**Green Stormwater Infrastructure   
Simplified Sizing Tool for Small Projects**

**Webinar Presented Tuesday, November 11, 2015**

*Speakers:   
Milly Archer, Water Resources Coordinator, VLCT;   
Amy Macrellis, Project Water Quality Specialist, Stone Environmental*

**Questions**

1. What is pervious pavers cost versus concrete sidewalk cost?

*During the webinar, we did not have cost data to share. However, Stone led the development of informational handouts on “stormwater-friendly driveways” for the City of Burlington in 2012, where we estimated that permeable paver systems start at a cost of around $20/square foot (see* [*https://www.burlingtonvt.gov/DPW/Stormwater-Friendly-Driveways*](https://www.burlingtonvt.gov/DPW/Stormwater-Friendly-Driveways)*). Adjusted for inflation to 2014 dollars, the permeable paver cost is closer to $21/square foot. The 2014 VTrans Bicycle and Pedestrian Program Unit Cost Database (see* [*http://vtransengineering.vermont.gov/sites/aot\_program\_development/files/documents/ltf/Cost\_Report\_2014.pdf*](http://vtransengineering.vermont.gov/sites/aot_program_development/files/documents/ltf/Cost_Report_2014.pdf)*) estimates the cost of a 5-foot-wide concrete sidewalk without curbing as $13-$31/square foot.*

1. Can you define impervious area?

*The LID/GSI Model Bylaw defines “impervious surface” as “Man-made surfaces, including, but not limited to, paved and unpaved roads, parking areas, roofs, driveways and walkways, from which precipitation runs off rather than infiltrates.”*

1. Who would use this toolkit? The homeowner or a contractor? And what if a homeowner (or other applicant) wanted to hire a designer for the site - especially larger sites? If that site surpassed the larger site threshold, would a hired designer alleviate the need for a independent technical review?

*The VT GSI Simplified Sizing Tool and the fact-sheet guidance can be used by home/property owners, other applicants, contractors, or designers/consultants—or it can be used by reviewers as a cross-check on calculations or sizing included in an application. The model bylaw references the simplified sizing tool for methods and calculations, but there is no “shall” accompanying those references. I do not believe the use of the tool is absolutely required. It’s certainly possible that hiring an engineer or landscape architect for larger sites that still fall below the 1-acre threshold could alleviate the need for independent technical review. The way the model bylaw is written, that decision would be at the discretion of the AMP.*

1. Also - why 1" and not 0.9" as is in the current manual? Is that also set to change in the forthcoming manual?

*The rainfall depth for the Water Quality Treatment Standard is anticipated to rise to 1” in the forthcoming Vermont Stormwater Management Manual.*

1. Please include comments on how this procedure considers climate change weather data.

*The model bylaw and the GSI Simplified Sizing Tool include an increase in the depth of rainfall the GSI practices are expected to be able to treat. This is in keeping with the forthcoming draft Vermont Stormwater Management Manual, and with analysis that was done in preparation for that manual, which demonstrated that the “90th percentile” storm depth has increased since the 2002 manual was implemented. More broadly, the model bylaw and guidance encourage minimizing the creation of impervious surfaces, and slowing down, spreading out, and sinking in what runoff is generated. These are generally good strategies for helping to create development and re-development projects that are more resilient to a changing climate.*

1. On the 20' proximity - does the trunk need to be within 20' or the canopy? I would think you want the canopy overhanging?

*The trunk of the tree should be within 20 feet of the impervious surface – you are correct that ultimately, some canopy overhanging the impervious surface is desired. The only caveat here is to be careful with high-litter species of trees located close to permeable paver/pavement systems, as the litter can cause premature clogging of the paver surface.*

1. Should allow runon from roofs? clean h20... no/minimal sediment/clogging loading, no? especially for driveways

*I assume that this question is referring to the use of permeable paver systems to absorb runoff from rooftops. There was a lot of animated discussion in the steering committee meetings about whether to allow this. Some of the simplified sizing methodologies we reviewed explicitly allow and encourage this. Ultimately the steering committee chose to remain consistent with the current DEC policy and with what will be in the forthcoming draft stormwater manual—which is to NOT allow “run-on” from rooftops into permeable paver systems.*

1. Why not a drywell (with a solid cover) in a paved area - like the parking lot, with the infiltrative surface well below the pavement subbase?

*This was not a practice that the steering committee chose to encourage, primarily because the objective was to keep the GSI practices fairly simple and accessible at this small, sub-jurisdictional scale. It can certainly be done from a technical perspective! The AMP would likely want an engineer involved to make sure that the drywell can support vehicle loading, there’s adequate vertical separation between pavement subbase and drywell infiltration, etc.—at which point the design is not necessarily “simple”.*

1. Any opportunities for partial credit? since might not implement requirement for full capture on existing impervious but would want to maximize capture to extent practicable?

*The model bylaw and guidance do not specifically address partial credit, but there’s no reason that this information (especially the bylaw) couldn’t be modified by an individual municipality to allow partial credit or partial capture, especially for existing impervious surfaces in re-development situations.*

1. I assume the 10,000 square foot standard for impervious draining to any single practice doesn't include pervious paving options?

*We did keep the 10,000 square foot per-practice maximum contributing area consistent across all GSI practices included in the tool—including for permeable paver systems. This could be a place where the AMP or reviewer has some discretion. However, if the site is sloping or there are other constraints, a relatively large area of permeable pavers may also represent a place where the AMP might want to see more engineering detail or ask for independent review to ensure the pavers will function as anticipated—at this point you’re considering installation of nearly a quarter of an acre of paver system.*

1. Do you have a "conservative estimate" of infiltration that could be used if this data is not available (for example, if design is happening in January freeze)?

*Site-specific information is always preferred for GSI practices that are expected to infiltrate stormwater. However, a planning-level idea of the possibility for infiltration could be obtained by looking up your site on the ANR Natural Resources Atlas internet mapping application (at* [*http://www.anr.state.vt.us/dec/maps.htm*](http://www.anr.state.vt.us/dec/maps.htm)*), specifically the Geology | Soils – Hydrologic Groups layer. Soils ranked as “A” or “B” in this classification are generally considered to be best-suited for infiltration, soils ranked as “C” may be suited, and soils ranked as “D” are generally very finely textured (silts and clays) and are not well suited for infiltration. However, this is only planning-level data—the NRCS Soil Survey only has a resolution of about 3 acres, so it is not an absolute predictor of the actual conditions on a property. This is especially true for the fairly small sites that are the primary focus of this guidance.*

1. Do you specs on your bioretention soil mix?

*Yes. The Bioretention and Rain Gardens guidance and specification sheet both include a recipe for the bioretention soil mix. That mix is consistent with recent research, and with the forthcoming draft Vermont Stormwater Management Manual.*

1. Where do you recommend getting low P compost in VT? GM Compost and other large producers do not carry it. There must be a connection to a source if this is a spec for local applications.

*Great question! This is an emerging market in Vermont and one that all of us, both producers and consumers of compost, are just starting to become aware of. We know there is more work to be done here and that we’re at the beginning of it—but are also hopeful that including these types of requirements will begin to drive demand, so that the compost operations have something to respond positively to.*