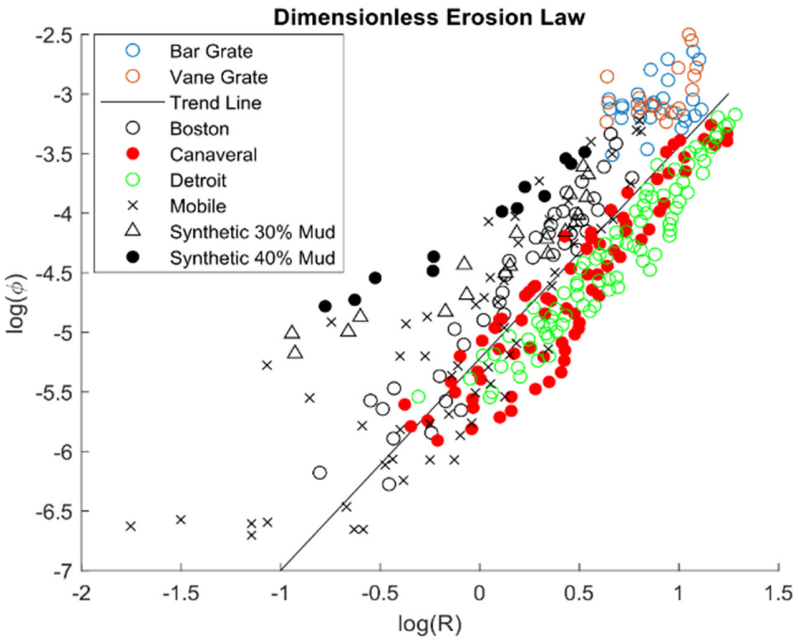

Figure S1. Dimensionless erosion rate (ϕ) and transport stage (R) relationship of bar and vane grate erosion tests (blue and orange open circles, respectively) plotted alongside data aggregated from other cohesive studies [15].

Table S1. Results of bridge deck drainage survey responses from 22 state DOTs.

State	Drain Type	Typical Size	Grate Type	Common Issues	Solutions to Issues	Clogging Factor	Design Reference
Alaska	Scuppers	6” to 8”	Varies	Clogging	Routine Maintenance	None	HEC-21
Arkansas	Grated Inlet	24” x 14”	Bar	Clogging	Routine Maintenance	None	HEC-21
Colorado	Grated Inlet	Varies	Vane	Clogging	Design for clogging/ increase Maintenance	None	HEC-21
Connecticut	Scupper	2’ x 2’	Bar	Clogging	Routine Maintenance	None	HEC-21
Delaware	Scupper and Grated Inlet	12” x 12”	N/A	Clogging	No solution	None	HEC-22
Georgia	Scupper	4” dia.	Bar	Capacity, Clogging	No solution	None	HEC-21
Hawaii	Slotted Openings	3’ x 2’	Bar	Clogging	Add drains, Maintenance	Location Dependent	HEC-12
Illinois	Scupper and Grated Inlet	1’ x 1’ 1’ x 2’	Vane	No issues	N/A	None	HEC-21
Indiana	Grated Inlet	1'8" x 1'7"	Bar	Clogging	Using Clogging Factor	Assume 50% Clogged	Indiana Design Manual
Louisiana	Scupper	8" dia.	N/A	Clogging	Routine Maintenance	Safety Factor of 2	HEC-21
Maryland	Scupper	Varies	Bar	Clogging	Design bridge with higher longitudinal slopes	None	HEC-22
Minnesota	Grated Inlet	1'5" x 1’5”	Cross hatch	Clogging	Avoid underdeck pipe system	Assume 50% Clogged	HEC-22
Nebraska	Grated Inlet	3.5’ x 1.5’	Bar	Clogging	Routine Maintenance	None	HEC-21
Nevada	Scupper and Grated Inlet	2 'x 3', 9" x 18"	Bar	Designing for maintenance	Avoid Deck Drains	Assume 50% for Sag, 25% for high debris, 10% all other	HEC-12, HEC-21, HEC-22
New Hampshire	Scupper	18" x 6" to 48" x 15"	Cross hatch	Rusting, Clogging	Increase Routine Maintenance	None	HEC-21
New York	Grated Inlet	1'10" x 1'5"	Bar	Clogging, Downspout disconnection	Use bridge washing program	None	HEC-21
North Carolina	Slotted Openings	6” dia.	N/A	Clogging	Paved approach shoulders	None	HEC-21
Ohio	Scupper	Varies	Varies	Clogging	Widen shoulders, Reduce speed limits	None	OHDOT Manuals
Oregon	Grated Inlet	2’8” x 1’2”	Bar	Clogging	Routine Maintenance	None	ODOT Hydraulics Design manual
Pennsylvania	Scupper	1’9” x 1’6”	Bar	Clogging	Routine Maintenance	None	HEC-22
South Dakota	Scupper	4” dia.	Open	Capacity	More or Larger Inlets	None	HEC-21
West Virginia	Scupper	6” or 8” dia.	Bar or Vane	Clogging	Increase Routine Maintenance	Designers Discretion	HEC-21

Table S2. Breakdown of experimental model components.

Component	Description	Tolerance
Deck Structure	Treated 2x4 wood boards running the length of the deck with cross members every 0.30-m.	-
Deck Surface	12-mm thick sanded plywood with a steel Z flashing for the curb. Adhered to structure with screws and sealed with roofing sealant.	-
Deck Supports	9.5-mm threaded zinc rods at 0.46-m length with aircraft cable suspended from the end attached to the deck structure with full adjustability.	1.6-mm height adjustability increments.
Deck Coating	Spray adhesive with 0.5-mm silica evenly distributed across the deck surface and curb.	-
Inflow Hose	15.875 diameter PVC hose attached to flow meter at laboratory water system valve.	+/- 1.00%
Inlet Opening	0.61m square opening with wood inlet supports below the deck surface. Inlet opening were sealed with modeling clay.	-
Discharge Capture Container	53-liter plastic container with electronically controlled valve to remove capture discharge. Container was rested in the center of the scale.	-
Scale	Ohaus SD75 Scale	+/- 50g