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TECHNICAL MEMORANDUM

Date: May 1, 2017

To: John Rotondo, Rich Rotondo, Rotondo Environmental Solutions, LLC

Copy to: John Lenth, Herrera Environmental Consultants, Inc.

From: Dylan Ahearn, Herrera Environmental Consultants, Inc.

Subject: StormGarden Infiltration Testing at the Ship Canal Testing Facility

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On April 20, 2017, Herrera Environmental Consultants, Inc. (Herrera) conducted infiltration testing on a 4- by 6-foot (internal dimensions) StormGarden Stormwater Filtration System (StormGarden) installed at the Ship Canal Testing Facility (SCTF) in Seattle, Washington (Figure 1). In order to determine the maximum flow rate that the system could infiltrate without bypassing, a firehose with Master Meter™ fire hydrant meter (flow meter) was used to discharge potable water into the system. The flow rate of the flow meter was verified with a calibrated 30-gallon bucket and timer prior to testing, and it was determined that the error was less than 5 percent. Figure 2 provides images of both the flow meter and the graduated bucket.

The water quality design infiltration rate of the StormGarden is 140 inches per hour (in/hr), which for a 4- by 6-foot unit equates to a flow rate of 34.9 gallons per minute (gpm). It was anticipated that the maximum infiltration rate would exceed the design infiltration rate so that the system would have capacity to progressively clog during operation without the flow rate falling below the design rate. Water was discharged into the unit in four runs with approximately 5 to 15 minutes of no flow separating each run. During each run, the water level above the mulch was measured along with the flow rate. Table 1 summarizes the results. The initial run was used to wet the media and only 12.5 gpm (50 in/hr) was discharged into the unit. No standing water above the mulch was observed. In the second run the flow rate was brought up to 54.3 gpm or 218 in/hr. At this flow rate the water level was 7 inches above the mulch and equal to the bypass invert; however, the water level was rising slightly so it was assumed that the steady state infiltration rate was slightly below this level. During the third run, the water level held steady at the bypass and the measured flow was 51 gpm or 213 in/hr. This value was used as the final maximum infiltration rate for the StormGarden (Table 1).

The StormGarden is configured with a 4-inch underdrain as well as a 6- by 4-inch permeable paver filter panel that is designed to drain the water beneath the underdrain perforated pipe between storm events. The filter panel also provides some infiltration benefit. During the final run, a valve sealed over the filter panel (Figure 3) was opened and one final infiltration test was run to determine the maximum infiltration rate with both the underdrain and filter panel exporting filtered stormwater. The result was an increased maximum infiltration rate from 213 in/hr to 249 in/hr (Table 1).

In summary, these results indicate that the StormGarden system installed at the SCTF exhibits a maximum infiltration rate of 213 in/hr with the filter panel sealed and 249 in/hr when the filter panel is allowed to drain free. It should be noted that when installed in the field the infiltration rate of the native soil may control the flow rate from the filter panel so the maximum infiltration rate of 249 in/hr may not be achievable under all field conditions.

Table 1. Infiltration Test Results.

Run	Date/Time	Head Above Mulch (in)	Flow Meter Flow Rate (gpm)	Equivalent Infiltration Rate (in/hr)	Notes
1	4/20/17 13:40	0	12.5	50	Low flow test to wet media
2	4/20/17 13:55	7	54.3	218	Water level at bypass but rising slightly
3	4/20/17 14:23	7	51	205	Water level steady at bypass invert
4	4/20/17 14:40	7	62	249	Filter panel underdrain valve open, estimated at 8 to 11 gpm. Water level steady at bypass
Estimated max infiltration rate with no filter panel			**51**	**213**	
Estimated max infiltration rate with filter panel			**62**	**249**	

in = inch

in/hr = inches per hour

gpm = gallons per minute

Bold values = final results

Figure 1. Image of the StormGarden System Tested at the SCTF.

Figure 2. Images of the Rotameter and Graduated Bucket used During the Infiltration Testing.

Figure 3. Filter Panel Valve.