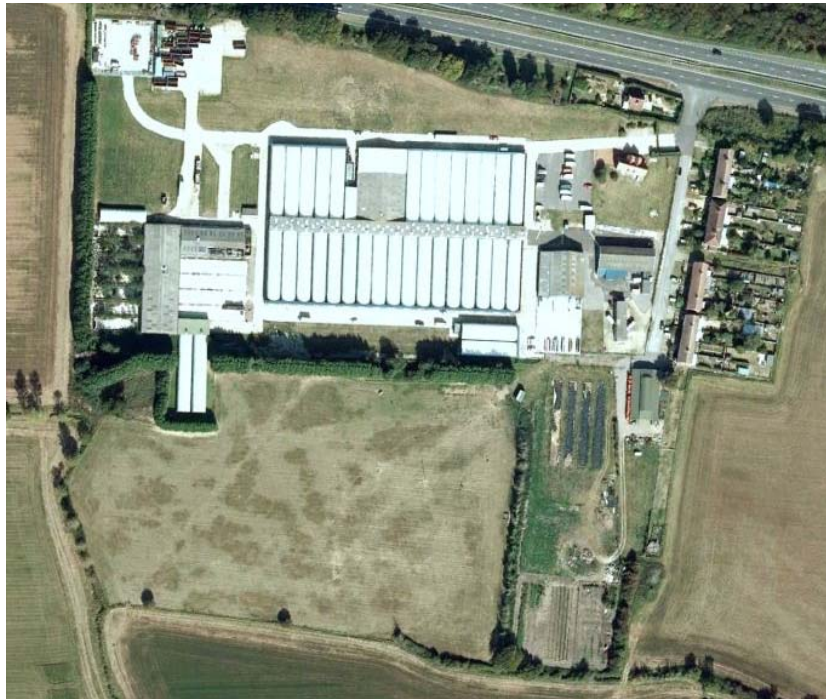


Millwood House Consultants Ltd

Creating connections in construction

Structures Contamination Civils



FLOOD RISK ASSESSMENT

The Vinery, Poling

CLIENT

Fargro Limited
Todddington Lane
Littlehampton
West Sussex
BN17 7PP

Ref: 4144C/2.3F
Date: October 2012

CONSULTING ENGINEERS

The Studio
Millwood House
Littlehampton Road
Ferring
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INDEX

- 1.0 Introduction
- 2.0 Existing Site
- 3.0 Current Flood Conditions
- 4.0 Proposed Development & Drainage Strategy
- 5.0 Summary and Recommendations

SCHEDULE OF APPENDICES

- A Site Location Map & Aerial View
- B Topographical Survey
- C Proposed Site Plan
- D Environment Agency Flood Map
- E Strategic Flood Risk Assessment Extracts
- F Proposed Drainage Strategy & Micro Drainage Calculations

Report by: **John Pakenham BSc (Hons)**
Checked by: **Martin Roberts I Eng, ACIWEM, MIHT**

Issue	Date	Compiled	Checked
Preliminary Issue	31 October 2012	JP	MR
Pre-planning issue	23 November 2012	JP	MR
Issue 3	7 th December 2012	MR	JP

1.0 INTRODUCTION

- 1.1 This report has been prepared for Fargro Limited in relation to The Vinery, Poling, West Sussex BN18 9PY and no responsibility is accepted to any third party for all or part of this study in connection with this or any other development.
- 1.2 Millwood House Consultants was appointed by the client to provide a Flood Risk Assessment (FRA) to accompany the planning application as requested by the Environment Agency and Arun District Council (ADC.)
- 1.3 This report will take the form of a formal Flood Risk Assessment in accordance with the 2012 National Planning Policy Framework (NPPF) and the associated Technical Guidance document, this being the current definitive central government flood risk policy.

W:\Projects\4144 Millwood, The Vinery, Poling, West Sx\2.3 Specifications & Reports\F. Flood Risk Assessments	Date	Job No.
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2.0 EXISTING SITE

- 2.1 The site lies within an area administered by Arun District Council (ADC.) at the following address:
- The Vinery
Poling
West Sussex BN18 9PY
- 2.2 The address is located at the south end of The Vinery and is surrounded by fields except to the north, where there is a mixture of commercial and residential properties. A site location map and aerial view are shown in Appendix A.
- 2.3 Currently the site comprises open land used for low intensity grazing. The site's area is approximately 4.0ha and is entirely permeable apart from a small barn located near to the entrance at the NE corner. As the surface water from this roof is assumed to drain directly to ground the site is effectively 100% permeable.
- 2.4 A topographical survey of the existing site has been conducted, with levels to ordnance datum (AOD), - see Appendix B of this report.
- 2.5 The survey shows that the site has a steady gradient from north to south. The levels range between 13.3m and 8.4m AOD approximately. Note that the lowest levels are within a ditch that discharges west to east along the south boundary. The site's runoff appears to drain into this ditch and then eastwards to the 'Decoy Ponds Ditch'. This flows in a broadly southwest direction into the River Arun.
- 2.6 Greenfield run-off rate calculations show that the existing peak rates of run-off for return periods Q1, Q30 and Q100 are 7.1, 18.9 and 26.6 litres/second respectively – refer to Appendix F for Micro Drainage calculations.
- 2.7 Geology: according to the BGS online geology map the solid bedrock of this vicinity is the Lambeth Group (clay, silt and sand). There is a 'northwest-southeast' divide in the drift deposits: to the northwest there is a band of undifferentiated River Terrace Deposits (sand, silt and clay). Over the southeast the BGS map indicates a stratum of Head (clay, silt, sand and gravel.)
- 2.8 The soil infiltration rate may be high enough to make soakaways feasible, but this would depend on the overall average particle sizes: if the drift deposits comprise more gravel/sand than silt and clay and the depth is sufficiently great then soakaways are probably feasible. Due to the frequency of ditches in this vicinity it is considered likely that the soil's infiltration is low, however.

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3.0 CURRENT FLOOD CONDITIONS

- 3.1 Fluvial flooding: the Environment Agency Flood Map in Appendix D shows that the site lies within Flood Zone 1 (FZ1.) Sites within Flood Zone 1 are susceptible to less than a 1 in 1000 chance (0.1%) of river or tidal/coastal flooding each year.
- 3.2 Tidal flooding does not pose a risk due to the site's distance from the shoreline and the absence of tidally influenced watercourses in the vicinity.
- 3.3 Sewer flooding occurs due to limited capacity or blockage in the sewer system causing backing up of storm water and effluent. The strategic flood risk assessment (SFRA) commissioned by ADC does not show any registered historical sewer flooding incidents at the site – refer to Appendix E.
- 3.4 Groundwater flooding: occurs when water levels in the ground rise above surface elevations. The SFRA does not show any registered historical groundwater flooding incidents at or near to the site – refer to Appendix E. The British Geological Society reports a very high susceptibility to groundwater flooding within 50m of the site.
- 3.5 However, the preliminary soil investigation carried out by Ashdown Site Investigations found no incidence of groundwater within boreholes dug to 5m deep. It is therefore unlikely there will be problems with groundwater on this site.
- 3.6 Surface water flooding occurs when excess rainwater does not infiltrate into the ground, or is not intercepted by urban drainage systems, and instead flows across the surface. The SFRA does not show any registered historical surface flooding incidents at the site – refer to Appendix E.
- 3.7 Artificial sources: namely flooding from reservoirs, canals and docks. The EA reservoir flooding map shows the site as being outside of areas designated as being at risk of flooding if a reservoir were to fail. There are no docks or canals in the vicinity.

4.0 PROPOSED DEVELOPMENT

- 4.1 The proposed development is to erect a 6400m² B1/B8 unit and a 5337m² covered storage area (B8) with associated access roads and hardstandings. A proposed scheme drawing is shown in Appendix C.
- 4.2 Vulnerability: the proposed use is Less Vulnerable as defined in Table 2 of the NPPF's technical guidance. Table 3 states that such uses are 'appropriate development' in Flood Zone 1.
- 4.3 The proposed storm drainage strategy is to utilise the ditch bounding the site to the south for the receiving of run-off from the new development. The total discharge to the ditch is to be restricted to 26.4l/s, which is slightly less than the existing greenfield peak rate of run-off during the 1 in 100 years event..

W:\Projects\4144 Millwood, The Vinery, Poling, West Sx\2.3 Specifications & Reports\F. Flood Risk Assessments	Date	Job No.
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- 4.4 The proposed restriction of 26.4 l/s from the site will not increase flood risk downstream as this is equivalent to the current 1 in 100 years discharge rate. The proposed development will provide a benefit to the flows in the downstream ditches to anything in excess of these flows due to the attenuation to be provided.
- 4.5 The flow from the site will be split over 2 outfalls, one at 17.6 l/s and the other at 8.8l/s as shown on drawing 4144/120 in Appendix F. The storm drainage strategy proposes a single large pond to the western outfall and an underground attenuation tank located at the south end of the site to the eastern outfall. Microdrainage calculations are contained in Appendix F. The total peak volumes of storage are shown in the following table:

Storage	Volume
Pond	680m ³
Tank	408m ³
TOTAL STORAGE	1088m³

- 4.6 The pond is designed as a wet/dry pond with the outlet located 450mm above its base. The pond will have a permanently wet base with the storage above this level, which shall provide an ecological value to the site.
- 4.7 The storage crates will be located under the access road to the side of the covered storage area.
- 4.8 SUDs: it is unlikely that the use of infiltration devices, such as soakaways, will be feasible. The use of balancing ponds and cellular storage tanks is sustainable as the flow rate in the '100 years + *climate change*' event will be limited to the *current* Q100 greenfield runoff rate.
- 4.9 The ditch system will be enhanced by lengthening the southern boundary ditch towards the west. The north to south ditch will be culverted under the new roundabout. The existing northern ditch will be diverted around the side of the roundabout to minimise culverting.
- 4.10 PPG3 states that oil separators are required on sites which are sensitive (e.g. over aquifers) and where goods vehicles manoeuvre/park. It is therefore proposed to insert a Class 1 bypass separator to the 2 outfalls (see drawing no 4144/120 in Appendix F.)
- 4.11 Proposed foul system: as there are no Southern Water foul sewers in the area, the foul drainage is proposed to discharge to a new sewage treatment plant located at the southern end of the site. This will be designed to meet the Environment Agency requirements for discharge to a watercourse. A 'consent to discharge' application will be made at detailed design stage.

5.0 SUMMARY AND RECOMMENDATIONS

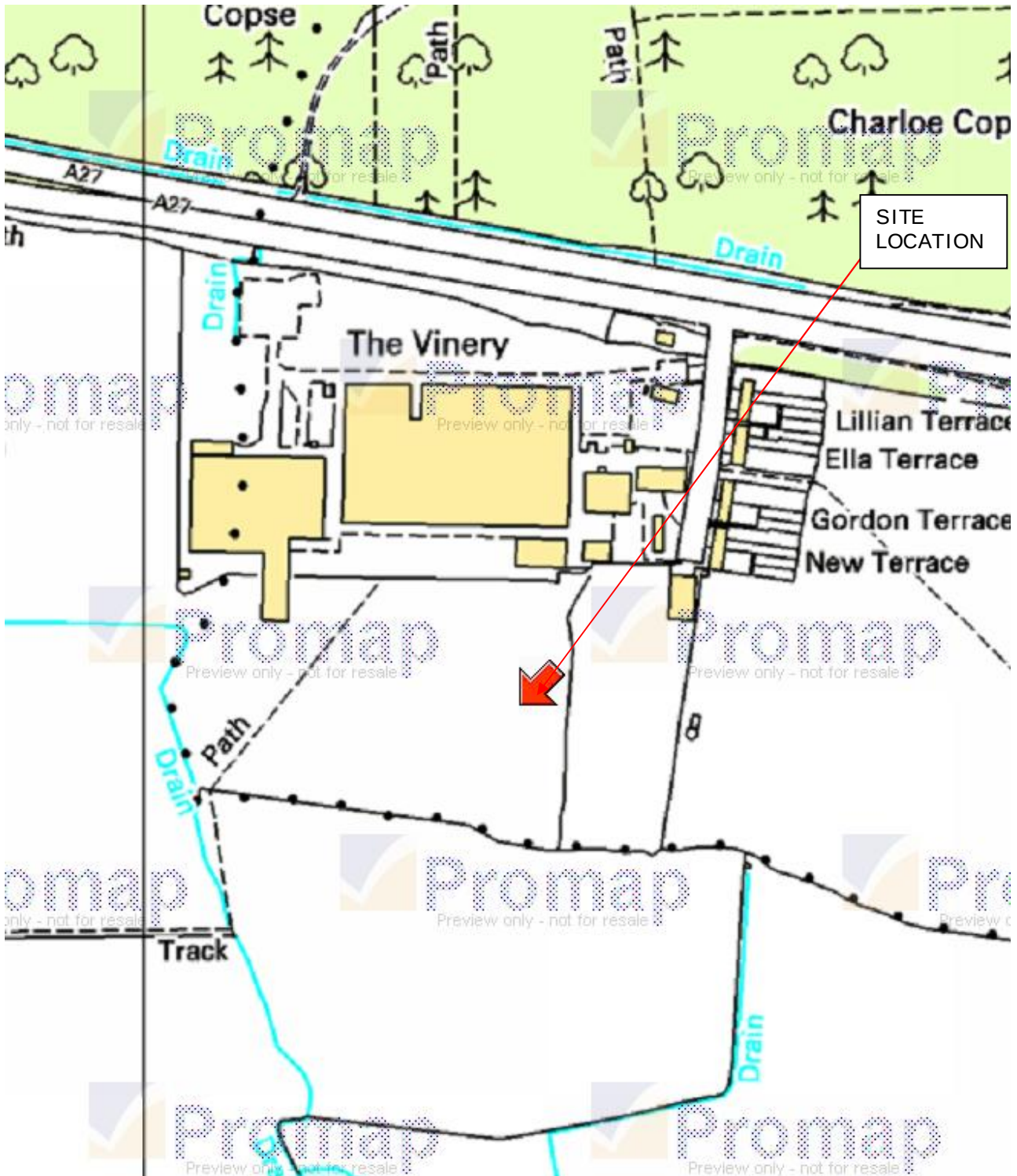
- 5.1 The proposal is to erect 2 industrial units on land in the village of Poling.
- 5.2 The site is in Flood Zone 1 as indicated by the Environment Agency Flood Map, and is therefore defined as having a low annual probability of flooding from tidal and fluvial sources.
- 5.3 Other flood sources have been considered – sewers, groundwater, overland flow and artificial sources. These were found to pose a low risk to the site.
- 5.4 SUDS: to comply with NPPF surface water drainage systems must be designed with sustainability in mind. With vacant sites the run-off rate should be limited to the current green field rate as closely as possible.
- 5.5 The storm drainage strategy proposed limits the storm flows to the ditch 1 in 100 year greenfield levels. Attenuation storage is to be provided by means of a large pond and a buried storage crate tank with total storage during a 1 in 100 year event + 20% of 1088m³.
- 5.6 There will be some culverting of ditches where the new access road enters but this will be more than offset by the additional lengths of ditches proposed along with the wet pond.
- 5.7 Taking into account the measures recommended in this report, the development is considered NPPF compliant.

– End of Report –

W:\Projects\4144 Millwood, The Vinery, Poling, West Sx\2.3 Specifications & Reports\F. Flood Risk Assessments	Date	Job No.
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APPENDIX A

Site Location Map & Aerial View



W:\Projects\4144 Millwood, The Vinery, Poling, West Sx\2.3
Specifications & Reports\F. Flood Risk Assessments

Date
Oct. '12

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4144/2.3F

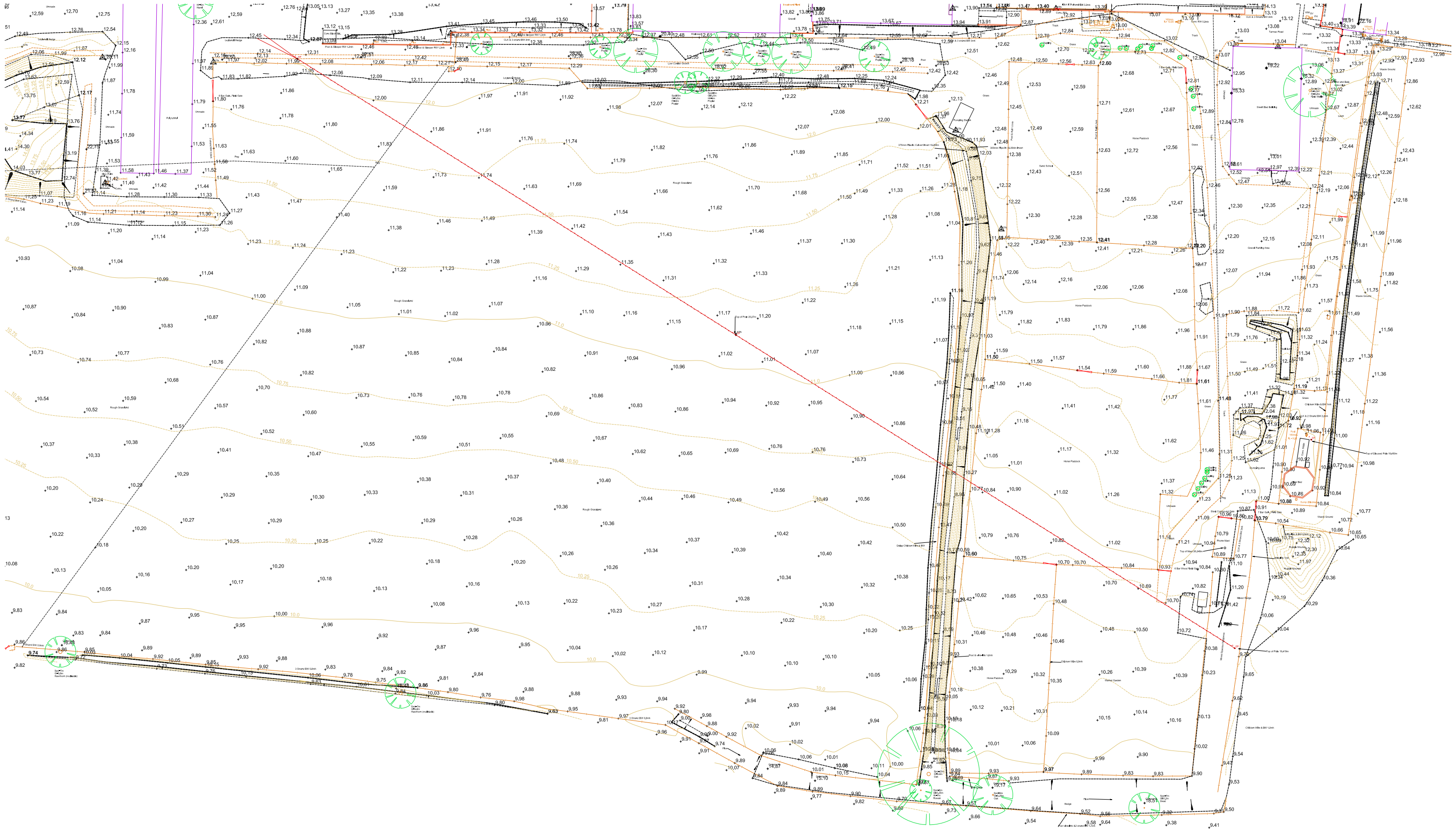


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	Oct. '12	4144/2.3F

APPENDIX B

Topographical Survey

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	Oct. '12	4144/2.3F



APPENDIX C

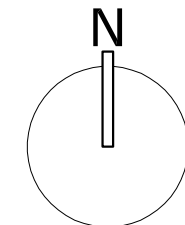
Proposed Site Plan

W:\Projects\4144 Millwood, The Vinery, Poling, West Sx\2.3 Specifications & Reports\F. Flood Risk Assessments	Date	Job No.
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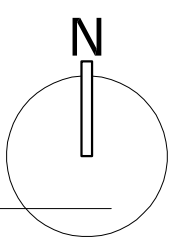
+LP proposed location plan

Scale in Metres



+BP proposed block plan

Scale in Metres



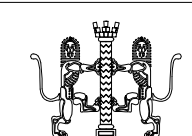
Only figured dimensions are to be used. All dimensions are to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

Notes

APPLICATION FOR DETAILED PLANNING CONSENT

REVISION



Liam Russell Architects
architecture and development

The Studios, 3 Broad Reach Mews, Ropeside, Shoreham by Sea, West Sussex, BN43 5EY, UK
+44 (0)845 180 3476 +44(0)845 180 3475 www.liamrussellarchitects.com
Liam Russell Architects Ltd registered in England and Wales 04758636



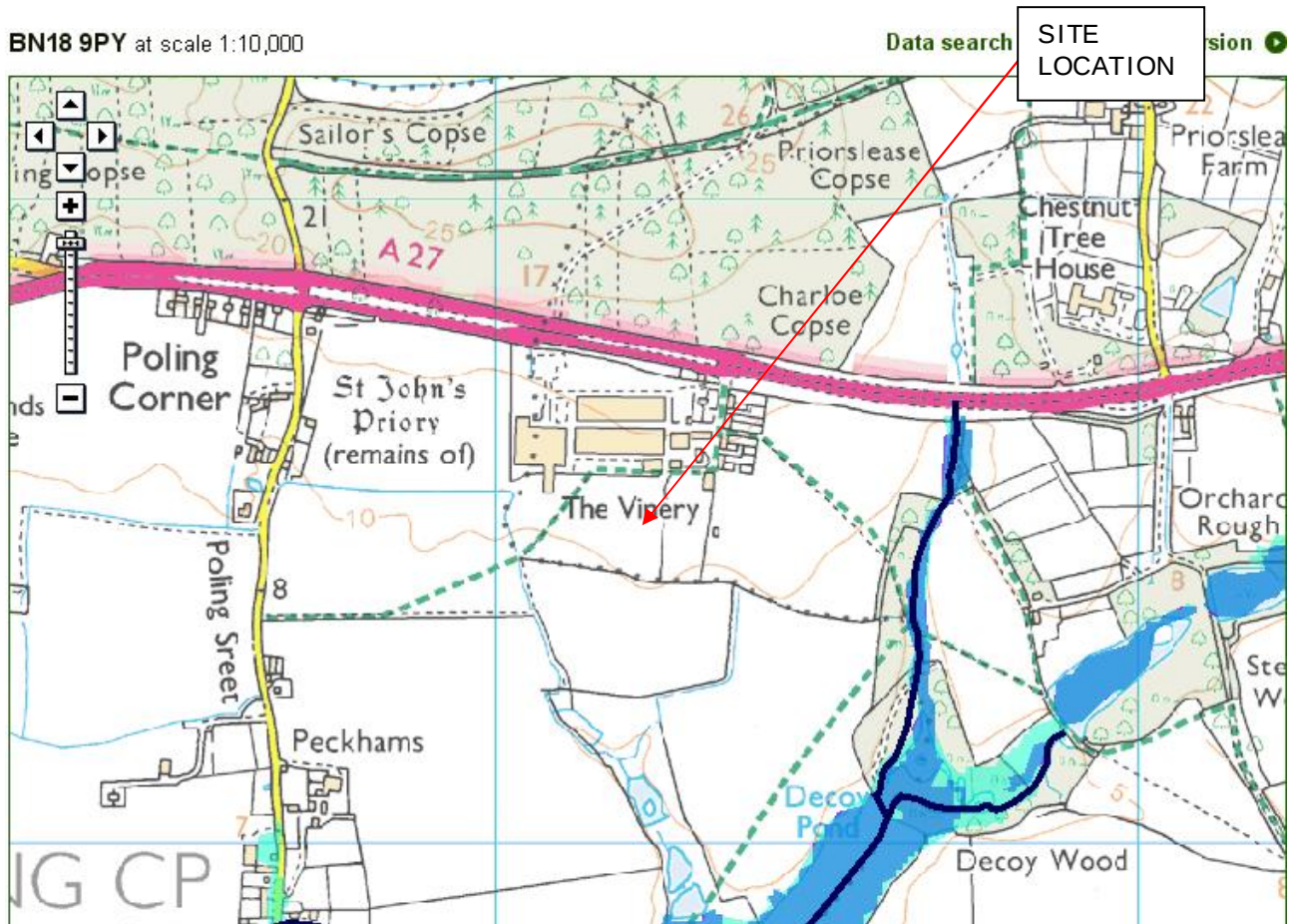
CLIENT	CHECKED LRA
	DRAWN BH
DRAWING PROPOSED SITE PLAN	DATE NOVEMBER 2012
	SCALE 1:500/2500 @ A1 1:1000/5000 @ A3
	REVISION A
	NUMBER 0764-PA-010

DO NOT SCALE FROM THIS DRAWING. THIS DRAWING IS COPYRIGHT ©

APPENDIX D

Environment Agency Flood Map

BN18 9PY at scale 1:10,000



© Environment Agency copyright and database rights 2012. © Ordnance Survey Crown copyright. All rights reserved. Environment Agency, 100026380.
Contains Royal Mail data © Royal Mail copyright and database right 2012.
This service is designed to inform members of the public, in line with our terms and conditions. For business or commercial use, please contact us.

Site is in Flood Zone 1

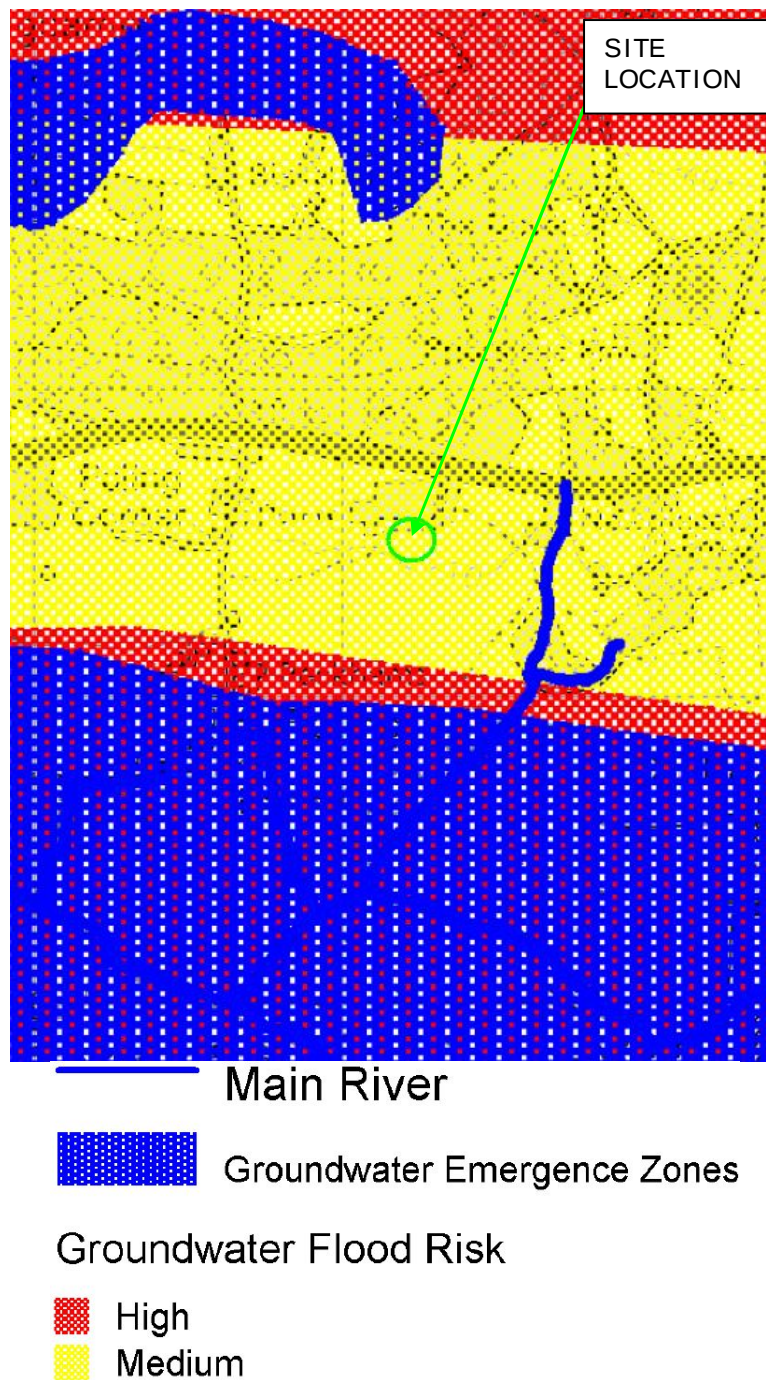
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Specifications & Reports\F. Flood Risk Assessments

Date
Oct. '12

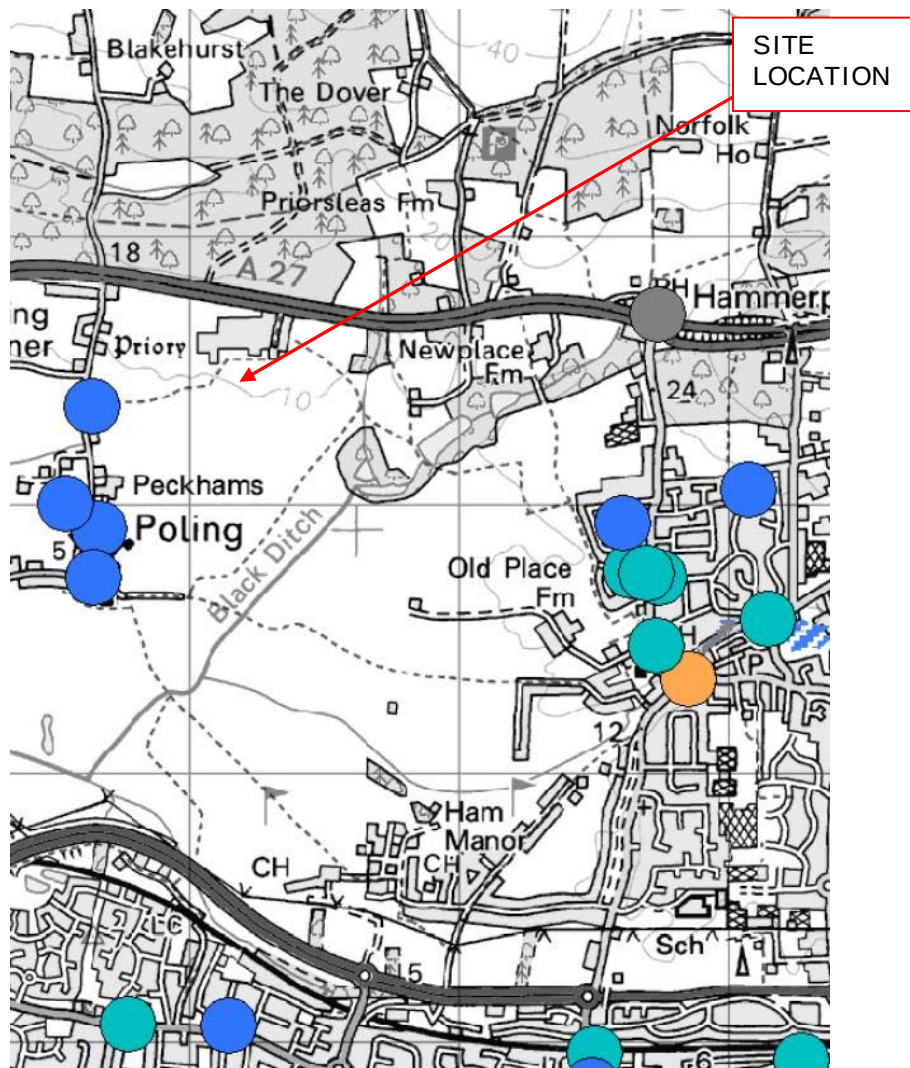
Job No.
4144/2.3F

APPENDIX E

Strategic Flood Risk Assessment Extracts



Enlarged Extract from SFRA's 'Indicative Risk of Groundwater Flooding' Map (G1)



Legend

— Arun District Boundary

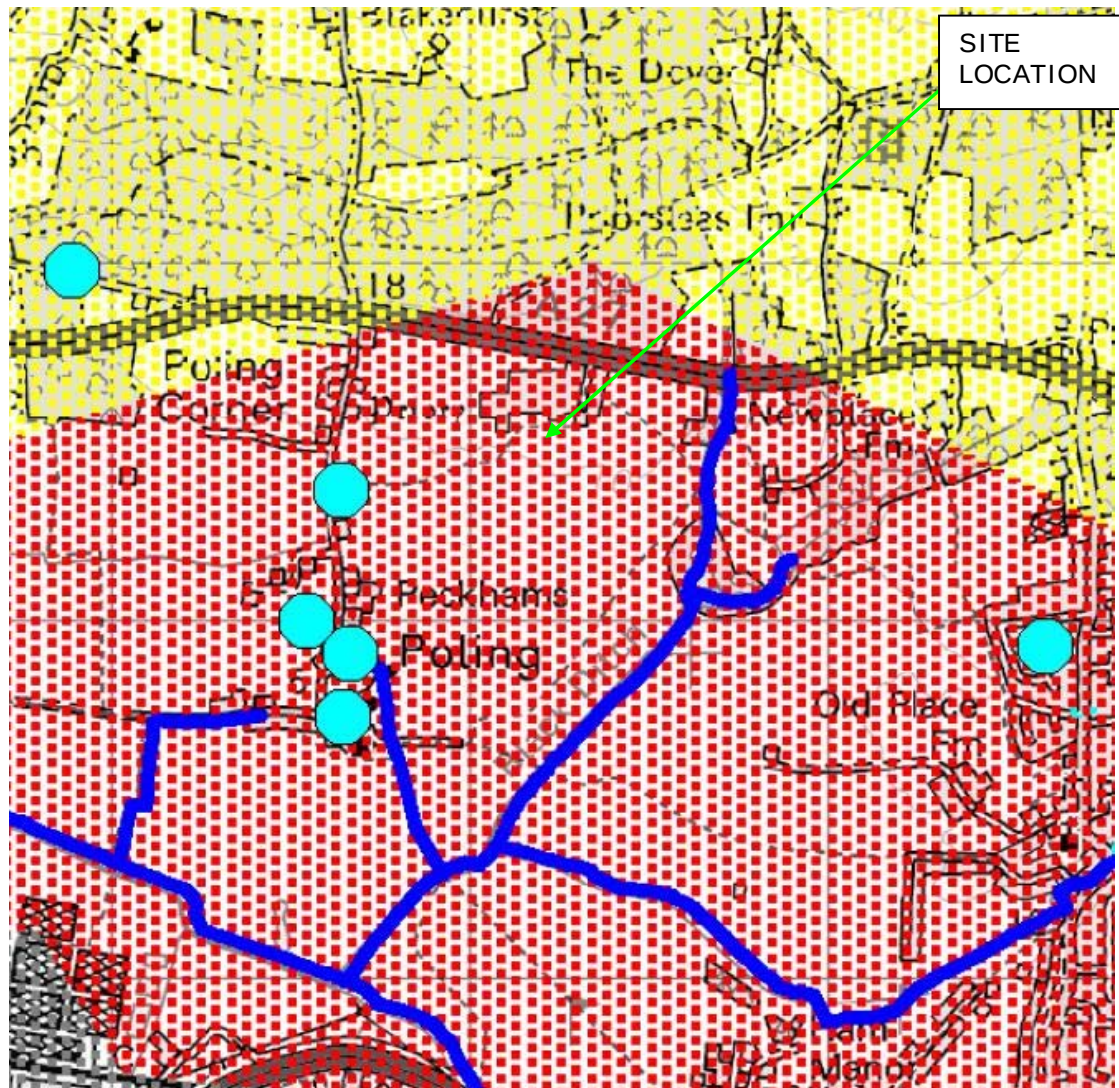
Historic Flood Events - Points

- Coastal
- Tidal
- Fluvial
- Surface Water
- Sewer
- Failure
- Unknown

Historic Flood Events - Areas

- ▨ Coastal
- ▨ Tidal
- ▨ Fluvial
- ▨ Surface Water
- ▨ Unknown

Enlarged Extract from SFRA's 'Historic Flood Events' Map (H)



Historic Surface Water Flooding

 Area

 Point

Risk of Flooding from Land

 Low to Medium

 Medium to High

 Urban

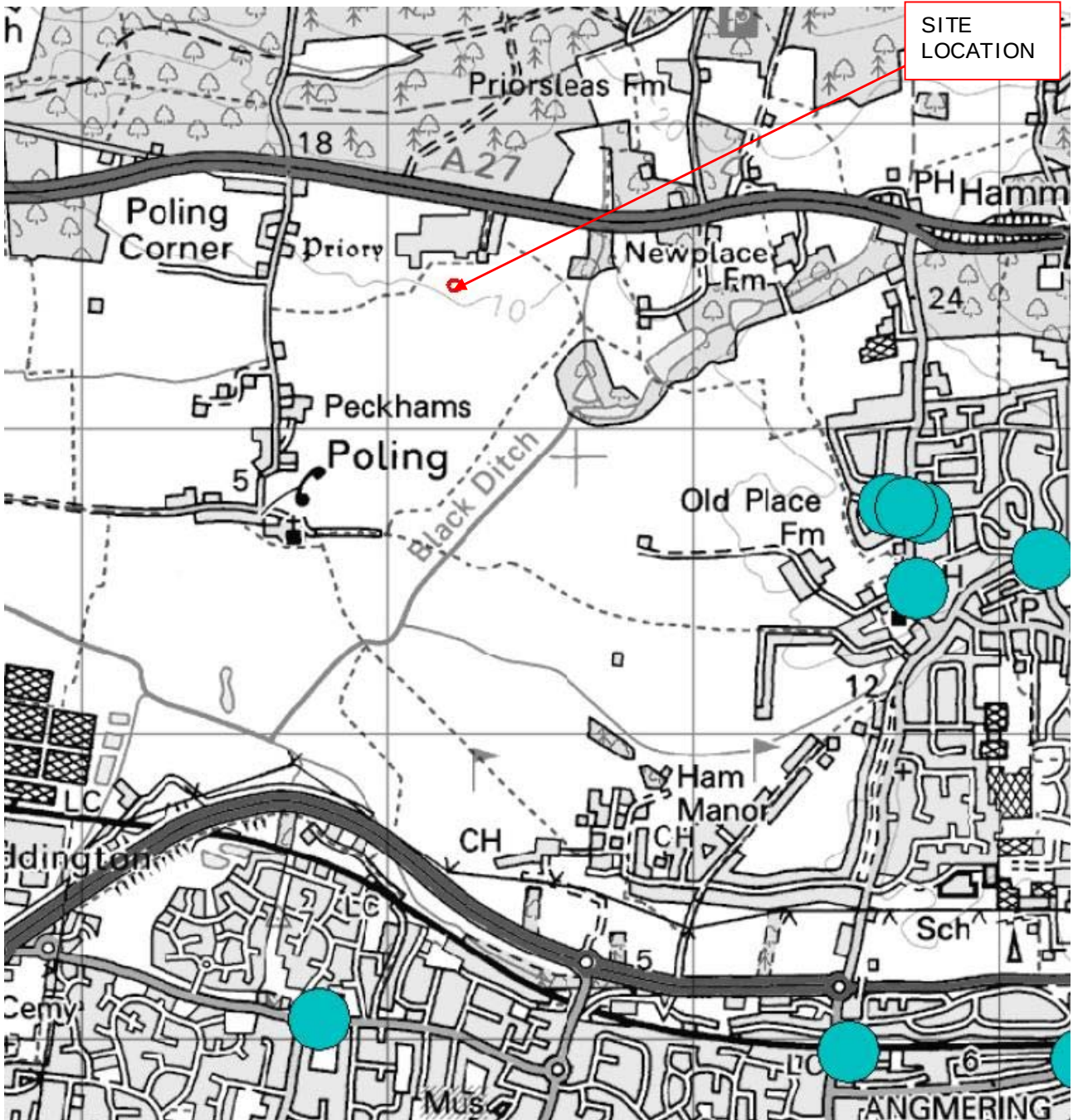
Enlarged Extract from SFRA's 'Areas Prone to Flooding From the Land' (L), ie overland flow

(Note that no actual points or areas of flooding have occurred in this vicinity)

W:\Projects\4144 Millwood, The Vinery, Poling, West Sx\2.3
Specifications & Reports\F. Flood Risk Assessments

Date
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Historic Incidents of Sewer Flooding

Enlarged Extract from SFRA's 'Historic Incidents of Flooding From Sewers' Map (S)

W:\Projects\4144 Millwood, The Vinery, Poling, West Sx\2.3
Specifications & Reports\F. Flood Risk Assessments

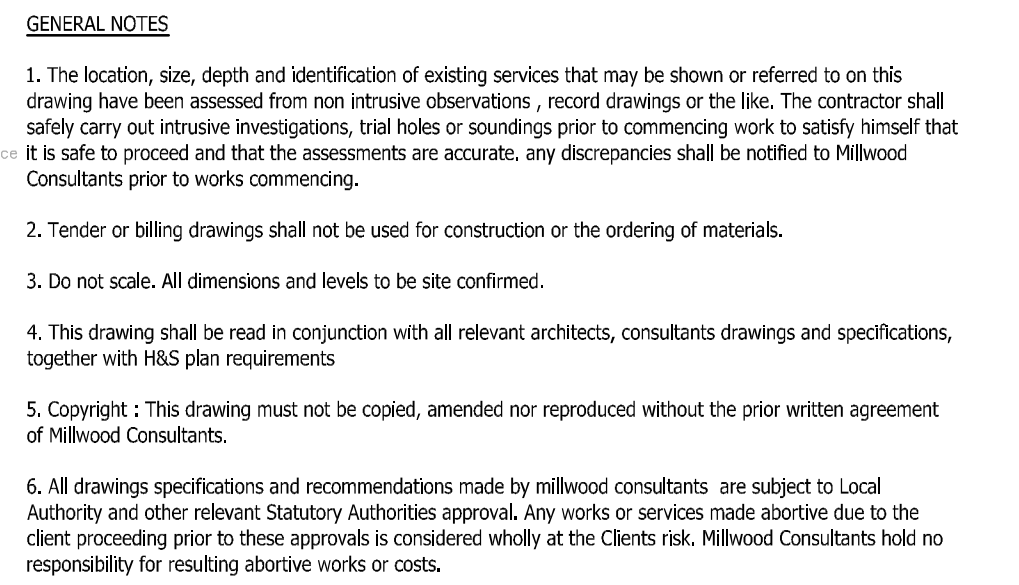
Date
Oct. '12

Job No.
4144/2.3F

APPENDIX F

Proposed Drainage Strategy & Micro Drainage Calculation

W:\Projects\4144 Millwood, The Vinery, Poling, West Sx\2.3 Specifications & Reports\F. Flood Risk Assessments	Date	Job No.
	Oct. '12	4144/2.3F



- | Abbreviations | |
|----------------------|--|
| D307.0 | DETAIL NUMBER - SEE DRAINAGE DETAIL SHEET |
| FD | FOUL DRAIN |
| SWD | SURFACE WATER DRAIN |
| FWS | ADOPTED WATER AUTHORITY
FOUL WATER SEWER |
| SWS | ADOPTED WATER AUTHORITY
SURFACE WATER SEWER |
| MH | MANHOLE |
| IC | INSPECTION CHAMBER |
| CI | CAST IRON |
| VC | VITRIFIED CLAY |
| CONC | CONCRETE |
| PVC-U | POLYVINYL CHLORIDE - UNPLASTICISED |
| G | SMALL GULLY - D209.0 |
| YG | YARD GULLY - D209.2 |
| RG | ROAD GULLY - D208.1 |
| CPG | CAR PARK GULLY - D208.2 |
| DP | BELOW GROUND DRAIN POINT |
| SYP | SOIL VENT PIPE DROP |
| RP | EXTERNAL ROOFTOP POINT D213.1 |
| FFL | FINISHED FLOOR LEVEL |
| SSL | STRUCTURAL SLAB LEVEL |
| GL | GROUND LEVEL |
| CL | COVER LEVEL |
| IL | INVERT LEVEL |
| HL | HIGH LEVEL |
| BD | BACKDROP |
| CRS | Concrete Bed & Surround |
| CRSS S | Gravelly Bed & Surround |
| CRSS B | Gravelly Bed |
| FIC | 450mm dia. foul inspection chamber - D202.6 |
| SIC | 450mm dia. surface water inspection chamber - D202.6 |
| FAC | 300mm dia. foul access chamber - D202.18 |
| SAC | 300mm dia. surface water access chamber - D202.18 |

B	Updated to latest architect's layout.		07.12.12	MR	SC
A	Updated to show single pond and tank relocated		23.11.12	MR	SC
Rev	Amendments	Date	Dsn	Chk	
Status					
PRELIMINARY					
Client					
FARGRO					
Architect					
LIAM RUSSELL ARCHITECTS					
Project					
THE VINERY POLING					
Title					
SURFACE WATER DRAINAGE STRATEGY					
Date		OCT 2012			
Scale @ A1		1:500			
Base Layout Ref.		CAD File ref.			
Clients Ref.		Project Ref.			
		35201			
Millwood House Consultants Ltd Creating connections in construction Structures Contamination Civils					
The Studio, Millwood House, Littlehampton Road, Ferring West Sussex, BN12 6PG Tel: 00-44-1903-827749 E-mail: chris@millwoodconsultants.co.uk					
Drawing Number				Rev.	
35201-20				B	

GTA Civils Ltd		Page 1																								
Gloucester House 66a Church Walk Burgess Hill RH15 9AS	The Vinery Poling Greenfield runoff																									
Date 25.10.12 File	Designed by MCR Checked by																									
Micro Drainage Source Control W.12.6.1																										
<u>ICP SUDS Mean Annual Flood</u> Input <table> <tr> <td>Return Period (years)</td> <td>100</td> <td>Soil</td> <td>0.400</td> </tr> <tr> <td>Area (ha)</td> <td>2.300</td> <td>Urban</td> <td>0.000</td> </tr> <tr> <td>SAAR (mm)</td> <td>739</td> <td>Region Number</td> <td>Region 7</td> </tr> </table> Results l/s <table> <tr> <td>QBAR Rural</td> <td>8.3</td> </tr> <tr> <td>QBAR Urban</td> <td>8.3</td> </tr> <tr> <td>Q100 years</td> <td>26.6</td> </tr> <tr> <td>Q1 year</td> <td>7.1</td> </tr> <tr> <td>Q30 years</td> <td>18.9</td> </tr> <tr> <td>Q100 years</td> <td>26.6</td> </tr> </table>			Return Period (years)	100	Soil	0.400	Area (ha)	2.300	Urban	0.000	SAAR (mm)	739	Region Number	Region 7	QBAR Rural	8.3	QBAR Urban	8.3	Q100 years	26.6	Q1 year	7.1	Q30 years	18.9	Q100 years	26.6
Return Period (years)	100	Soil	0.400																							
Area (ha)	2.300	Urban	0.000																							
SAAR (mm)	739	Region Number	Region 7																							
QBAR Rural	8.3																									
QBAR Urban	8.3																									
Q100 years	26.6																									
Q1 year	7.1																									
Q30 years	18.9																									
Q100 years	26.6																									
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GTA Civils Ltd				Page 1			
Gloucester House 66a Church Walk Burgess Hill RH15 9AS		The Vinery Tank Storage					
Date 25.10.12 File Vinery - Tank.srcx		Designed by mcr Checked by					
Micro Drainage		Source Control W.12.6.1					
<u>Summary of Results for 100 year Return Period (+20%)</u> Half Drain Time : 450 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.356	0.506	0.0	6.5	6.5	163.6	0 K
30 min Summer	9.523	0.673	0.0	6.5	6.5	217.3	0 K
60 min Summer	9.690	0.840	0.0	7.3	7.3	271.4	0 K
120 min Summer	9.838	0.988	0.0	7.9	7.9	319.0	0 K
180 min Summer	9.898	1.048	0.0	8.1	8.1	338.4	0 K
240 min Summer	9.921	1.071	0.0	8.2	8.2	345.8	0 K
360 min Summer	9.931	1.081	0.0	8.3	8.3	349.0	0 K
480 min Summer	9.927	1.077	0.0	8.3	8.3	347.9	0 K
600 min Summer	9.918	1.068	0.0	8.2	8.2	344.8	0 K
720 min Summer	9.904	1.054	0.0	8.2	8.2	340.5	0 K
960 min Summer	9.871	1.021	0.0	8.0	8.0	329.9	0 K
1440 min Summer	9.797	0.947	0.0	7.7	7.7	306.0	0 K
2160 min Summer	9.690	0.840	0.0	7.3	7.3	271.4	0 K
2880 min Summer	9.594	0.744	0.0	6.9	6.9	240.3	0 K
4320 min Summer	9.428	0.578	0.0	6.5	6.5	186.8	0 K
5760 min Summer	9.284	0.434	0.0	6.5	6.5	140.3	0 K
7200 min Summer	9.122	0.272	0.0	6.5	6.5	88.0	0 K
8640 min Summer	9.048	0.198	0.0	6.4	6.4	64.1	0 K
10080 min Summer	9.021	0.171	0.0	6.0	6.0	55.3	0 K
15 min Winter	9.419	0.569	0.0	6.5	6.5	183.6	0 K
30 min Winter	9.606	0.756	0.0	6.9	6.9	244.1	0 K
60 min Winter	9.795	0.945	0.0	7.7	7.7	305.4	0 K
Storm Event	Rain (mm/hr)		Time-Peak (mins)				
15 min Summer	112.395		22				
30 min Summer	75.504		37				
60 min Summer	48.361		66				
120 min Summer	29.862		124				
180 min Summer	22.167		182				
240 min Summer	17.817		242				
360 min Summer	13.114		322				
480 min Summer	10.534		384				
600 min Summer	8.879		446				
720 min Summer	7.718		512				
960 min Summer	6.181		652				
1440 min Summer	4.511		926				
2160 min Summer	3.285		1340				
2880 min Summer	2.620		1732				
4320 min Summer	1.901		2512				
5760 min Summer	1.512		3288				
7200 min Summer	1.267		3896				
8640 min Summer	1.097		4496				
10080 min Summer	0.971		5144				
15 min Winter	112.395		22				
30 min Winter	75.504		36				
60 min Winter	48.361		64				
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GTA Civils Ltd				Page 2			
Gloucester House 66a Church Walk Burgess Hill RH15 9AS		The Vinery Tank Storage					
Date 25.10.12 File Vinery - Tank.srcx		Designed by mcr Checked by					
Micro Drainage		Source Control W.12.6.1					
<u>Summary of Results for 100 year Return Period (+20%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
120 min Winter	9.967	1.117	0.0	8.4	8.4	360.7	0 K
180 min Winter	10.040	1.190	0.0	8.7	8.7	384.4	0 K
240 min Winter	10.073	1.223	0.0	8.8	8.8	394.7	0 K
360 min Winter	10.098	1.248	0.0	8.9	8.9	401.2	0 K
480 min Winter	10.084	1.234	0.0	8.8	8.8	397.7	0 K
600 min Winter	10.071	1.221	0.0	8.8	8.8	394.0	0 K
720 min Winter	10.052	1.202	0.0	8.7	8.7	388.2	0 K
960 min Winter	10.005	1.155	0.0	8.5	8.5	372.9	0 K
1440 min Winter	9.895	1.045	0.0	8.1	8.1	337.5	0 K
2160 min Winter	9.737	0.887	0.0	7.5	7.5	286.5	0 K
2880 min Winter	9.598	0.748	0.0	6.9	6.9	241.5	0 K
4320 min Winter	9.358	0.508	0.0	6.5	6.5	164.2	0 K
5760 min Winter	9.072	0.222	0.0	6.5	6.5	71.7	0 K
7200 min Winter	9.015	0.165	0.0	5.9	5.9	53.2	0 K
8640 min Winter	8.994	0.144	0.0	5.1	5.1	46.4	0 K
10080 min Winter	8.981	0.131	0.0	4.6	4.6	42.2	0 K
	Storm Event		Rain (mm/hr)	Time-Peak (mins)			
	120 min Winter		29.862	122			
	180 min Winter		22.167	180			
	240 min Winter		17.817	236			
	360 min Winter		13.114	344			
	480 min Winter		10.534	402			
	600 min Winter		8.879	470			
	720 min Winter		7.718	548			
	960 min Winter		6.181	702			
	1440 min Winter		4.511	1000			
	2160 min Winter		3.285	1432			
	2880 min Winter		2.620	1848			
	4320 min Winter		1.901	2684			
	5760 min Winter		1.512	3168			
	7200 min Winter		1.267	3744			
	8640 min Winter		1.097	4416			
	10080 min Winter		0.971	5144			
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Gloucester House 66a Church Walk Burgess Hill RH15 9AS	The Vinery Tank Storage																																	
Date 25.10.12 File Vinery - Tank.srcx	Designed by mcr Checked by																																	
Micro Drainage Source Control W.12.6.1																																		
<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>19.900</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>+20</td> </tr> </table> <u>Time / Area Diagram</u> Total Area (ha) 0.800 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> </tr> </thead> <tbody> <tr> <td>0-4</td> <td>0.400</td> <td>4-8</td> <td>0.400</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)	19.900	Shortest Storm (mins)	15	Ratio R	0.350	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+20	Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.400	4-8	0.400
Rainfall Model	FSR	Winter Storms	Yes																															
Return Period (years)	100	Cv (Summer)	0.750																															
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Summer Storms	Yes	Climate Change %	+20																															
Time (mins)	Area (ha)	Time (mins)	Area (ha)																															
0-4	0.400	4-8	0.400																															
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Gloucester House 66a Church Walk Burgess Hill RH15 9AS	The Vinery Tank Storage	
Date 25.10.12 File Vinery - Tank.srcx	Designed by mcr Checked by	
Micro Drainage Source Control W.12.6.1		

Model Details

Storage is Online Cover Level (m) 11.050

Cellular Storage Structure

Invert Level (m) 8.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	340.0	300.0	2.600	0.0	300.0
0.200	340.0	300.0	2.800	0.0	300.0
0.400	340.0	300.0	3.000	0.0	300.0
0.600	340.0	300.0	3.200	0.0	300.0
0.800	340.0	300.0	3.400	0.0	300.0
1.000	340.0	300.0	3.600	0.0	300.0
1.200	340.0	300.0	3.800	0.0	300.0
1.400	0.0	300.0	4.000	0.0	300.0
1.600	0.0	300.0	4.200	0.0	300.0
1.800	0.0	300.0	4.400	0.0	300.0
2.000	0.0	300.0	4.600	0.0	300.0
2.200	0.0	300.0	4.800	0.0	300.0
2.400	0.0	300.0	5.000	0.0	300.0

Hydro-Brake® Outflow Control

Design Head (m) 1.200 Hydro-Brake® Type Md4 Invert Level (m) 8.850
Design Flow (l/s) 8.8 Diameter (mm) 101

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	1.200	8.7	3.000	13.8	7.000	21.0
0.200	6.4	1.400	9.4	3.500	14.9	7.500	21.8
0.300	5.7	1.600	10.1	4.000	15.9	8.000	22.5
0.400	5.3	1.800	10.7	4.500	16.9	8.500	23.2
0.500	5.7	2.000	11.2	5.000	17.8	9.000	23.8
0.600	6.2	2.200	11.8	5.500	18.6	9.500	24.5
0.800	7.1	2.400	12.3	6.000	19.5		
1.000	7.9	2.600	12.8	6.500	20.3		

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Gloucester House 66a Church Walk Burgess Hill RH15 9AS		The Vinery Pond			
Date 25.10.12 File VINERY LARGE PON...		Designed by mcr Checked by			
Micro Drainage		Source Control W.12.6.1			
<u>Summary of Results for 100 year Return Period (+20%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.447	0.597	15.4	285.6	0 K
30 min Summer	9.614	0.764	15.4	381.0	0 K
60 min Summer	9.767	0.917	15.4	475.4	0 K
120 min Summer	9.890	1.040	16.3	554.9	0 K
180 min Summer	9.933	1.083	16.6	584.0	0 K
240 min Summer	9.944	1.094	16.7	591.6	0 K
360 min Summer	9.944	1.094	16.7	591.0	0 K
480 min Summer	9.933	1.083	16.6	584.1	0 K
600 min Summer	9.919	1.069	16.5	574.1	0 K
720 min Summer	9.901	1.051	16.3	562.3	0 K
960 min Summer	9.861	1.011	16.0	536.1	0 K
1440 min Summer	9.779	0.929	15.4	482.8	0 K
2160 min Summer	9.658	0.808	15.4	407.9	0 K
2880 min Summer	9.544	0.694	15.4	340.0	0 K
4320 min Summer	9.301	0.451	15.4	207.5	0 K
5760 min Summer	9.134	0.284	15.4	124.5	0 K
7200 min Summer	9.083	0.233	14.0	100.8	0 K
8640 min Summer	9.057	0.207	12.4	88.7	0 K
10080 min Summer	9.039	0.189	11.2	80.6	0 K
15 min Winter	9.511	0.661	15.4	321.5	0 K
30 min Winter	9.693	0.843	15.4	428.9	0 K
60 min Winter	9.861	1.011	16.0	536.1	0 K
120 min Winter	9.999	1.149	17.1	629.2	0 K
Storm Event		Rain (mm/hr)		Time-Peak (mins)	
15 min Summer		112.395		29	
30 min Summer		75.504		43	
60 min Summer		48.361		72	
120 min Summer		29.862		128	
180 min Summer		22.167		184	
240 min Summer		17.817		242	
360 min Summer		13.114		306	
480 min Summer		10.534		370	
600 min Summer		8.879		434	
720 min Summer		7.718		504	
960 min Summer		6.181		642	
1440 min Summer		4.511		918	
2160 min Summer		3.285		1324	
2880 min Summer		2.620		1712	
4320 min Summer		1.901		2432	
5760 min Summer		1.512		3008	
7200 min Summer		1.267		3680	
8640 min Summer		1.097		4408	
10080 min Summer		0.971		5144	
15 min Winter		112.395		29	
30 min Winter		75.504		43	
60 min Winter		48.361		70	
120 min Winter		29.862		126	
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Date 25.10.12 File VINERY LARGE PON...		Designed by mcr Checked by			
Micro Drainage		Source Control W.12.6.1			
<u>Summary of Results for 100 year Return Period (+20%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	10.052	1.202	17.5	666.1	0 K
240 min Winter	10.070	1.220	17.6	678.7	0 K
360 min Winter	10.072	1.222	17.6	679.9	0 K
480 min Winter	10.057	1.207	17.5	669.1	0 K
600 min Winter	10.038	1.188	17.4	655.9	0 K
720 min Winter	10.014	1.164	17.2	639.3	0 K
960 min Winter	9.958	1.108	16.8	600.9	0 K
1440 min Winter	9.838	0.988	15.8	520.7	0 K
2160 min Winter	9.660	0.810	15.4	408.9	0 K
2880 min Winter	9.480	0.630	15.4	303.8	0 K
4320 min Winter	9.119	0.269	15.1	117.5	0 K
5760 min Winter	9.059	0.209	12.6	89.5	0 K
7200 min Winter	9.032	0.182	10.6	77.5	0 K
8640 min Winter	9.015	0.165	9.2	69.9	0 K
10080 min Winter	9.003	0.153	8.2	64.5	0 K
Storm Event	Rain (mm/hr)		Time-Peak (mins)		
180 min Winter	22.167		182		
240 min Winter	17.817		238		
360 min Winter	13.114		342		
480 min Winter	10.534		388		
600 min Winter	8.879		464		
720 min Winter	7.718		542		
960 min Winter	6.181		694		
1440 min Winter	4.511		992		
2160 min Winter	3.285		1416		
2880 min Winter	2.620		1832		
4320 min Winter	1.901		2332		
5760 min Winter	1.512		2992		
7200 min Winter	1.267		3680		
8640 min Winter	1.097		4408		
10080 min Winter	0.971		5144		
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Gloucester House 66a Church Walk Burgess Hill RH15 9AS	The Vinery Pond	
Date 25.10.12 File VINERY LARGE PON...	Designed by mcr Checked by	
Micro Drainage Source Control W.12.6.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.900	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time / Area Diagram

Total Area (ha) 1.432

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.358	4-8	0.358	8-12	0.358	12-16	0.358

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Micro Drainage Source Control W.12.6.1		

Model Details

Storage is Online Cover Level (m) 10.500

Tank or Pond Structure

Invert Level (m) 8.850

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	402.0	0.700	579.0	1.400	754.0	2.100	0.0
0.100	428.0	0.800	604.0	1.500	779.0	2.200	0.0
0.200	453.0	0.900	629.0	1.600	804.0	2.300	0.0
0.300	479.0	1.000	654.0	1.700	0.0	2.400	0.0
0.400	504.0	1.100	679.0	1.800	0.0	2.500	0.0
0.500	529.0	1.200	704.0	1.900	0.0		
0.600	554.0	1.300	729.0	2.000	0.0		

Hydro-Brake® Outflow Control

Design Head (m) 1.200 Hydro-Brake® Type Md4 Invert Level (m) 8.850
Design Flow (l/s) 17.6 Diameter (mm) 143

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.8	1.200	17.5	3.000	27.6	7.000	42.2
0.200	12.0	1.400	18.9	3.500	29.8	7.500	43.6
0.300	15.4	1.600	20.2	4.000	31.9	8.000	45.1
0.400	14.0	1.800	21.4	4.500	33.8	8.500	46.5
0.500	12.8	2.000	22.5	5.000	35.6	9.000	47.8
0.600	12.9	2.200	23.6	5.500	37.4	9.500	49.1
0.800	14.3	2.400	24.7	6.000	39.0		
1.000	15.9	2.600	25.7	6.500	40.6		

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