

Trash Guard Performance

Stormwater management is increasingly critical as an element of watershed protection. Stormwater conveys pollutants from the land surface into surface waters of the nation and stormwater treatment is increasingly necessary to protect surface waters. One option that is being tested is a drain insert called Trash Guardtm. Trash Guard devices were installed in the Fayetteville area in December 2007 to ascertain the degree of solids accumulation in these systems. Two of the Trash Guard installations were selected for assessment of water quality consequences associated with the device. The influent to and effluent from two Trash Guard facilities located in the Fayetteville area have been tested for three (3) months; the sampling devices were installed in October, 2009 and have been sampled during storm events in November and December of 2009 and in January, 2010.

Site one is an industrial area. The watershed area is approximately 5 acres and the bulk of the area is impermeable surface. A metal recycling facility is located in the watershed and truck traffic into and out of the watershed is significant. Results of the sampling are presented below.

Table 1, Selected Pollutant Concentrations in Influent to and Effluent from Trash Guard Device Installed on Glidden Street, Fayetteville, NC (as mg/l) and Percent Removal

Month	Constituent	Influent mg/l	Effluent mg/l	Removal %
Nov, 2009	TSS	205	68	67 %
	TN	1.51	0.74	51 %
	NH4	0.54	0.38	30 %
	NO3	0.97	0.36	57 %
	TP	0.03	0.01	67 %
	K	1.69	1.52	10 %
	Zn	0.03	0.01	67 %
	Cu	0.01	ND (0.005)	50 %
	Dec, 2009	TSS	310	54
TN		5.98	1.89	68 %
NH4		0.25	0.22	12 %
NO3		5.73	1.67	71 %
TP		0.91	0.42	54 %
K		9.26	5.86	37 %
Zn		2.60	0.55	79 %
Cu		0.11	0.05	55 %
Jan, 2010		TSS	228	42
	TN	1.93	1.49	23 %
	NH4	0.24	0.22	8 %
	NO3	1.69	1.27	25 %
	TP	1.30	0.39	70 %
	K	7.96	7.11	11 %
	Zn	3.81	0.79	70 %
	Cu	0.20	0.05	75 %

The Glidden Street site is heavily industrial. A large metal recycling facility is located immediately up-slope of the Trash Guard installation. Lead storage batteries, galvanized metal, copper tubing and a variety of other metals are present on the recycling facility. These metals are the source of the high levels of metal reported in the liquid and present in the stormwater solids collected and tested from the site.

Solids accumulation has been significant in the stormwater basin containing the Trash Guard device. More than one (1) ton of solids have been removed from the basin since the Trash Guard was installed in 2007. During the three months test period 212 lbs. of solids were collected. Results of the solids testing are reported in Table 2, Stormwater Solids Characteristics in Glidden Street Basin, below.

Table 2, Characteristics of Stormwater Solids Collected in Glidden Street Basin, as mg/kg, unless specified

Constituent	GR1	GR2	GR3	GR4
Dry Matter (%)	88 %	81 %	84 %	81 %
pH (SU)	8.2 mg/kg	7.2 mg/kg	9.1 mg/kg	7.6 mg/kg
N	1167 mg/kg	687 mg/kg	550 mg/kg	1189 mg/kg
P	196 mg/kg	206 mg/kg	139 mg/kg	113 mg/kg
K	308 mg/kg	184 mg/kg	180 mg/kg	166 mg/kg
Ca	6500 mg/kg	7449 mg/kg	8927 mg/kg	6358 mg/kg
Mg	2311 mg/kg	1519 mg/kg	1619 mg/kg	1218 mg/kg
Na	102 mg/kg	119 mg/kg	93 mg/kg	35 mg/kg
Zn	2185 mg/kg	3250 mg/kg	519 mg/kg	809 mg/kg
Cu	2654 mg/kg	2546 mg/kg	1603 mg/kg	1061 mg/kg
Ni	29 mg/kg	48 mg/kg	21 mg/kg	35 mg/kg
Pb	599 mg/kg	545 mg/kg	163 mg/kg	218 mg/kg
Cd	8.5 mg/kg	11.2 mg/kg	2.2 mg/kg	2.3 mg/kg
TOC	34130 mg/kg	19677 mg/kg	28850 mg/kg	22431 mg/kg

The volume of solids removed from the Glidden Street site has been over 2000 pounds since the Trash Guard was installed. These solids were removed and handled in a solid waste facility.

Site 2 tested in Fayetteville was Loch Haven Drive. The watershed area measures approximately 8 acres and is approximately 40 % impermeable. The neighborhood is residential and the drainage from the area enters Lake McFadden. Concerns expressed by the City of Fayetteville suggest sediment entering the lake is a significant public concern. Testing indicates significant removal of pollutants in the samples collected. Comparison of influent to the Trash Guard and effluent from the Trash Guard indicates pollutant removal levels between 11 and almost 80 % depending on the pollutant. Results of the stormwater sampling are presented in Table 3, below.

Table 3, Selected Pollutant Concentrations in Influent to and Effluent from Trash Guard Device Installed on Loch Haven Drive, Fayetteville, NC (as mg/l) and Percent Removal

Month	Constituent	Influent mg/l	Effluent mg/l	Removal %
Nov, 2009	TSS	191	39	80 %
	TN	1.51	1.01	33 %
	NH4	0.27	0.22	19 %
	NO3	1.03	0.72	30 %
	TP	0.03	0.01	67 %
	K	1.13	0.74	35 %
	Zn	0.01	ND (0.005)	50 %
	Cu	0.01	ND (0.005)	50 %
	Dec 2009	TSS	198	44
TN		7.98	2.89	64 %
NH4		0.25	0.22	12 %
NO3		5.73	1.67	71 %
TP		0.91	0.42	54 %
K		9.26	5.85	37 %
Zn		2.60	0.55	79 %
Cu		0.11	0.05	55 %
Jan, 2010	TSS	210	48	77 %
	TN	2.93	2.49	15 %
	NH4	0.24	0.22	8 %
	NO3	1.60	1.20	25 %
	TP	1.30	0.40	69 %
	K	7.96	7.11	11 %
	Zn	3.81	0.79	79 %
	Cu	0.20	0.09	55 %

The quantity of solids removed in the basin by the Trash Guard device installed on Loch Haven Drive was 440 pounds from mid November 2009 until late January 2010. An additional 90 pounds of solids were removed during the first few weeks of the test. The total amount of solids removed during the three month test period was 530 pounds. The bulk of the weight retained was due to sand, the bulk of the volume was occupied by leaf waste. These leaf wastes are the result of autumn leaf fall. The solids retained were collected, weighed, and tested. Results of the testing are presented below in Table 4.

Table 4, Characteristics of Stormwater Solids Collected in Loch Haven Drive Basin, as mg/kg, unless specified

Constituent	Lake 1	Lake 2
Dry Matter (%)	38 %	42 %
pH (SU)	5.9 mg/kg	6.2 mg/kg
N	7340 mg/kg	6359 mg/kg
P	581 mg/kg	549 mg/kg
K	539 mg/kg	432 mg/kg
Ca	4665 mg/kg	5193 mg/kg
Mg	905 mg/kg	839 mg/kg
Na	181 mg/kg	224 mg/kg
Zn	180 mg/kg	193 mg/kg
Cu	29 mg/kg	28 mg/kg
TOC	210840 mg/kg	180036 mg/kg

Conclusions: the Trash Guard device effectively removes pollutants contained in stormwater. When used in combination with other treatment systems as a part of a comprehensive stormwater management effort, pollutant removals are significant.

The accumulation of stormwater solids in a catch basin necessitates the removal of these solids. The Trash Guard device is designed to allow passage of liquid through an overflow area located at the apex of the device. This will allow passage of water as solids accumulate, but if the solids are not removed periodically, the effectiveness of the device will decline.

The Trash Guard device has exhibited significant potential to remove suspended solids, organic matter, nutrients and regulated metals. These pollutants impair water-ways throughout the nation and the Trash Guard devices tested in this study have effectively removed significant quantities of these pollutants from direct discharge.

Respectfully submitted;

A. R. Rubin, Professor Emeritus, NCSU-BAE