.8	Flood Risk																																																																																																																																																																													
2160 min Winter	99.826	0.526	11.9	1886.8	Flood Risk																																																																																																																																																																													
2880 min Winter	99.814	0.514	11.8	1837.4	Flood Risk																																																																																																																																																																													
4320 min Winter	99.782	0.482	11.4	1702.8	Flood Risk																																																																																																																																																																													
5760 min Winter	99.746	0.446	11.0	1557.2	Flood Risk																																																																																																																																																																													
7200 min Winter	99.711	0.411	10.5	1417.7	Flood Risk																																																																																																																																																																													
8640 min Winter	99.679	0.379	10.1	1290.5	O K																																																																																																																																																																													
10080 min Winter	99.648	0.348	9.7	1173.9	O K																																																																																																																																																																													
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																														
180 min Winter	23.488	0.0	1318.7	192																																																																																																																																																																														
240 min Winter	18.897	0.0	1396.4	250																																																																																																																																																																														
360 min Winter	13.902	0.0	1496.8	366																																																																																																																																																																														
480 min Winter	11.169	0.0	1552.7	480																																																																																																																																																																														
600 min Winter	9.417	0.0	1581.1	596																																																																																																																																																																														
720 min Winter	8.187	0.0	1592.2	708																																																																																																																																																																														
960 min Winter	6.558	0.0	1588.3	932																																																																																																																																																																														
1440 min Winter	4.789	0.0	1563.4	1348																																																																																																																																																																														
2160 min Winter	3.489	0.0	2604.2	1672																																																																																																																																																																														
2880 min Winter	2.783	0.0	2713.6	2136																																																																																																																																																																														
4320 min Winter	2.020	0.0	2699.2	3036																																																																																																																																																																														
5760 min Winter	1.607	0.0	3367.6	3920																																																																																																																																																																														
7200 min Winter	1.346	0.0	3514.6	4760																																																																																																																																																																														
8640 min Winter	1.165	0.0	3635.5	5544																																																																																																																																																																														
10080 min Winter	1.032	0.0	3721.3	6360																																																																																																																																																																														
©1982-2012 Micro Drainage Ltd																																																																																																																																																																																		

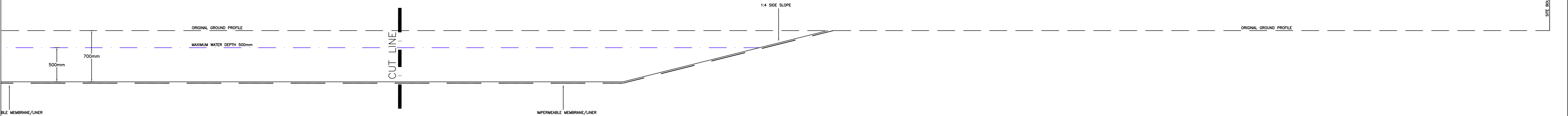
Michael A Jennings Associates		Page 3																																																
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:100 + 30% year Max Discharge =12 l/s																																																	
Date 19.03.13 File Southern Attenuation Pond - ...	Designed by C.Pendle Checked by																																																	
Micro Drainage Source Control 2013.1																																																		
<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>19.400</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.350</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) 2.643 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4 0.500</td> <td>8</td> <td>12 0.500</td> <td>16</td> <td>20 0.643</td> </tr> <tr> <td>4</td> <td>8 0.500</td> <td>12</td> <td>16 0.500</td> <td></td> <td></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)	19.400	Shortest Storm (mins)	15	Ratio R	0.350	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	From:	To:	From:	To:	From:	To:	0	4 0.500	8	12 0.500	16	20 0.643	4	8 0.500	12	16 0.500		
Rainfall Model	FSR	Winter Storms	Yes																																															
Return Period (years)	100	Cv (Summer)	0.750																																															
Region	England and Wales	Cv (Winter)	0.840																																															
M5-60 (mm)	19.400	Shortest Storm (mins)	15																																															
Ratio R	0.350	Longest Storm (mins)	10080																																															
Summer Storms	Yes	Climate Change %	+30																																															
Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)																																													
From:	To:	From:	To:	From:	To:																																													
0	4 0.500	8	12 0.500	16	20 0.643																																													
4	8 0.500	12	16 0.500																																															
©1982-2012 Micro Drainage Ltd																																																		

Michael A Jennings Associates		Page 4																																																																																																																																								
58-62 Ock Street Abingdon Oxon OX14 5BZ	Southern Attenuation Pond 1:100 + 30% year Max Discharge =12 l/s																																																																																																																																									
Date 19.03.13 File Southern Attenuation Pond - ...	Designed by C.Pendle Checked by																																																																																																																																									
Micro Drainage Source Control 2013.1																																																																																																																																										
Model Details Storage is Online Cover Level (m) 100.000 Tank or Pond Structure Invert Level (m) 99.300 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>2960.0</td><td>0.700</td><td>4671.0</td><td>1.400</td><td>0.0</td><td>2.100</td><td>0.0</td></tr><tr><td>0.100</td><td>3194.0</td><td>0.701</td><td>0.0</td><td>1.500</td><td>0.0</td><td>2.200</td><td>0.0</td></tr><tr><td>0.200</td><td>3435.0</td><td>0.900</td><td>0.0</td><td>1.600</td><td>0.0</td><td>2.300</td><td>0.0</td></tr><tr><td>0.300</td><td>3673.0</td><td>1.000</td><td>0.0</td><td>1.700</td><td>0.0</td><td>2.400</td><td>0.0</td></tr><tr><td>0.400</td><td>3919.0</td><td>1.100</td><td>0.0</td><td>1.800</td><td>0.0</td><td>2.500</td><td>0.0</td></tr><tr><td>0.500</td><td>4167.0</td><td>1.200</td><td>0.0</td><td>1.900</td><td>0.0</td><td></td><td></td></tr><tr><td>0.600</td><td>4417.0</td><td>1.300</td><td>0.0</td><td>2.000</td><td>0.0</td><td></td><td></td></tr></tbody></table> Hydro-Brake® Outflow Control Design Head (m) 0.530 Hydro-Brake® Type Md7 Invert Level (m) 99.300 Design Flow (l/s) 12.0 Diameter (mm) 156 <table><thead><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>0.100</td><td>3.9</td><td>1.200</td><td>18.0</td><td>3.000</td><td>28.4</td><td>7.000</td><td>43.5</td></tr><tr><td>0.200</td><td>8.8</td><td>1.400</td><td>19.4</td><td>3.500</td><td>30.7</td><td>7.500</td><td>45.0</td></tr><tr><td>0.300</td><td>9.0</td><td>1.600</td><td>20.8</td><td>4.000</td><td>32.8</td><td>8.000</td><td>46.5</td></tr><tr><td>0.400</td><td>10.4</td><td>1.800</td><td>22.0</td><td>4.500</td><td>34.8</td><td>8.500</td><td>47.9</td></tr><tr><td>0.500</td><td>11.6</td><td>2.000</td><td>23.2</td><td>5.000</td><td>36.7</td><td>9.000</td><td>49.3</td></tr><tr><td>0.600</td><td>12.7</td><td>2.200</td><td>24.4</td><td>5.500</td><td>38.5</td><td>9.500</td><td>50.6</td></tr><tr><td>0.800</td><td>14.7</td><td>2.400</td><td>25.4</td><td>6.000</td><td>40.2</td><td></td><td></td></tr><tr><td>1.000</td><td>16.4</td><td>2.600</td><td>26.5</td><td>6.500</td><td>41.9</td><td></td><td></td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	2960.0	0.700	4671.0	1.400	0.0	2.100	0.0	0.100	3194.0	0.701	0.0	1.500	0.0	2.200	0.0	0.200	3435.0	0.900	0.0	1.600	0.0	2.300	0.0	0.300	3673.0	1.000	0.0	1.700	0.0	2.400	0.0	0.400	3919.0	1.100	0.0	1.800	0.0	2.500	0.0	0.500	4167.0	1.200	0.0	1.900	0.0			0.600	4417.0	1.300	0.0	2.000	0.0			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	3.9	1.200	18.0	3.000	28.4	7.000	43.5	0.200	8.8	1.400	19.4	3.500	30.7	7.500	45.0	0.300	9.0	1.600	20.8	4.000	32.8	8.000	46.5	0.400	10.4	1.800	22.0	4.500	34.8	8.500	47.9	0.500	11.6	2.000	23.2	5.000	36.7	9.000	49.3	0.600	12.7	2.200	24.4	5.500	38.5	9.500	50.6	0.800	14.7	2.400	25.4	6.000	40.2			1.000	16.4	2.600	26.5	6.500	41.9		
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																																																																																			
0.000	2960.0	0.700	4671.0	1.400	0.0	2.100	0.0																																																																																																																																			
0.100	3194.0	0.701	0.0	1.500	0.0	2.200	0.0																																																																																																																																			
0.200	3435.0	0.900	0.0	1.600	0.0	2.300	0.0																																																																																																																																			
0.300	3673.0	1.000	0.0	1.700	0.0	2.400	0.0																																																																																																																																			
0.400	3919.0	1.100	0.0	1.800	0.0	2.500	0.0																																																																																																																																			
0.500	4167.0	1.200	0.0	1.900	0.0																																																																																																																																					
0.600	4417.0	1.300	0.0	2.000	0.0																																																																																																																																					
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																																																																																			
0.100	3.9	1.200	18.0	3.000	28.4	7.000	43.5																																																																																																																																			
0.200	8.8	1.400	19.4	3.500	30.7	7.500	45.0																																																																																																																																			
0.300	9.0	1.600	20.8	4.000	32.8	8.000	46.5																																																																																																																																			
0.400	10.4	1.800	22.0	4.500	34.8	8.500	47.9																																																																																																																																			
0.500	11.6	2.000	23.2	5.000	36.7	9.000	49.3																																																																																																																																			
0.600	12.7	2.200	24.4	5.500	38.5	9.500	50.6																																																																																																																																			
0.800	14.7	2.400	25.4	6.000	40.2																																																																																																																																					
1.000	16.4	2.600	26.5	6.500	41.9																																																																																																																																					
©1982-2012 Micro Drainage Ltd																																																																																																																																										

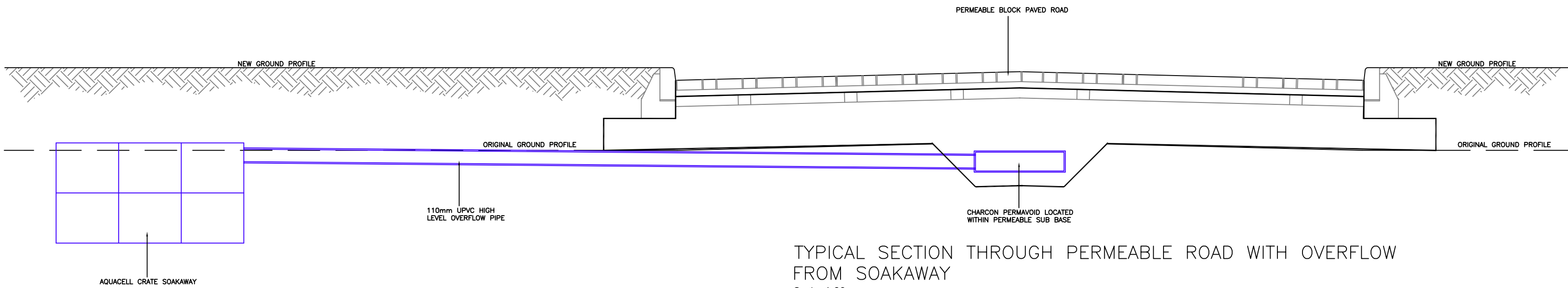




TYPICAL SECTION THROUGH IMPERMEABLE ATTENUATION POND
Scale 1:20



TYPICAL SECTION THROUGH IMPERMEABLE ATTENUATION POND
Scale 1:20



TYPICAL SECTION THROUGH PERMEABLE ROAD WITH OVERFLOW FROM SOAKAWAY
Scale 1:20

PRELIMINARY				
REV. No.	DATE	DESCRIPTION	INITIALS	
Client				
 BARRATT SOUTHAMPTON			 CIVIL AND STRUCTURAL ENGINEERS 58-62 Oak Street, Abingdon Oxon, OX14 5BZ Tel: 01235 555173 Fax: 01235 523228 	
Project Manor Farm Denvilles				
Title		Scale As shown	Date Mar 13	Drawing No. 4527:71
Drainage sections		Checked KTG	Drawn KTG	Rev -

APPENDIX H
ENVIRONMENT AGENCY CORRESPONDENCE

MJA CONSULTING
CIVIL AND STRUCTURAL ENGINEERS

58-62 Ock Street, Abingdon, Oxon OX14 5BZ
Tel: (01235) 555173 Fax: (01235) 523226

Environment Agency
Solent & South Downs Area Office
Colvedene Court (Wessex Business Park)
Wessex Way
Colden Common
Winchester
SO21 1WP

Our ref: CP/13:0043/4527
Date: 21st January 2013
E-mail: ChrisP@mjaconsulting.co.uk

HA/2012/113691/01-L01

Pre-application Enquiry
Flood Risk Assessment
Manor Farm and Copeys Nursery, Hallett Road, Havent

Dear Miss Giles,

Thank you for your comments relating to the FRA submitted for the above development.

Please see the revised Flood Risk Assessment (Rev C) which has been updated to cover the deficiencies highlighted in your objection letter of 27.12.12.

1. Consider the impact of overland flow into the Nore Farm Stream given the known flooding problems experienced downstream.

Please refer to paragraphs: 5.4.6, 7.9 & 9.10

2. Appropriately address the likely infiltration problems at the site.

Please refer to paragraphs: 3.2.6, 5.4.4-5.4.6, 7.8-7.9 & 9.9

I trust you find the amendments to the FRA acceptable to overcome the objection, however should you require additional information then please do not hesitate to contact me.

Yours sincerely,



CHRIS PENDLE
FOR MJA CONSULTING



MICHAEL A JENNINGS ASSOCIATES LIMITED

Managing Director: P P Berrill Directors: K T Gebhart, J A Kerton BEng CEng MICE,

Consultant: G J Ford BSc CEng MICE MIHT

Registered Office: 24 Bath Street, Abingdon OX14 3QH

Incorporated in England & Wales Company Number: 4414364 VAT No. 787 8086 61



MJA CONSULTING
CIVIL AND STRUCTURAL ENGINEERS

58-62 Ock Street, Abingdon, Oxon OX14 5BZ
Tel: (01235) 555173 Fax: (01235) 523226

Environment Agency
Solent & South Downs Area Office
Colvedene Court (Wessex Business Park)
Wessex Way
Colden Common
Winchester
SO21 1WP

Our ref: CP/13:0001/4527
Date: 01st March 2013
E-mail: ChrisP@mjaconsulting.co.uk

HA/2013/113856/02-L01

Pre-application Enquiry
Flood Risk Assessment
Manor Farm and Copeseys Nursery, Hallett Road, Havent

Dear Miss Giles,

Thank you for your recent comments relating to the FRA submitted for the above development.

Please find enclosed the revised Flood Risk Assessment (Rev E) which has been updated to cover the issues highlighted in your letter of 28.02.13 and my subsequent discussion with George Woodward on the 01.03.13.

Please also find below the individual responses to each of the comments:

You intend to intercept overland flows from the existing developed area to the west of your site and then convey these flows into your proposed drainage system. However, you have not taken account of these overland flows in your drainage calculations and storage requirements. This needs to be done and additional storage provided if necessary, to ensure that the existing properties are drained effectively and that flood risk is not increased to either the existing or proposed properties.

FRA Ref: Appendix D & 6.4.2

The attenuation ponds are presently shown as indicative in terms of size and available storage volumes.

Although we feel the occurrence of overland flow from the existing development to the west will be very rare, a full allowance for the potential runoff from this area will be included in the pond detailed design storage calculations.

This will ensure that the existing properties are drained effectively and that flood risk is not increased to either the existing or proposed properties.

Please see an update to the 'Post-Development Runoff' calculation in Appendix D of the FRA to also include an allowance for this offsite runoff.



MICHAEL A JENNINGS ASSOCIATES LIMITED

Managing Director: P P Berrill Directors: K T Gebhart, J A Kerton BEng CEng MICE,

Consultant: G J Ford BSc CEng MICE MIHT

Registered Office: 24 Bath Street, Abingdon OX14 3QH

Incorporated in England & Wales Company Number: 4414364 VAT No. 787 8086 61



We note that you intend to raise ground levels even further than before, in the region of 450mm above existing levels, using a free-draining aggregate. This would result in a relatively permeable layer lying above the existing relatively impermeable ground, with the proposed soakaways cutting through both. This could lead to water moving laterally out of the soakaways through the fill material. What implications does this have from a geotechnical point of view? Could lateral flows travel sub-surface along the prevailing topography and affect either the existing or proposed properties?

FRA Ref: 5.2.5 & 5.5.3

Following discussions with our geotechnical engineer (Dominic Brightman of Wilson Bailey), whilst we feel that there would be a suitable level of interaction through the free-draining stone material used to raise the site and the existing strata, we acknowledge that the lower infiltration rates of the existing strata could cause residual lateral flows within the free-draining stone material.

The possibility of high groundwater and for lateral flow has been considered within the geotechnical design of the house foundations, potential issues will be mitigated through the use of vibro stone columns.

The topography of the site would suggest that any lateral groundwater flow at the site will be in an easterly direction away from the existing development and towards the Nore Farm Stream.

Any lateral flow that has not infiltrated into the existing strata will be collected at the eastern boundary of the site by a series of collector cells and distributed into the attenuation ponds.

This will ensure that the peak flow rate into the Nore Farm stream is not increased as a result of the raising of the site.

The borehole log in Appendix E indicates extremely high groundwater levels over this winter, in one location only 210mm below the ground. Whilst it is important that infiltration is included in the drainage design to reduce the amount of runoff entering the Nore Farm Stream as much as possible, there is a real risk of groundwater infiltration into the attenuation ponds. In your design, the attenuation ponds are effectively providing a backup means of safely attenuating runoff, and would only come into operation when the soakaways cannot function, i.e. when groundwater is high. Because of this we recommend that the ponds are lined to prevent groundwater ingress interfering with their designed operation. Will this change your storage requirements?

FRA Ref: 5.2.4, 7.10, 7.15 & 9.10

All attenuation ponds will be lined with an impermeable lining to prevent any interaction with the groundwater and the lack of infiltration within these ponds will be accounted for in the detailed design sizing calculations.

You state that a management company will own and maintain all of the SUDS features. Given the importance of the maintenance for the functioning of the system we recommend that this arrangement is incorporated into a Section 106 agreement. This would obviously be a matter of discussion for yourselves and Havant Borough Council though.

FRA Ref: 7.16

The arrangement for the long term maintenance of SUDS will be incorporated into a S106 agreement.

I trust you find the amendments to the FRA acceptable to overcome the objection, however should you require additional information then please do not hesitate to contact me.

Yours sincerely,



CHRIS PENDLE
FOR MJA CONSULTING

MJA CONSULTING
CIVIL AND STRUCTURAL ENGINEERS

58-62 Ock Street, Abingdon, Oxon OX14 5BZ
Tel: (01235) 555173 Fax: (01235) 523226

Environment Agency
Solent & South Downs Area Office
Colvedene Court (Wessex Business Park)
Wessex Way
Colden Common
Winchester
SO21 1WP

Our ref: CP/13:0001/4527
Date: 19th March 2013
E-mail: ChrisP@mjaconsulting.co.uk

HA/2013/113856/03-L01

Pre-application Enquiry
Flood Risk Assessment
Manor Farm and Copeseys Nursery, Hallett Road, Havent

Dear Miss Giles,

Thank you for your recent comments relating to the FRA submitted for the above development.

Please find enclosed the revised Flood Risk Assessment (**Rev F**) which has been updated to cover the issues highlighted in your letter of 13.03.13.

Please also find below the individual responses to each of the comments:

Following the Environment Agency's comments, the ponds are now lined to prevent direct groundwater ingress, but there is still the potential for groundwater infiltration of the ponds via the overflows from the soakaways and from the collector cells for intercepting lateral flow. How will this be controlled? In addition, the additional storage volume required now that the pond is lined has not been calculated.

The principle surface water drainage strategy for the proposed site is infiltration, the attenuation ponds are designed solely as a protection measure to intercept any overland flows from the existing houses to the west and any overflows from the SuDS features within the proposed development (soakaways & permeable block paving) which subsequently MAY include high groundwater flows via the overflow system.

Whilst it may not be possible to completely prevent the infiltration of groundwater into the pond via overflows, it should be noted that only shallow soakaways will be used and the level of the overflows within the soakaways and collector cells within the permeable paving will be set as high as possible (approximately 150-300mm) above the highest recorded groundwater level (Jan 2013).



MICHAEL A JENNINGS ASSOCIATES LIMITED

Managing Director: P P Berrill Directors: K T Gebhart, J A Kerton BEng CEng MICE,

Consultant: G J Ford BSc CEng MICE MIHT

Registered Office: 24 Bath Street, Abingdon OX14 3QH

Incorporated in England & Wales Company Number: 4414364 VAT No. 787 8086 61



Please find in Appendix G a set of calculations for the two attenuation ponds.

These have been calculated for the worst possible case scenario of zero infiltration through all the SuDS features across the whole site resulting in all impermeable areas from proposed development and the potential runoff from offsite areas discharging directly into the ponds.

There is no infiltration allowance through the ponds within the calculations.

These ponds will also have a minimum freeboard of 200mm.

We have included an additional 25% contingency of the total contributing impermeable area to allow for the potential groundwater infiltration into the attenuation ponds via the overflow system.

Southern Attenuation Pond Criteria:

Site total impermeable area = 1.69ha

Offsite total impermeable area = 0.425ha

+25% for groundwater infiltration = 2.64ha

Design Storm = 100year +30% Climate Change

Max Discharge = 16 l/s

Max Water Depth =0.5m

Northern Attenuation Pond Criteria:

Site total impermeable area = 1.45ha

Offsite total impermeable area = 0ha

+25% for groundwater infiltration = 1.81ha

Design Storm = 100year +30% Climate Change

Max Discharge = 12 l/s

Max Water Depth =0.4m

Following the Environment Agency's comments regarding the lack of consideration of overland flows from offsite in the drainage design, an allowance has been made in the drainage calculations for a small area of additional land. How has this area been derived? The FRA should include a plan of the indicative catchment draining into the site.

Please find in Appendix G a plan highlighting the 4250m² of offsite land which could potentially contribute to overland flows onto the proposed site.

Please note that the offsite contributing area has been derived from areas of known historic flooding and via anecdotal evidence from residents.

Given the 2 points above the attenuation ponds may potentially need to be larger to provide additional storage. Is there space on site for these ponds and are they deliverable given the requirement for public open space on the site? Do Havant Borough Council accept the loss of this public open space to make way for the ponds? If they do not, will the drainage strategy need to be revised?

Please see revised layout plan within the FRA Appendix A highlighting the required area of the proposed attenuation ponds.

Although the ponds are situated within POS, as a backup for the drainage system and due to being lined with an impermeable membrane, they will be predominantly dry throughout the year and will only come into operation during exceedance events or as a result of exceptionally high groundwater levels over and above those recorded at the end of 2012 (one of the wettest years in record in England).

Also, as they will be only 0.7m deep from top of bank to base with side slopes of 1:4 they can be safely utilised as POS when dry.

The developer intends to raise ground levels substantially (up to 450mm) to increase the depth to the water table. The impacts of this ground raising on the drainage of the existing houses to the west have not been assessed in detail, other than noting that land drains will be installed along the boundary of the development. Will these drains be sufficient to address the localised flooding issues raised by residents? In addition, do Havant Borough Council accept the land raising proposals, given the potential for it to impact on other planning matters? If they do not, will the drainage strategy need to be revised?

Presently the proposed site does not have an influence on the occurrence of flooding events to the existing houses to the west.

These houses currently sit upstream of the proposed site and flood either due to a combination of blocked road gullies and possible lack of maintenance of the existing drainage regimes causing overland flooding to gardens.

If this flood water reaches the proposed site it infiltrates into the existing strata.

The topography of the existing site would suggest that lateral groundwater flows will be in an easterly direction away from the existing development and towards the Nore Farm Stream.

The ground level raising of the proposed site up to 450mm using a free draining material will not have a negative impact on the ability and rate of any offsite overland flood water infiltrating into the soils on the proposed site or reduce the groundwater lateral flows below the site, and will not affect the drainage capability of the existing houses.

Likewise, the raising of the site will not increase the flood risk to the existing houses due to runoff from the proposed site.

Due to the proposed topography of the development any overland runoff or lateral groundwater flows will continue to flow eastwards away from the existing houses.

The proposals include a network of shallow land drains at the western boundary of the proposed site which will intercept any overland flows from the existing houses to the west of the development and any residual runoff from the proposed site entrance roads that is not collected by a SuDS system.

This will provide a level of betterment over current conditions by providing a positive drainage route for overland flood water from the existing houses without relying wholly on infiltration.

These land drains will consist of perforated 225mmdia pipes laid at no flatter than 1:250, providing a system capable of disposing approximately 33l/s into the proposed attenuation ponds.

The drainage design calls for the new development's roads to be permeably paved. Have Hampshire Highways been consulted on whether they will adopt them? If they will not, will the roads be privately maintained or will the drainage strategy need to be revised?

The roads are to be private and will be maintained through a management company.

These will however be constructed to an adoptable standard.

*In the latest version of the drainage strategy plan (ref 4527:70, Revision **D** produced **02.04.13**) two basins are now shown adjacent the road junction in the centre of the development. What is the function of these basins? Are they for drainage purposes?*

No, these are not for drainage purposes.

These are embankments created where we are proposing to raise the surrounding round levels around retained existing trees.

Havant Borough Council and the developer need to agree on a Section 106 agreement to cover management and maintenance of the sustainable drainage. Have Havant Borough Council included this within their draft heads of terms? Management and maintenance is a critical issue for the proper functioning of the drainage system and we believe it should be included within a S106.

The developer has agreed to Havant Borough Council imposing a 'SuDs Management Scheme'.

I trust you find the amendments to the FRA acceptable to overcome the objection, however should you require additional information then please do not hesitate to contact me.

Yours sincerely,



CHRIS PENDLE
FOR MJA CONSULTING

MJA CONSULTING
CIVIL AND STRUCTURAL ENGINEERS

58-62 Ock Street, Abingdon, Oxon OX14 5BZ
Tel: (01235) 555173 Fax: (01235) 523226

Environment Agency
Solent & South Downs Area Office
Colvedene Court (Wessex Business Park)
Wessex Way
Colden Common
Winchester
SO21 1WP

Our ref: CP/13:0001/4527
Date: 2nd April 2013
E-mail: ChrisP@mjaconsulting.co.uk

HA/2013/113856/04-L01

Pre-application Enquiry

Flood Risk Assessment

Manor Farm and Copses Nursery, Hallett Road, Havent

Dear Miss Giles,

Thank you for your recent comments relating to the FRA submitted for the above development.

Please find enclosed the revised Flood Risk Assessment (**Rev I**) which has been updated to cover the issues highlighted in your letter of 27.03.13.

Please also find below the individual responses to each of the comments:

The proposed discharge rates for the north and south ponds (serving the Copses Nursery site and the Manor Farm respectively) appear to have been assigned the wrong way round.

The proposed runoff rate for both sites combined has been calculated as 28 litres a second (l/s), which represents the greenfield runoff rate. MJA Consulting have assigned allowable discharge rates of 12 l/s from Copses Nursery and 16 l/s from Manor Farm, based upon the differing proportions that these 2 areas contribute to the site area when taken as a whole. However this does not appear to reflect the contributing areas accurately. The Copses Nursery site has an area of 4.48 Ha, while the Manor Farm site has an area of 3.37 Ha, representing 57% and 43% of the total site area respectively. It appears that the permitted discharge rates should therefore be 16 l/s for Copses Nursery and 12 l/s for Manor Farm.

As the required storage volumes are based upon the discharge rates above, the uncertainty over the accuracy of these rates means that it is unclear whether sufficient volume has been provided in either the north or south ponds. We are concerned that potential inaccuracies could lead to the provision of insufficient storage and clarity on this matter is required.

Given that either site could currently be developed separately, it is critical that the drainage for each is capable of working on its own without reliance on the other site.

The calculations and discharge rates do not appear to demonstrate this. MJA Consulting need to clearly explain how they have decided to split the flows between the north and south ponds. They also need to clearly show the total pond volume required to safely store runoff, and indicate how much volume each pond actually provides.

Following the Environment Agency's comments, the allowable discharge rates for the northern and southern ponds have been reassigned as follows:

Northern Pond (Copseys Nursery)

Existing Greenfield Area = 4.48ha

Greenfield Runoff = 16l/s

Maximum discharge = 16l/s

Impermeable Catchment = 1.81ha

Required attenuation volume (1:100y + 30% storm) = 1112m³

Actual volume of pond at 0.5m depth = 1496m³

0.7m depth = 2194m³

Maximum water depth (1:100y + 30% storm) = 0.382m

Southern Ponds (Manor Farm)

Existing Greenfield Area = 3.37ha

Greenfield Runoff = 12l/s

Maximum discharge = 12l/s

Impermeable Catchment = 2.64ha

Required attenuation volume (1:100y + 30% storm) = 1916m³

Actual volume of pond at 0.5m depth = 1778m³

0.7m depth = 2661m³

Maximum water depth (1:100y + 30% storm) = 0.533m

The volume of the attenuation ponds has been added to the drainage layout plan.

Please note the volume indicated for the southern ponds takes into account the overall volume of all three linked ponds at 700mm depth.

Following the meeting, MJA Consulting were going to revise the proposed drainage plan in Appendix A of the FRA to show the entire site (as part of Copseys Nursery was clipped off) but this has not been done in the latest revisions of the FRA. This should also be addressed.

The overall drainage layout plan Rev D (Appendix A) now shows the entire development boundary.

The proposed ground raising and potential for groundwater infiltration was also discussed at the meeting following the previous points raised by us in response to Revision E of the FRA (our reference: HA/2013/113856/03). To save any misunderstanding MJA Consulting or Barratt Homes should confirm if the ponds are to be built in areas of raised land or if only the proposed housing would be raised up. An indicative cross-section of the ponds and development showing the soakaway-overflow/collector cell-pond arrangement would be useful.

The ponds will not be within areas of raised land, only the houses.

Please refer to Appendix G, drawing 4527:71 for an indicative cross section of the ponds in relation to the development.