Appendix B

Test Subwatershed Evaluation

INTRODUCTION

The most common treatment device throughout the Coon Creek Watershed District (District) is a stormwater pond. Therefore, three subwatersheds were chosen to determine the removal efficiency of stormwater ponds designed to the applicable rate control and water quality standards.

The type of downstream receiving body determines the level of water quality treatment required for development. Areas that discharge to Type 1, 2, 6, or 7 wetlands and ditches must provide treatment for the runoff from a 0.5-inch storm and include skimming of floatable materials. Areas draining to Type 3, 4, or 5 wetlands and lakes must meet National Urban Runoff Program (NURP) design requirements (runoff from the 2.5-inch storm) and include skimming of floatable materials. For this study, downstream receiving bodies were identified by observation using NWI and aerial photos.

Many subwatersheds in the District drain to Type 1, 2, 6, and 7 wetlands or ditches and are subject to drainage sensitive uses runoff rate control. Stormwater ponds in these subwatersheds are typically constructed with a larger permanent pool than required because a larger flood pool volume is needed to satisfy the drainage sensitive uses criteria. Therefore, the combination of these two requirements indirectly results in greater water quality treatment than required for a subwatershed discharging to a Type 1, 2, 6, or 7 wetland or ditch.

TEST SUBWATERSHED SELECTION

Three test subwatersheds were selected for this evaluation: one each in Coon Rapids, Blaine, and Andover. Subwatershed 3703 in Andover (Figure B.1) consists primarily of residential land use. Subwatershed 6012 (Figure B.2) in Blaine contains a mix of commercial and residential land use. Finally, Subwatershed 5414 (Figure B.3) in Coon Rapids includes a mix of residential (high and low density) and agricultural land.

Wenck staff reviewed the grading plans and stormwater calculations provided for each development at the time of the permit application to the District. For each subwatershed, drainage areas, outlet devices, and permanent and flood pool volumes were obtained from plans submitted to the District when the development was permitted. This data was entered into a P8 model for each subwatershed.

Limited information was available for developments in the Coon Rapids and Blaine subwatersheds. It is likely that portions of these subwatersheds developed prior to District rules in 1988, so stormwater management plans were not submitted to the District.

TEST SUBWATERSHED MODELS

The TSS treatment efficiency of each stormwater pond within the test subwatersheds was evaluated using hourly precipitation from 1975 to 1985. This record differs from that used in the nondegredation study (1993-2002) because the test subwatershed evaluation was conducted early in the scope of the project and the hourly precipitation record from 1993-2002 had not yet been obtained. All test subwatershed simulations were conducted using the P8 model NURP50 particle file.

The results of the test subwatershed evaluation are listed in Tables B.1, B.2, and B.3 for Andover, Blaine, and Coon Rapids, respectively. The tables include an ID for each stormwater pond in the subwatershed; the required treatment level according to the District rules (2.5" or 0.5" permanent pool volume); the expected TSS removal efficiency based on literature values; and the modeled removal efficiency from P8.

Table B.1. Expected and modeled TSS removal for Subwatershed 3703 in Andover.

Stormwater Pond ID	Treatment Level	Perm Pool (ac-ft)	Average Depth (ft)	Flood Pool (ac-ft)	TSS Removal %	
					Expected	Modeled 1975-1985
CCNP5	2.5" runoff	0.83	1.86	0.22	85	79.5
OP2P1	2.5" runoff	0.34	3.40	0.95	85	93.0
EagleCCN	0.5" runoff	0.31	1.94	0.57	45	87.5
CEP2	2.5" runoff	2.14	3.01	1.73	85	93.8
DrakeCE	2.5" runoff	0.34	3.40	0.06	85	92.0
AvctCC	2.5" runoff	0.18	0.90	0.20	85	91.5
156CC	2.5" runoff	0.16	2.29	0.13	85	87.5
PnslaCC	2.5" runoff	0.14	0.93	0.12	85	90.5
WOP2	2.5" runoff	0.63	2.74	1.12	85	87.6
WOP5	0.5" runoff	0.27	1.80	0.36	<45	60.7
WOP1	2.5" runoff	0.09	0.90	0.40	85	90.5
WPEP4	2.5" runoff	3.10	5.08	0.65	85	94.3
WPEP3	2.5" runoff	1.15	5.48	0.73	85	95.8
WPEP2	2.5" runoff	0.65	1.67	0.99	85	94.7
WPEP5	2.5" runoff	3.27	7.79	2.15	85	95.9
SphyP2	2.5" runoff	1.33	3.32	1.51	85	95.6
SphyP6	2.5" runoff	1.18	2.07	1.14	85	96.6
SphyP3	2.5" runoff	0.42	2.33	0.76	85	89.7
NECC	0.5" runoff	0.87	1.85	1.52	45	80.0
BbrdCC	0.5" runoff	0.65	1.76	2.18	45	89.1
HSP1	2.5" runoff	0.28	0.72	0.67	85	96.9
CEP1	2.5" runoff	10.84	5.00	10.33	85	87.5
PCP1	2.5" runoff	0.75	2.27	0.60	85	96.8
SOCP1	2.5" runoff	0.36	2.77	0.52	85	89.9

Table B.2. Expected and modeled TSS removal for Subwatershed 6012 in Blaine.

Stormwater Pond ID	Treatment Level	Perm Pool (ac-ft)	Average Depth (ft)	Flood Pool (ac-ft)	TSS Removal %	
					Expected	Modeled 1975-1985
ABP1	0.5" runoff	0.08	1.60	0.13	45	92.4
ABP2	0.5" runoff	0.06	0.00 (inf)	0.13	45	96.0
ABP3	Dry pond	0.00	0.00 (inf)	.04	<45	65.6
WGP	2.5" runoff	0.49	2.22	0.80	85	87.6
NMP	2.5" runoff	11.00	5.14	15.0	85	94.9
ACP	2.5" runoff	0.033	0.04	0.13	85	56.8 (+Stormceptor)
MSMP	2.5" runoff	0.43	2.15	0.85	85	87.3
HWW	2.5" runoff	4.50	1.40	7.0	85	96.7
HWP2	2.5" runoff	6.50	2.41	17.91	85	95.6
HWP1	2.5" runoff	0.53	2.41	1.04	85	95.2
BSP	0.5" runoff	0.22	1.57	0.83	45	82.8

Table B.3. Expected and modeled TSS removal for Subwatershed 5414 in Coon Rapids.

Stormwater Pond ID	Treatment Level	Perm Pool (ac-ft)	Average Depth (ft)	Flood Pool (ac-ft)	TSS Removal %	
					Expected	Modeled 1975-1985
WWBHW	0.5" runoff	0.27	2.65	0.89	45	83.7
WWBHE	0.5" runoff	0.42	2.39	1.76	45	81.0
HM1	0.5" runoff	0.16	1.38	0.07	45	87.1

APPLICATION TO WATERSHED MODEL

The modeled removal efficiency of almost every stormwater pond is greater than the expected removal efficiency. Therefore, Wenck used the more conservative expected removal efficiency for calculating the removal of TSS by the District rules (Table B.4). The P8 model predicted much higher removal rates for ponds sized for the 0.5-inch storm (by calculating treatment achieved in the flood pool of the pond). The expected removal rates were used in the nondegredation study because of literature values and the relatively shallow average pond depths reported in Tables B.1-B.3.

Rate Control Standard	Water Quality Standard	% TSS Removal	% TP Removal
Drainage sensitive uses	NURP standards	85	50
No drainage sensitive uses	NURP standards	85	50
Drainage sensitive uses	0.5-inch standard	65	40
No drainage sensitive uses	0.5-inch standard	45	20