

## **Deliverable 4.8: Progress Report 8**

### **Overview of Work Period: 1/20/22 –11/9/22**

		Water Quality		Toxicology		Stormwater	
Water Year	Event	Basic	Full	Zfish	Coho	Collection Date (2022)	Treatment Dates
11	61	x				11/28	11/29-11/30
11	62	x				12/4	12/6-12/7
11	63	x				1/17	1/18-1/19
11	64	x				2/5-2/6	2/7-2/8
11	65	x				2/20-2/21	2/22-2/23
11	66	x	x	*		3/7-3/8	3/9-3/10

\*Zebrafish molecular assays have not yet been completed for Event 66.

### ***Report Summary***

#### **Work Progress Status**

Project Tasks	% Completion
1. QAPP development	100
2. Prepare experimental columns	100
3. Condition experimental columns	100
4. Bioretention performance throughout accelerated aging	85
5. Outreach and communication	0

#### **Discussions/decisions made since last report period**

- None

#### **Summary of Events**

##### Summary of Full Water Chemistry

##### Event 66 (Post WY11)

- There were no significant differences in metals release from the different BSM depths
- pH was slightly lower in effluent from the deeper than shallower BSM
- Less Mg was leached into effluent from the deeper than shallower BSM
- NOx was leached into effluent from all depths, with no differences in BSM depth
- oP was reduced in effluent compared with influent stormwater, but more leached from the deeper BSM

##### Maintenance Activities and Dosing Notes

- Very slow filtration noted for several replicates suggesting imminent clogging. The low turbidity of effluent for these replicates is a good indicator of this slow filtration.

- Backflush and Ksat test between Event 64 and Event 65. Several columns noted to be leaking during the Ksat testing (in which water is held in the column to saturate the soil). Old silicone sealant was removed and new sealant applied.

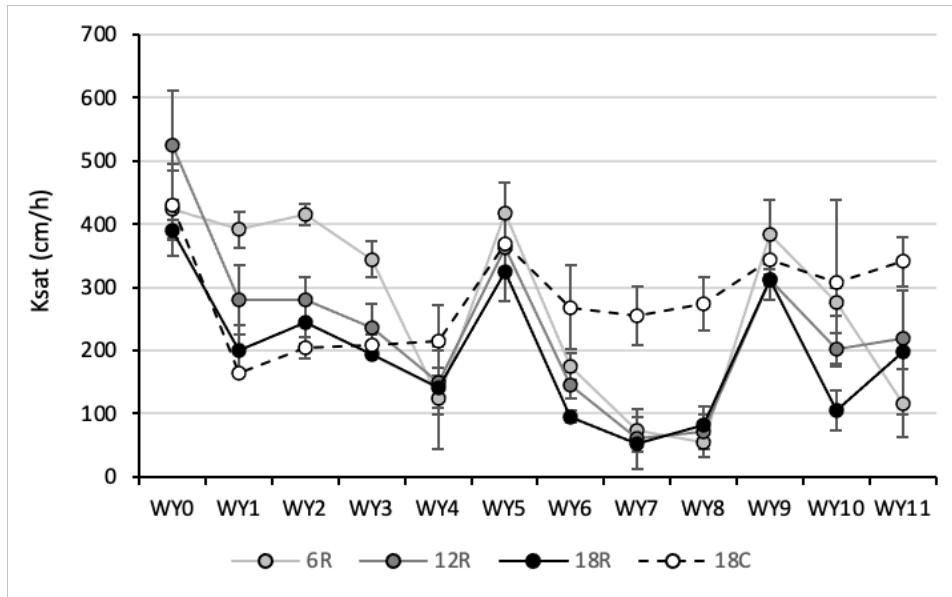


Figure 1. Saturated hydraulic conductivity (mean  $\pm$  SE) following each water year for the three depths of bioretention receiving runoff (6", 12", 18") and the clean water control (18"). Maintenance consisting of backflushing all columns between Event 64 and Event 65.

## **Full Water Chemistry**

Full water chemistry analysis was conducted for Events 66 (End of WY11). Samples for water chemistry were collected and analyzed as previously (Deliverable 4.1: Progress Report 1). Statistical differences are shown when they exist between the depths of bioretention treating runoff (6R, 12R, 18R).

## Event 66 (End of WY11)

### Metals

**Table 1.** Average concentrations of dissolved and total metals in ppb (standard error) for influent waters (clean water and influent stormwater runoff) and triplicate effluent waters from each of the three runoff treatment (R) depths (6", 12", 18") plus the clean water control (C) for the event ending Water Year 11. One-half of the value of the detection limit was substituted for the value of non-detects in calculating means; used when the compound was detected in at least one replicate for the treatment. Values following '<' are equal to the detection limit. There were no significant differences among depths of bioretention treated with runoff (6R, 12R, 18R).

Compound	MDL	Clean Water	Influent Runoff	6R	12R	18R	18C
Dissolved As	0.0373	0.038	0.473	0.298 (0.02)	0.318 (0.03)	0.34 (0.009)	0.359 (0.005)
Dissolved Cd	0.03	0.039	0.047	<0.03	<0.03	<0.03	<0.03
Dissolved Cu	0.173	<0.173	7.02	5.68 (0.6)	4.41 (0.2)	4.54 (0.7)	2.59 (0.6)
Dissolved Pb	0.05	<0.05	0.086	<0.05	0.035 (0.009)	<0.05	0.054 (0.003)
Dissolved Ni	0.0792	0.199	0.78	0.532 (0.01)	0.89 (0.2)	0.71 (0.1)	0.05 (0.03)
Dissolved Zn	2.92	<2.92	33.3	2.13 (0.7)	3.18 (0.05)	<2.92	<2.92
As	0.0373	<0.0373	1.64	0.324 (0.04)	0.352 (0.02)	0.371 (0.01)	0.405 (0.02)
Cd	0.03	0.038	0.202	<0.03	<0.03	<0.03	<0.03
Cu	0.173	0.276	45.4	6.64 (0.4)	5.58 (0.5)	5.62 (0.9)	3.27 (0.7)
Pb	0.05	<0.05	7.54	0.405 (0.2)	0.154 (0.02)	0.074 (0.02)	0.134 (0.008)
Ni	0.0792	0.161	5.86	0.758 (0.2)	1.06 (0.4)	0.818 (0.1)	0.546 (0.04)
Zn	2.92	<2.92	198	6.89 (1.8)	4.72 (0.8)	2.99 (0.8)	<2.92

### Nutrient & Conventional Water Chemistry

**Table 2.** Average water chemistry values in mg/L (standard error) for influent waters (clean water and influent stormwater runoff) and triplicate effluent waters from each of the three runoff treatment (R) depths (6", 12", 18") plus the clean water control (C) for the event ending Water Year 11. One-half of the value of the detection limit was substituted for the value of non-detects in calculating means; used when the compound was detected in at least one replicate for the treatment. Values following '<' are equal to the detection limit. n.m. = not measured for this event. Effluent from bioretention treated with runoff was compared among bioretention depths (6R, 12R, 18R). Analytes with significant differences among depths, values that share a superscript letter are not significantly different.



Acenaphthylene	<0.002	0.011	<0.002	<0.002	<0.002	<0.002
Anthracene	<0.001	0.011	<0.001	<0.001	<0.001	<0.001
Carbazole	<0.001	0.017	<0.001	<0.001	<0.001	<0.001
Dibenzofuran	<0.002	0.01	<0.002	<0.002	<0.002	<0.002
Fluorene	<0.002	0.015	<0.002	<0.002	<0.002	<0.002
Phenanthrene	<0.001	0.131	0.0027 (0.0003)	0.0023 (0.0003)	0.002 (0)	0.0012 (0.0004)
Benz[a]anthracene	<0.0008	0.043	<0.0008	<0.0008	<0.0008	<0.0008
Chrysene	<0.001	0.127	0.001 (0.0005)	0.0012 (0.0004)	0.0007 (0.0002)	<0.001
Fluoranthene	<0.002	0.22	0.0017 (0.0003)	0.0013 (0.0003)	<0.002	<0.002
Pyrene	<0.001	0.317	0.0018 (0.0007)	0.002 (0.0006)	<0.001	<0.001
Benzo(a)pyrene	<0.003	0.061	<0.003	<0.003	<0.003	<0.003
Benzo(b)fluoranthene	<0.0005	0.076	0.0005 (0.0003)	0.0009 (1E-04)	0.0006 (0.0002)	<0.0005
Benzo(j)fluoranthene	<0.002	0.046	<0.002	<0.002	<0.002	<0.002
Benzo(k)fluoranthene	<0.004	0.046	<0.004	<0.004	<0.004	<0.004
Dibenzo(a,h)anthracene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Perylene	<0.007	0.037	<0.007	<0.007	<0.007	<0.007
Benzo(ghi)perylene	<0.002	0.114	<0.002	<0.002	<0.002	<0.002
Indeno(1,2,3-cd)pyrene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
<b>Total PAHs</b>	0.011	1.528	0.0165	0.0162	0.0108	0.0082

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