



SLEEPERS HILL, WINCHESTER

SURFACE WATER DRAINAGE, OPTIONEERING

October 2024

Sleepers Hill Association

RESIDENTIAL
SLEEPERS HILL
WINCHESTER

SURFACE WATER DRAINAGE OPTIONEERING

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1. INTRODUCTION

- 1.1 Paul Basham Associates have been appointed by the Sleepers Hill Association, henceforth referred to as "the Association", to consider possible drainage solutions that could be provided on Sleepers Hill, Winchester, to address the existing flooding caused by surface water run-off and lack of any positive drainage system.
- 1.2 Figure 1 shows surface water flooding on Sleepers Hill during an intense rainfall event.



Figure 1: Surface Water Flooding on Sleepers Hill

- 1.3 The Sleepers Hill carriageway is constructed from an impermeable bituminous surface. The verges, while mostly unsealed, consist (largely) of compacted hardcore material that is effectively impermeable. If some of these areas can be replaced with a permeable surface, the area contributing to surface water flooding would be reduced. Furthermore, permeable surfaces can capture, attenuate and infiltrate surface run-off.

2. CONSTRAINTS

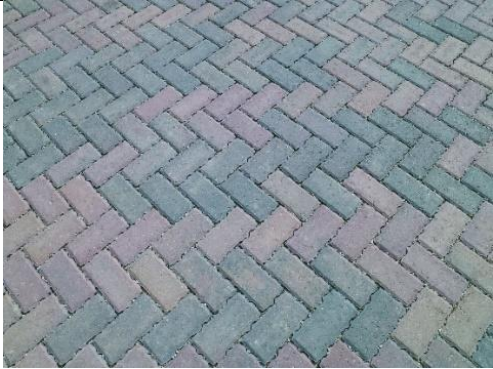
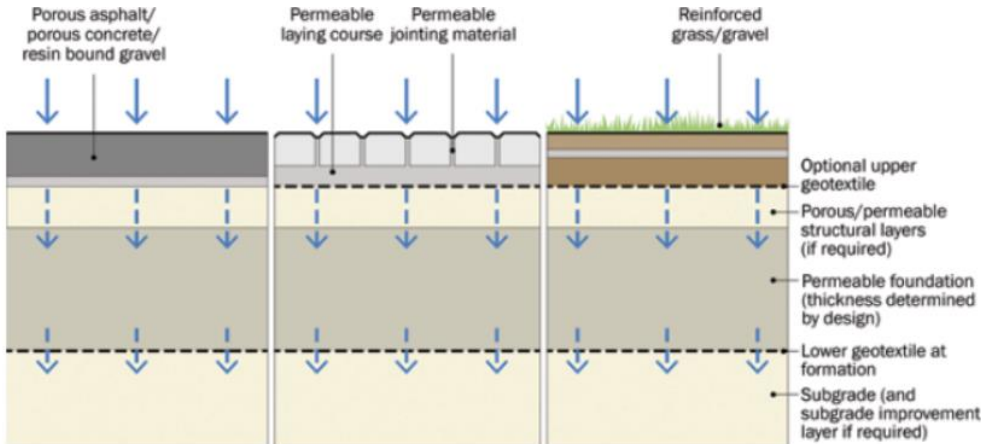
2.1 There are multiple constraints on Sleepers Hill that limit the options available for mitigating surface water flooding, see Table 1.

Constraint	Details	Recommended Actions
Land Ownership	The verges are owned by the adjacent property; therefore, any solution installed in the verge is only feasible with the approval of the freeholder. This is further complicated as some frontages have multiple properties, and the verge is presumably owned by a non-resident landlord and managed by a management company.	
	The Association proposed installing soakaway features in the rear gardens of properties. While a good option from a technical perspective, this would likely lead to conveyancing issues should the property ever be sold. Furthermore, any new owner could disconnect the drainage system.	
Pedestrian Routes	The Association requires that any solution installed in verges is suitable for pedestrian to walk on. This prohibits the most effective solutions such as raingardens that can capture, attenuate and infiltrate run-off.	
Parking	Many householders use the verges for parking, though this is not a universal requirement. The assessment will note which solutions are suitable for vehicular traffic.	
Utilities	The Association provided a 2014 report that included details of six trial holes. The trial holes located shallow services including LV electricity, potable water and telecoms. These will likely prevent the installation of any deeper soakaways in the verge; however, infiltration trenches and permeable paving with an underlying infiltration blanket may be feasible, pending infiltration testing. Refer to Appendix A for details of 2014 the Trial pits.	Commission ground penetrating radar (GPR) survey to locate existing utilities and purchase up to date utility records (<i>PBA can assist with this recommendation if required</i>)
Tree Roots	Sleepers Hill is lined with mature trees. Excavation for pipework on infiltration features will be restricted in many areas to protect their roots.	An arboriculturist should be consulted to determine the extent of root protection zones. (<i>PBA can assist with this recommendation if required</i>)
Ground conditions	Sleepers Hill is underlain by the Lewes Nodular Chalk formation. Typically, this offers reasonable infiltration rates; however, it is interbedded with soft to medium-hard chinks, which may pose a risk of solution features.	A geotechnical engineer should be appointed to undertake BRE 365 infiltration tests at various depths to determine the potential for infiltration and chalk density testing to determine the chalk's vulnerability to dissolution and, if deemed necessary, a solution features assessment. (<i>PBA can assist with this recommendation if required</i>).
Cost	The works are to be funded by the Association and ultimately the residents of Sleepers Hill; the budget is therefore, a key factor and lower-cost solutions are preferred by the Association.	

Table 1: Constraints

3. OPTION 1 - PERMEABLE SURFACING, CARRIAGEWAY

- 3.1 Permeable block paving is a well-established method for of constructing a permeable surface. Block paving is widely used at ports, airports and helipads, as well as on carriageways and driveways. Providing the system is designed and installed per BS 7533-13:2009-13 it is very durable, though high quality workmanship is essential in achieving a durable finish.
- 3.2 On Sleepers Hill block paving could be installed in bands across the existing road as budget and other constraints permit.


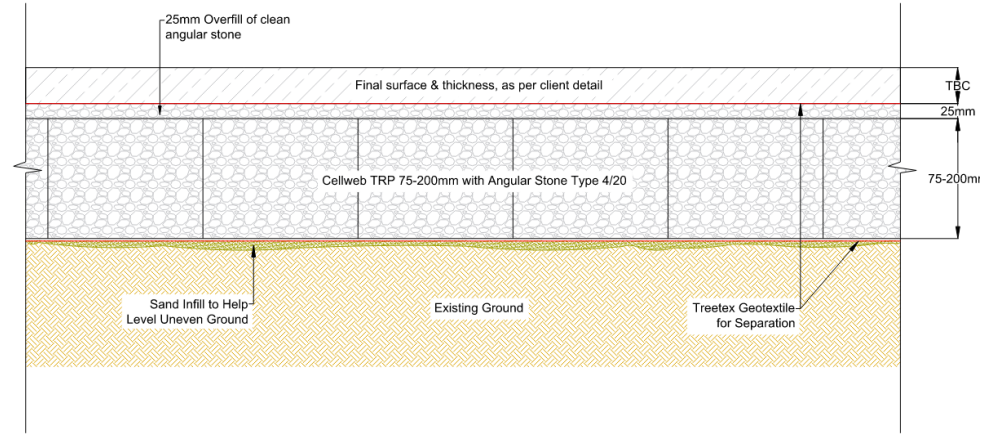
Permeable Paving, Carriageway. Block paving underlain with open graded coarse aggregate.	
Example	 <p>Detail</p>  <p>Figure 20.12 Pervious pavement system types: Type A – total infiltration</p>
Execution	<p>Areas of the existing carriageway could be removed, with 5-10m bands of permeable paving installed at regular intervals (per budget constraints) along Sleepers Hill to capture and infiltrate surface run-off. An ACO MonoDrain unit could be installed on the uphill edge of the paving to capture run-off and divert it into the permeable sub-base during more intense rainfall events.</p>
Benefits	<p>Collection, attenuation and infiltration of surface water. Suitable for vehicles and pedestrians.</p>

3.3 The proposed maintenance schedule for a permeable block paving carriageway is shown below.

Maintenance Category	Maintenance Activity	Frequency
Regular Maintenance	Brushing and debris removal (standard cosmetic sweep over the whole surface)	Regularly during autumn then as required.
Occasional Maintenance	Maintain adjacent soft landscaping	As required
	Removal of weeds	As required
Remedial Actions	Remedial work to any depressions, rutting, cracked or broken blocks considered detrimental to the structural performance or hazard to users, replace jointing material	As required
	Rehabilitation of surface and upper substructure through replacement of jointing materials	Every 10 – 15 years or as required
Monitoring	Initial inspection	Monthly for the first 3 months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48hr after large storm events in the first 6 months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Monthly for three months then then as required

4. OPTION 2 – PERMEABLE SURFACING, VERGES

- 4.1 Sleepers Hill verges vary in width, type, and surface quality. Installing a reinforced gravel system could create high quality permeable surfaces to manage surface run-off. Underpinned by a cellweb system, this would support vehicles while minimising excavation depth, crucial given the constraints such as utilities and tree roots.


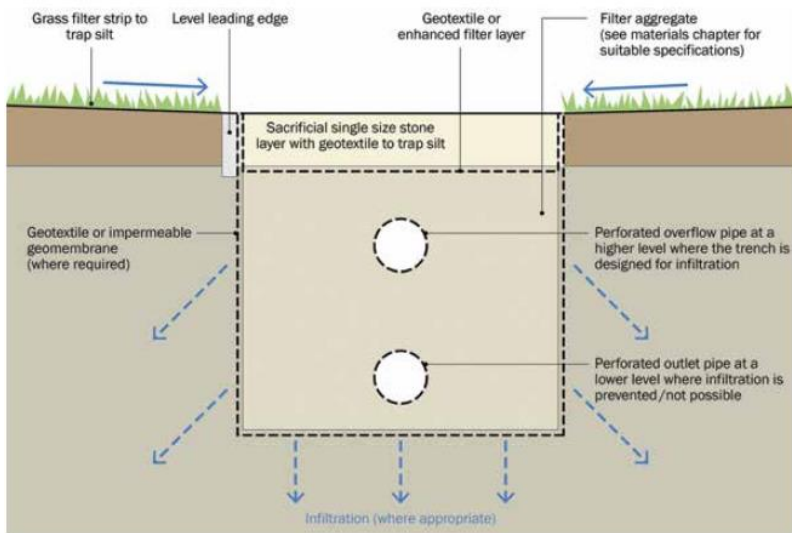
Permeable Paving, Verge/footway Reinforced gravel underlain with Cellweb filled with open graded coarse aggregate	
Example	 <p>Detail</p> 
Execution	To be installed within verges, flush with the carriageway to permit surface run-off to drain to the verge effectively. Bollards or rocks to be provided to prevent vehicle run-over if desired. Kerbs could be placed at the rear to prevent surface run-off entering front gardens during intense rainfall events that may overwhelm the surface's collection ability.
Benefits	Suitable for pedestrian and vehicle traffic, is permeable, will capture, attenuate and infiltrate surface water. The use of Cellweb provides strength at shallow depth, making this solution suitable for areas with shallow services and possible tree roots.

4.2 The proposed maintenance schedule for permeable paving verge/footway is listed below.

Maintenance Category	Maintenance Activity	Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Top up gravel	As required
Remedial Actions	Relevel uneven surfaces and reinstate design levels	As required
	Remove grids, excavate gravel, remove silt and reinstate gravel and grids	As required, if system performance decreases.

5. OPTION 3 – FILTER DRAINS

- 5.1 The 2014 report noted that, according to the trial pits, there was space in verges for infiltration features up to approximately 0.8m in width. This would be sufficient space to provide a filter strip. Filter strips are a low-cost and effective means of capturing, attenuating and infiltrating surface run-off; however, they are not suitable for vehicle run-over or pedestrian traffic. Due to their narrow width, they may be suitable for installation in verges where a permeable surface is not feasible or desired.

Filter Drain Trench filled with Type B filter material	
Example	 <p>Detail</p>  <p>Figure 16.2 Filter drain schematic</p>
Execution	<p>Installed adjacent to and flush with the carriageway. Not suitable for vehicular run-over or pedestrian use. Grass filter strips are optional. The filter strip can be provided without them where space is limited.</p>
Benefits	<p>Low cost and compact method of capturing, attenuating and infiltrating surface water.</p>

5.2 The proposed maintenance schedule for filter drains is as below.

Maintenance Category	Maintenance Activity	Frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, for blockages, clogging, standing water and structural damage	Monthly
	Top up gravel surface course	As required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, in consultation with suitably competent person.	As required
	Remove surface geotextile and replace, and wash or replace overlying filter medium	Ten yearly, or if performance is compromised

6. CONCLUSIONS

- 6.1 All the above options would provide a benefit in terms of reducing surface water flood risk if installed on Sleepers Hill.
- 6.2 The most effective solution would be a combination of the above measures; however, due to budget constraints, this may not be feasible.
- 6.3 If only a single option is possible, this report would propose Option 1, bands of permeable paving in the carriageway. This would likely have the greatest impact and would also be the most feasible solution to apply at scale, given the density of constraints relating to the verges (utilities, pedestrian access and root protection zones).
- 6.4 It is not possible to eliminate the risk of surface water flooding in its entirety through such measures, and a scheme which aimed to do so would likely require a much greater capital investment and a piped discharge to the adopted sewer network via a S104 self-lay adopted sewer. However, they will improve the situation compared to the do-nothing (existing) scenario.
- 6.5 To progress the design further, completing BRE 365 soakage testing and chalk density testing is key to provide engineers with a detailed understanding of the site geology and potential infiltration rates. A GPR survey to locate utilities and an arboricultural survey to define root protection areas would also be beneficial.

Appendix A

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APPENDICES



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