



R Elliott Associates Ltd
Consulting Structural & Civil Engineers

Surface Water Run Off for a 1:100 Year + Climate Change Calculations

Location:

Plot 2, Harts Farm Way, Havant

Our Ref: 6425
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1.0 Introduction

R Elliott Associates Ltd has been appointed to carry out a Surface Water Run-Off Assessment for the proposed development of Plot 2, Harts Farm Way, Havant. The proposed development includes the construction of an industrial building.

The purpose of the Surface Water Run-Off assessment is to provide sufficient attenuation in the form of soakaways during a 1 in 100-year storm event allowing for climate change. A nominal 30% increase will be provided to allow for climate change.

2.0 Existing Site – Pre-Development

2.1. Site Location & Description

The plot is located approximately 500mm south-east of the Havant bypass and approximately 500mm north of bridge lake. The surrounding buildings are of an industrial nature. The proposed development consists have hard and soft standing areas and an industrial building. The hard standing areas consist mainly of Tarmac.

2.2. Site Topography & Existing Drainage

Consulting a geological map of the area the site is situated onto Lewes Nodular Chalk Formation. Referring to local borehole logs, the chalk formation can be found at 750-1000mm below ground level. A permeability test has not been carried out but based on the local borehole logs a conservative infiltration rate of $2.02 \times 10^{-4} \text{ m/s}$ which is an indicative permeability for chalk.

3.0 Drainage Strategy

The SuDS management train introduces various techniques to simulate the natural catchment process as closely as possible and is a fundamental tool used in this strategy.

The proposed drainage strategy will utilize Sustainable Drainage Techniques (SuDS) and the use of the SuDS Management Train for all areas of the site. The design will incorporate a sufficient capacity for a peak rate of run-off in a 1 in 100-year storm event with the allowance for climate change (+30%). The proposal must allow for the event of local drainage system failure, demonstrating that flooding of the property will not occur in the event of extreme rainfall, lack of maintenance or the failure of the local drainage system.

The SuDS Manual indicates a preference to the disposal of surface water in the following order:

1. Infiltration systems & other SuDS components
2. Discharge to an un-adopted watercourse
3. Surface water sewer
4. Combined sewer

With the ground relatively permeable, infiltration systems will be used in correspondence with the SuDS management train. The infiltration system chosen will be soakaways, relatively cheap and very effective it is deemed that they are the best solution for the proposed site.

The calculations represent the peak flow rate for the site (impermeable area) post development for a 1 in 100-year storm event (peak flow rate occurred at a 5-minute storm). An allowance of a 30% increase was incorporated into the calculations to allow for climate change.

Please note the calculations for the storm events can be found in Appendix A.

It is anticipated that all rainfall falling onto permeable areas will infiltrate the permeable soils or in extreme events will cause an overland flow which will run into the adjacent watercourse. Therefore, rain that falls onto permeable areas will have very little effect on the design of the soakaways and can be neglected from calculations.

Soakaways which are going to be formed out of concrete manhole rings sunk into the ground with 100% free void volume. The calculations were carried out using the BRE 365 – Soakaway Design considering a 100 year storm event. Each soakaway as a 12500-litre capacity and it is required to have 4 of these.

3.1.Groundwater Flooding

Groundwater flooding can occur due to prolonged heavy rainfall during winter. This can cause soils to become fully saturated, and surface water cannot permeate into the soil layers (very unlikely on chalk). This scenario could ultimately result in an overland flow leading to the adjacent watercourse.

3.2.Surface Water Run-off

During intense periods of rainfall, drainage systems can become temporarily overwhelmed which can result in flash flooding. Due to the topography of the site, overland flows will flow into the adjacent watercourse.

Appendix A

Surface Water Calculations

Plot 2 Harts Farm Way

Soakaway Design

POST DEVELOPMENT

Location	=	Havant
Period	=	100 yr
Impermeable Area	=	4500 m ²
Impermeable Area (incl. 30% Climate Change)	=	5850 m ²

Storm Duration	Z1	M5 Rainfall mm	Z2	M10 Rainfall mm	Intensity mm/hr	SW Run-off l/s	Run-off Vol. m ³
5 min	0.36	7.20	1.20	8.64	103.68	168.48	50.54
10 min	0.51	10.20	1.22	12.44	74.66	121.33	36.40
15 min	0.62	12.40	1.23	15.25	61.01	99.14	29.74
30 min	0.79	15.80	1.24	19.59	39.18	63.67	19.10
1 hr	1	20.00	1.24	24.80	24.80	40.30	12.09
2 hr	1.22	24.40	1.24	30.26	15.13	24.58	7.37
4 hr	1.48	29.60	1.21	35.82	8.95	14.55	4.37
6 hr	1.67	33.40	1.19	39.75	6.62	10.76	3.23
10 hr	1.9	38.00	1.18	44.84	4.48	7.29	2.19
24 hr	2.42	48.40	1.15	55.66	2.32	3.77	1.13

Ratio of 60 min. to 2day rainfall of 5yr return period = 0.35

M5 rain falls calculated from Table 1 & Fig 1 BRE Digest 365 using Factor Z1

Storm Duration	In m ³	Internal Surface as50 - m ²	Outflow m ³	Storage Req m ³	Storage m ³	Storage Adequate?
5 min	50.54	108.10	0.66	49.89	50.00	OK
10 min	36.40	108.10	0.66	35.74	50.00	OK
15 min	29.74	108.10	0.66	29.09	50.00	OK
30 min	19.10	108.10	0.66	18.45	50.00	OK
1 hr	12.09	108.10	0.66	11.43	50.00	OK
2 hr	7.37	108.10	0.66	6.72	50.00	OK
4 hr	4.37	108.10	0.66	3.71	50.00	OK
6 hr	3.23	108.10	0.66	2.57	50.00	OK
10 hr	2.19	108.10	0.66	1.53	50.00	OK
24 hr	1.13	108.10	0.66	0.48	50.00	OK

Soakaway Dimensions (Rectangular)

Diameter m	=	1.85
Depth m	=	4.65
No. of Soakaways	=	4
Infiltration m/s	=	0.0000202
Free volume %	=	100

Soakaway to empty 50%

Req. Storage	=	49.89	m ³
Avail. Storage	=	50.00	m ³
Time	=	190	min.
		3	Hour

