APPENDICES

APPENDICES

Appendix A

Water Quality Modeling Summary

Summary of City-Wide TMDL Modeling Results
City of Oconomowoc

Reachshed	Area (acres)	Total Suspended Solids			Total Phosphorus		
		Discharge No Controls (pounds)	Discharge With Controls (pounds)	TSS Reduction (%)	Discharge No Controls (pounds)	Discharge With Controls (pounds)	Phosphorus Reduction (%)
Oconomowoc River #25 (Upstream)	1264.75	340154.50	165006.09	51.49%	1058.33	626.68	40.79%
Oconomowoc River #25 (Downstream)	1864.28	434485.78	298119.17	31.39%	1401.19	1041.74	25.65%
Subtotal	**3129.03**	**774640.28**	**463125.26**	**40.21%**	**2459.52**	**1668.42**	**32.16%**
Battle Creek #26	932.45	308261.38	66815.75	78.32%	3402.77	1210.91	64.41%
Rock River #27	26.42	1576.10	0.00	100.00%	8.34	0.00	100.00%
Upper Nemahbin #55	541.84	127680.58	10781.71	91.56%	346.75	45.77	86.80%
Overall	**4629.74**	**1212158.34**	**540722.72**	**55.39%**	**6217.38**	**2925.10**	**52.95%**

Summary of MS4 Modeling Results

Oconomowoc River (Upstream) Reachshed #25	Area (acres)	Total Suspended Solids: Discharge no controls (pounds)	Total Suspended Solids: Discharge with controls (pounds)	Total Suspended Solids: TSS Control (%)	Total Phosphorus: Discharge no controls (pounds)**	Total Phosphorus: Discharge with controls (pounds)**	Total Phosphorus: P Control (%)**	Stormwater Practices Employed: Primary (WP, SW, etc.)	Stormwater Practices Employed: Other (WP, GS, etc.)
LDR	5.16	782.09	707.40	9.55%	3.27	3.06	6.30%	VS	
MDRNA	334.40	69600.07	62953.26	9.55%	260.02	243.64	6.30%	VS	
HDRNA	17.43	4735.57	4283.32	9.55%	16.72	15.67	6.30%	VS	
STRIPCOM	22.07	11390.01	10302.27	9.55%	24.02	22.51	6.30%	VS	
OFFICE PARK	5.60	2190.89	1981.66	9.55%	4.90	4.59	6.30%	VS	
DOWNTOWN	9.41	3753.06	3394.64	9.55%	9.62	9.01	6.30%	VS	
HOSP	2.65	1004.27	908.36	9.55%	2.68	2.51	6.30%	VS	
INST	33.35	13239.47	11975.10	9.55%	31.05	29.09	6.30%	VS	
SCH	14.27	4981.50	4505.76	9.55%	14.39	13.48	6.30%	VS	
LI	27.86	15046.88	13609.90	9.55%	26.40	24.74	6.30%	VS	
OPEN	9.43	453.82	410.48	9.55%	2.61	2.45	6.30%	VS	
PARKS	4.47	533.46	482.52	9.55%	2.32	2.17	6.30%	VS	
CEMETARY	0.06	7.30	6.60	9.55%	0.03	0.03	6.30%	VS	
SUBTOTAL	**486.16**	**127718.39**	**115521.28**	**9.55%**	**398.03**	**372.95**	**6.30%**		
Downtown (Street Sweeping)	59.52	20908.88	18456.28	11.73%	55.67	51.56	7.38%	VS	
E-BB	10.67	5646.60	1129.24	80.00%	10.05	4.32	57.03%		
E-I2	41.24	8583.39	1201.76	86.00%	32.07	11.79	63.25%		
E-K	19.05	3964.86	713.76	82.00%	14.81	5.88	60.29%		
E-L	131.63	27899.47	1116.02	96.00%	102.57	29.91	70.84%		
E-M	21.30	4626.34	925.31	80.00%	16.88	6.89	59.19%		
E-N	6.57	1367.43	396.65	70.99%	5.11	2.44	52.20%		
E-O	33.83	7940.14	79.41	99.00%	27.02	6.93	74.37%		
E-P	20.47	4260.54	511.23	88.00%	15.92	5.62	64.71%		
E-PP	5.74	2196.18	241.59	89.00%	5.31	1.41	73.44%		
EQ-North	14.23	2961.83	29.61	99.00%	11.06	3.01	72.80%		
EQ-South	3.82	795.10	0.00	100.00%	2.97	0.79	73.54%		
E-R	11.08	2340.01	46.80	98.00%	8.64	2.40	72.25%		
E-S	13.91	2895.12	260.62	91.00%	10.82	3.58	66.92%		
E-T	3.18	661.88	59.58	91.00%	2.47	0.82	66.91%		
E-U	9.69	2016.89	262.23	87.00%	7.53	2.71	63.97%		
E-V	25.02	7747.83	1084.77	86.00%	22.08	7.12	67.73%		
Ex-aa1	13.74	5147.79	1132.45	78.00%	13.88	4.84	65.13%		
Ex-d1	34.03	7082.74	0.00	100.00%	26.46	7.00	73.54%		
Ex-e1	3.71	772.26	0.00	100.00%	2.88	0.76	73.53%		
Ex-f1	5.10	2632.09	105.29	96.00%	5.55	0.94	83.15%		
Ex-g1	10.64	4474.49	581.75	87.00%	11.04	3.13	71.63%		
Ex-ii1	4.75	1817.76	54.53	97.00%	4.37	0.87	80.16%		
Ex-jj1	4.74	1819.97	236.59	87.00%	4.51	1.29	71.40%		
Ex-v1	3.65	1173.51	82.15	93.00%	3.06	0.79	74.03%		
ORU-1	13.51	2811.98	0.00	100.00%	10.51	0.00	100.00%		
ORU-2	14.98	3117.88	0.00	100.00%	11.65	0.00	100.00%		

Summary of MS4 Modeling Results

Oconomowoc River (Upstream) Reachshed #25		Total Suspended Solids			Total Phosphorus			Stormwater Practices Employed	
	Area (acres)	Discharge no controls (pounds)	Discharge with controls (pounds)	TSS Control (%)	Discharge no controls (pounds)**	Discharge with controls (pounds)**	P Control (%)**	Primary (WP, SW, etc.)	Other (WP, GS, etc.)
ORU-3	3.91	1062.33	0.00	100.00%	3.75	0.00	100.00%		
ORU-4	1.35	366.80	0.00	100.00%	1.30	0.00	100.00%		
ORU-5	7.90	2146.30	0.00	100.00%	7.58	0.00	100.00%		
ORU-6	11.61	3936.42	0.00	100.00%	11.55	0.00	100.00%		
ORU-7	2.81	763.44	0.00	100.00%	2.70	0.00	100.00%		
ORU-8	4.95	1030.28	164.85	84.00%	3.85	1.47	61.76%		
ORU-9	12.08	2757.09	496.21	82.00%	10.09	3.97	60.68%		
ORU-10	15.99	3328.02	532.47	84.00%	12.43	4.75	61.76%		
ORU-11	8.86	2407.12	4.33	99.82%	8.50	0.20	97.60%		
ORU-12	22.99	8025.48	1043.30	87.00%	23.18	7.22	68.83%		
ORU-13	5.77	2014.28	261.83	87.00%	5.82	1.81	68.83%		
ORU-14	1.98	444.12	333.54	24.90%	1.57	1.29	17.35%		
ORU-15	8.32	3290.56	2605.05	20.83%	8.44	7.19	14.84%		
ORU-16	1.14	588.36	35.30	94.00%	1.24	0.23	81.42%		
ORU-17	23.58	8241.63	1648.29	80.00%	23.76	8.71	63.32%		
ORU-18	0.68	266.03	233.78	12.12%	0.59	0.53	10.41%		
ORU-19	0.23	70.70	33.39	52.76%	0.19	0.11	41.55%		
ORU-20	0.14	38.30	18.34	52.11%	0.11	0.06	39.79%		
ORU-21	0.27	79.63	38.22	52.00%	0.22	0.13	40.35%		
ORU-22	0.29	71.60	33.94	52.60%	0.21	0.13	40.47%		
ORU-23	0.21	25.30	11.86	53.12%	0.10	0.07	35.86%		
ORU-24	13.12	2679.17	2096.82	21.74%	10.05	8.58	14.67%		
ORU-25	6.65	1329.97	1045.30	21.40%	4.97	4.25	14.44%		
ORU-26	30.60	8514.28	7033.46	17.39%	25.54	22.40	12.31%		
ORU-27	41.87	15415.92	3083.22	80.00%	35.26	12.14	65.56%		
ORU-28	11.09	156.50	23.70	84.86%	0.35	0.06	83.01%		
ORU-29	0.40	5723.53	0.00	100.00%	12.07	1.62	86.62%		
SUBTOTAL	**778.59**	**212436.11**	**49484.81**	**76.71%**	**660.30**	**253.73**	**61.57%**		
TOTAL	**1264.75**	**340154.50**	**165006.09**	**51.49%**	**1058.33**	**626.68**	**40.79%**		

Land Use Areas:

LDR
MDRNA
HDRNA
STRIPCOM
OFFICE PARK
DOWNTOWN
HOSP
INST
SCH
LI
OPEN
PARKS
CEMETARY

Stormwater Practices:

WD: wet detention
SW: street sweeping
VS: vacuum streets
B: biofiltration
I: infiltration
C: catch basin
DC: drainage control
O: other control
GS: grass swales
FS: Filter Strip

Summary of MS4 Modeling Results

Oconomowoc River (Downstream) Reachshed #25	Area (acres)	Total Suspended Solids: Discharge no controls (pounds)	Total Suspended Solids: Discharge with controls (pounds)	Total Suspended Solids: TSS Control (%)	Total Phosphorus: Discharge no controls (pounds)**	Total Phosphorus: Discharge with controls (pounds)**	Total Phosphorus: P Control (%)**	Stormwater Practices Employed: Primary (WP, SW, etc.)	Stormwater Practices Employed: Other (WP, GS, etc.)
LDR	51.35	7781.41	7038.29	9.55%	32.51	30.46	6.30%	VS	
MDRNA	534.88	111297.86	100668.92	9.55%	415.68	389.49	6.30%	VS	
HDRNA	39.88	10832.44	9797.95	9.55%	38.24	35.83	6.30%	VS	
STRIPCOM	4.15	2141.79	1937.25	9.55%	4.52	4.23	6.30%	VS	
OFFICE PARK	9.51	3716.68	3361.74	9.55%	8.31	7.78	6.30%	VS	
HOSP	1.06	401.70	363.34	9.55%	1.07	1.00	6.30%	VS	
INST	76.43	30334.14	27437.23	9.55%	71.14	66.65	6.30%	VS	
SCH	55.03	19206.87	17372.62	9.55%	55.47	51.98	6.30%	VS	
LI	28.19	15371.14	13903.20	9.55%	26.96	25.27	6.30%	VS	
OPEN	72.47	3487.20	3154.17	9.55%	20.09	18.83	6.30%	VS	
PARKS	158.70	18934.65	17126.39	9.55%	82.27	77.09	6.30%	VS	
CEMETARY	4.84	588.93	532.69	9.55%	2.76	2.59	6.30%	VS	
SUBTOTAL	**1036.49**	**224094.82**	**202693.77**	**9.55%**	**759.03**	**711.21**	**6.30%**		
E-BBB	16.12	2680.77	53.61	98.00%	10.47	0.46	95.59%		
E-CC1	8.58	1822.57	255.22	86.00%	6.68	2.44	63.47%		
E-CC2	4.47	934.12	289.67	68.99%	3.48	1.71	50.76%		
E-CCC	44.50	8705.99	174.12	98.00%	33.17	1.38	95.85%		
E-D	21.95	1512.46	60.50	96.00%	7.51	4.02	46.52%		
E-DD	2.88	599.38	125.89	79.00%	2.24	0.94	58.09%		
E-E	13.01	2601.04	364.19	86.00%	9.28	3.58	61.40%		
E-F	8.78	1827.38	200.93	89.00%	6.83	2.36	65.43%		
E-G	15.93	3197.01	1246.83	61.00%	7.73	5.00	35.26%		
E-GG	6.69	2655.93	345.16	87.00%	6.23	1.72	72.43%		
E-X	2.11	439.12	57.09	87.00%	1.64	0.59	63.98%		
Ex-bb1	7.10	2632.49	421.09	84.00%	7.17	2.18	69.58%		
Ex-cc1	4.90	1019.46	142.73	86.00%	3.80	1.40	63.25%		
Ex-dd1	7.76	1615.03	807.52	50.00%	6.03	3.82	36.75%		
Ex-ee1	23.49	4839.49	1693.76	65.00%	18.11	9.47	47.69%		
Ex-ff1	6.28	1307.13	235.18	82.01%	4.88	1.94	60.29%		
Ex-gg1	3.64	757.63	15.15	98.00%	2.83	0.12	95.88%		
Ex-hh1	7.77	1617.24	32.35	98.00%	6.04	0.25	95.88%		
Ex-II1	2.75	255.42	17.87	93.00%	0.93	0.53	43.06%		
Ex-j1	22.98	5149.59	2072.98	59.74%	17.05	8.04	52.85%		
Ex-k1	20.06	5521.80	2981.66	46.00%	16.69	10.75	35.61%		
Ex-k2	9.14	1092.78	120.20	89.00%	4.58	2.03	55.74%		

Summary of MS4 Modeling Results

Oconomowoc River (Downstream) Reachshed #25	Area (acres)	Total Suspended Solids: Discharge no controls (pounds)	Total Suspended Solids: Discharge with controls (pounds)	Total Suspended Solids: TSS Control (%)	Total Phosphorus: Discharge no controls (pounds)**	Total Phosphorus: Discharge with controls (pounds)**	Total Phosphorus: P Control (%)**	Stormwater Practices Employed: Primary (WP, SW, etc.)	Stormwater Practices Employed: Other (WP, GS, etc.)
Ex-k3	1.13	169.60	142.45	16.01%	0.67	0.60	10.80%		
Ex-mm1	2.62	992.82	158.86	84.00%	2.65	0.77	70.76%		
E-Y	4.48	932.52	37.30	96.00%	3.48	1.02	70.60%		
E-Z	38.08	7848.39	1177.32	85.00%	29.39	11.03	62.45%		
ORD-1	1.00	540.08	16.20	97.00%	0.95	0.30	68.58%		
ORD-2	5.22	1548.32	0.00	100.00%	4.84	0.00	100.00%		
ORD-3	1.40	467.36	0.00	100.00%	1.38	0.00	100.00%		
ORD-4	2.30	1186.93	83.10	93.00%	2.50	0.49	80.56%		
ORD-5	2.50	520.25	266.23	48.83%	1.94	1.07	45.06%		
ORD-6	93.86	22208.19	18759.37	15.53%	74.98	67.15	10.45%		
ORD-7	3.20	1729.82	202.13	88.31%	3.03	1.14	62.46%		
ORD-8	62.86	18898.00	16135.70	14.62%	53.59	48.14	10.17%		
ORD-9	7.75	1832.59	183.26	90.00%	5.69	1.94	65.97%		
ORD-10	11.30	3622.70	0.00	100.00%	10.61	0.00	100.00%		
ORD-11	10.84	3134.11	0.00	100.00%	9.35	2.20	76.48%		
ORD-12	2.51	996.42	199.28	80.00%	2.34	0.78	66.60%		
ORD-13	0.48	187.06	37.42	80.00%	0.44	0.15	66.37%		
ORD-14	0.74	201.13	0.00	100.00%	0.71	0.00	99.43%		
ORD-15	12.19	4176.21	459.35	89.00%	9.94	2.87	71.13%		
Grass Swale 1	49.76	22517.30	11585.48	48.55%	42.73	24.08	43.65%		GS
Grass Swale 2	34.64	17299.39	13126.59	24.12%	30.95	24.96	19.35%		GS
Grass Swale 3	43.45	8910.72	273.85	96.93%	33.43	1.22	96.35%		GS
Grass Swale 4	117.66	28761.07	19941.30	30.67%	96.36	71.06	26.26%		GS
Grass Swale 5	56.93	8926.15	926.51	89.62%	36.82	4.85	86.84%		GS
SUBTOTAL	**827.79**	**210390.96**	**95425.41**	**54.64%**	**642.16**	**330.53**	**48.53%**		
TOTAL	**1864.28**	**434485.78**	**298119.17**	**31.39%**	**1401.19**	**1041.74**	**25.65%**		

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WD: wet detention
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FS: Filter Strip

Summary of MS4 Modeling Results

Battle Creek Reachshed #26	Area (acres)	Total Suspended Solids: Discharge no controls (pounds)	Total Suspended Solids: Discharge with controls (pounds)	Total Suspended Solids: TSS Control (%)	Total Phosphorus: Discharge no controls (pounds)**	Total Phosphorus: Discharge with controls (pounds)**	Total Phosphorus: P Control (%)**	Stormwater Practices Employed: Primary (WP, SW, etc.)	Stormwater Practices Employed: Other (WP, GS, etc.)
LDR	6.94	1051.84	951.39	9.55%	4.40	4.12	6.30%	VS	
MDRNA	38.09	7927.64	7170.55	9.55%	29.61	27.74	6.30%	VS	
HDRNA	4.57	1241.62	1123.05	9.55%	4.39	4.11	6.30%	VS	
STRIPCOM	2.65	1367.66	1237.05	9.55%	2.88	2.70	6.30%	VS	
OFFICE PARK	0.03	11.74	10.62	9.55%	0.03	0.02	6.30%	VS	
DOWNTOWN	2.30	917.35	829.74	9.55%	2.35	2.20	6.30%	VS	
SCH	7.23	2523.97	2282.93	9.55%	7.29	6.83	6.30%	VS	
LI	22.03	11897.96	10761.71	9.55%	20.87	19.56	6.30%	VS	
OPEN	17.68	850.84	769.58	9.55%	4.90	4.59	6.30%	VS	
PARKS	17.08	2038.31	1843.65	9.55%	8.86	8.30	6.30%	VS	
SUBTOTAL	**118.60**	**29828.94**	**26980.27**	**9.55%**	**85.57**	**80.18**	**6.30%**		
E-AAA	275.43	71945.65	15109.42	79.00%	209.14	80.99	61.27%		
E-II	11.44	2381.08	47.62	98.00%	8.89	2.48	72.07%		
E-JJ	3.77	784.68	86.32	89.00%	2.93	1.01	65.44%		
E-KK	18.30	3867.30	850.79	78.00%	14.40	6.13	57.42%		
E-LL	9.11	1896.09	75.84	96.00%	7.08	2.08	70.59%		
E-MM	12.82	2440.58	170.84	93.00%	9.30	2.99	67.85%		
E-QQ	81.07	43784.16	0.00	100.00%	76.81	0.00	100.00%		
E-SS	78.29	41398.07	8279.69	80.00%	72.96	31.83	56.37%		
E-TT	41.67	22505.48	2925.77	87.00%	39.48	15.19	61.52%		
Ex-c1	66.91	35013.86	7002.81	80.00%	62.24	27.04	56.55%		
Ex-hl	8.60	1802.74	306.50	83.00%	6.72	2.62	61.05%		
Ex-il	7.23	1504.85	180.57	88.00%	5.62	1.98	64.71%		
Ex-nl	35.27	14494.02	1594.40	89.00%	31.97	10.84	66.09%		
Ex-sl	6.10	1830.18	54.91	97.00%	5.31	1.27	76.06%		
Ex-tl	3.34	1723.81	327.53	81.00%	3.64	1.08	70.16%		
Ex-ul	1.66	856.80	291.27	66.00%	1.81	0.77	57.16%		
Ex-wl	21.56	2511.29	200.93	92.00%	10.96	4.06	62.98%		
Ex-xl	31.99	3878.92	310.31	92.00%	16.77	6.04	63.95%		
Ex-yl	0.51	60.86	1.22	98.00%	0.26	0.08	67.99%		
E-ZZ	72.14	14636.65	1317.35	91.00%	54.99	18.27	66.77%		
BC-1	1.98	699.34	216.35	69.06%	1.98	0.62	68.75%		

Summary of MS4 Modeling Results

Battle Creek Reachshed #26	Area (acres)	Total Suspended Solids: Discharge no controls (pounds)	Total Suspended Solids: Discharge with controls (pounds)	Total Suspended Solids: TSS Control (%)	Total Phosphorus: Discharge no controls (pounds)**	Total Phosphorus: Discharge with controls (pounds)**	Total Phosphorus: P Control (%)**	Stormwater Practices Employed: Primary (WP, SW, etc.)	Stormwater Practices Employed: Other (WP, GS, etc.)
BC-2	3.58	1249.84	250.01	80.00%	3.61	1.32	63.30%		
BC-3	3.16	1103.20	220.56	80.01%	3.19	1.17	63.31%		
BC-4	13.78	3386.00	11.24	99.67%	11.24	4.44	60.55%		
GS-6	4.14	2677.00	3.22	99.88%	3.22	2.17	32.55%	**GS**	
SUBTOTAL	**813.85**	**278432.45**	**39835.48**	**85.69%**	**664.52**	**226.51**	**65.91%**		
TOTAL	**932.45**	**308261.38**	**66815.75**	**78.32%**	**750.10**	**306.70**	**59.11%**		

Land Use Areas:

LDR
MDRNA
HDRNA
STRIPCOM
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Stormwater Practices:

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I: infiltration
C: catch basin
DC: drainage control
O: other control
GS: grass swales
FS: Filter Strip

Summary of MS4 Modeling Results

Rock River Reachshed #27	Area (acres)	Total Suspended Solids: Discharge no controls (pounds)	Total Suspended Solids: Discharge with controls (pounds)	Total Suspended Solids: TSS Control (%)	Total Phosphorus: Discharge no controls (pounds)**	Total Phosphorus: Discharge with controls (pounds)**	Total Phosphorus: P Control (%)**	Stormwater Practices Employed: Primary (WP, SW, etc.)	Stormwater Practices Employed: Other (WP, GS, etc.)
LDR	1.80	272.82	0.00	100.00%	1.14	0.00	100.00%	WOTS	
MDRNA	0.74	154.02	0.00	100.00%	0.58	0.00	100.00%	WOTS	
OPEN	23.88	1149.26	0.00	100.00%	6.62	0.00	100.00%	WOTS	
SUBTOTAL	**26.42**	**1576.10**	**0.00**	**100.00%**	**8.34**	**0.00**	**100.00%**		
TOTAL	**26.42**	**1576.10**	**0.00**	**100.00%**	**8.34**	**0.00**	**100.00%**		

Land Use Areas:

LDR
MDRNA
HDRNA
STRIPCOM
OFFICE PARK
DOWNTOWN
HOSP
INST
SCH
LI
OPEN
PARKS
CEMETARY

Stormwater Practices:

WD: wet detention
SW: street sweeping
VS: vacuum streets
B: biofiltration
I: infiltration
C: catch basin
DC: drainage control
O: other control
GS: grass swales
FS: Filter Strip

Other:

WOTS: Waters Of The State

Winslamm Procedures

Summary of MS4 Modeling Results

Upper Nemahbin Reachshed #55	Area (acres)	Total Suspended Solids: Discharge no controls (pounds)	Total Suspended Solids: Discharge with controls (pounds)	Total Suspended Solids: TSS Control (%)	Total Phosphorus: Discharge no controls (pounds)**	Total Phosphorus: Discharge with controls (pounds)**	Total Phosphorus: P Control (%)**	Stormwater Practices Employed: Primary (WP, SW, etc.)	Stormwater Practices Employed: Other (WP, GS, etc.)
MDR	2.41	501.62	453.71	9.55%	1.87	1.76	6.30%	VS	
LI	1.88	1015.36	918.40	9.55%	1.78	1.67	6.30%	VS	
OPEN	50.44	2427.44	2195.62	9.55%	13.98	13.10	6.30%	VS	
PARKS	23.63	2820.10	2550.78	9.55%	12.25	11.48	6.30%	VS	
SUBTOTAL	**78.36**	**6764.52**	**6118.51**	**9.55%**	**29.89**	**28.01**	**6.30%**		
E-UU1	62.06	8009.45	0.00	100.00%	33.05	0.00	100.00%	I	
Ex-a1	107.32	19566.09	0.00	100.00%	67.69	0.00	100.00%	I	
Ex-b1	43.17	23315.60	4663.20	80.00%	40.91	17.76	56.57%	I	
Ex-l1a	12.85	2674.56	0.00	100.00%	9.99	0.00	100.00%	WD	I
Ex-l1b	19.50	4058.61	0.00	100.00%	15.16	0.00	100.00%	WD	I
Ex-l1c	16.28	3388.32	0.00	100.00%	12.66	0.00	100.00%	WD	I
Ex-o1	64.33	34744.02	0.00	100.00%	60.94	0.00	100.00%	WD	I
Ex-p1	7.58	4093.87	0.00	100.00%	7.18	0.00	100.00%	WD	I
Ex-q1	5.37	2900.33	0.00	100.00%	5.09	0.00	100.00%	WD	I
Ex-r1	2.94	1587.79	0.00	100.00%	2.78	0.00	100.00%	WD	
Ex-z1	6.94	3748.31	0.00	100.00%	6.57	0.00	100.00%	I	
UNL-1	115.14	12829.11	0.00	100.00%	54.83	0.00	100.00%	WD	I
SUBTOTAL	**463.48**	**120916.06**	**4663.20**	**96.14%**	**316.86**	**17.76**	**94.39%**		
TOTAL	**541.84**	**127680.58**	**10781.71**	**91.56%**	**346.75**	**45.77**	**86.80%**		

Land Use Areas:

LDR
MDRNA
HDRNA
STRIPCOM
OFFICE PARK
DOWNTOWN
HOSP
INST
SCH
LI
OPEN
PARKS
CEMETARY

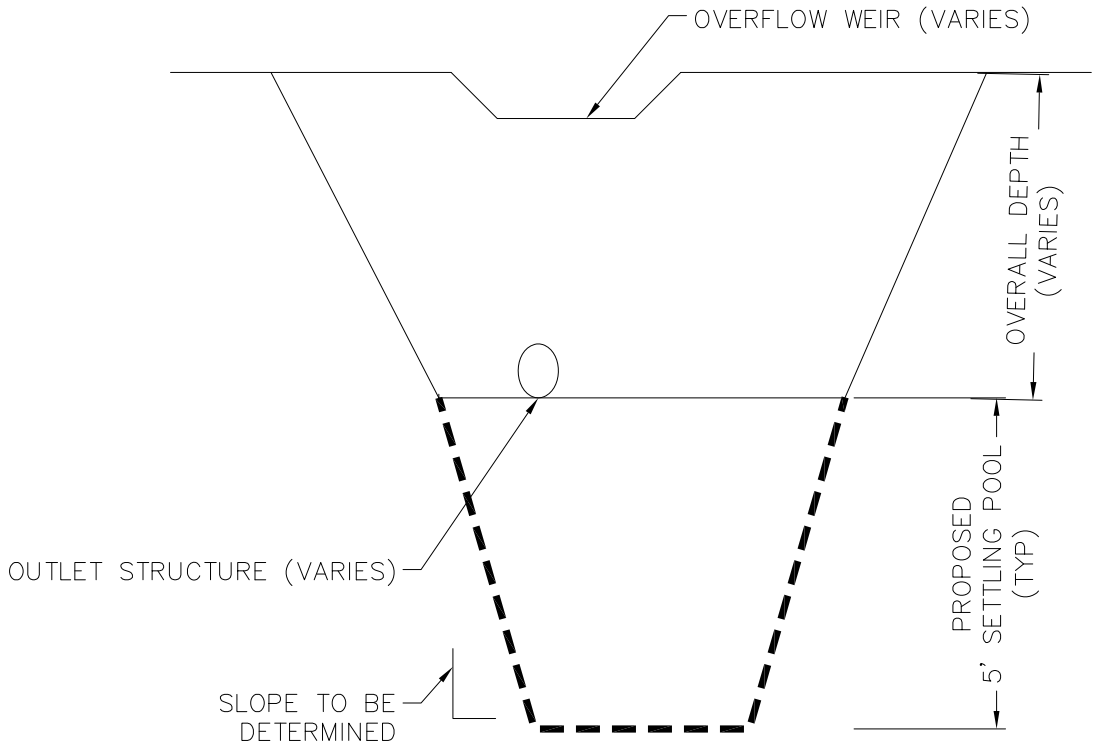
Stormwater Practices:

WD: wet detention
SW: street sweeping
VS: vacuum streets
B: biofiltration
I: infiltration
C: catch basin
DC: drainage control
O: other control
GS: grass swales
FS: Filter Strip

Appendix B

BMP Typical Sections

RM811PB



WET POND ALTERNATIVE
TYPICAL CROSS-SECTION

NO SCALE

CGDT-WETPOND DEVICE 24

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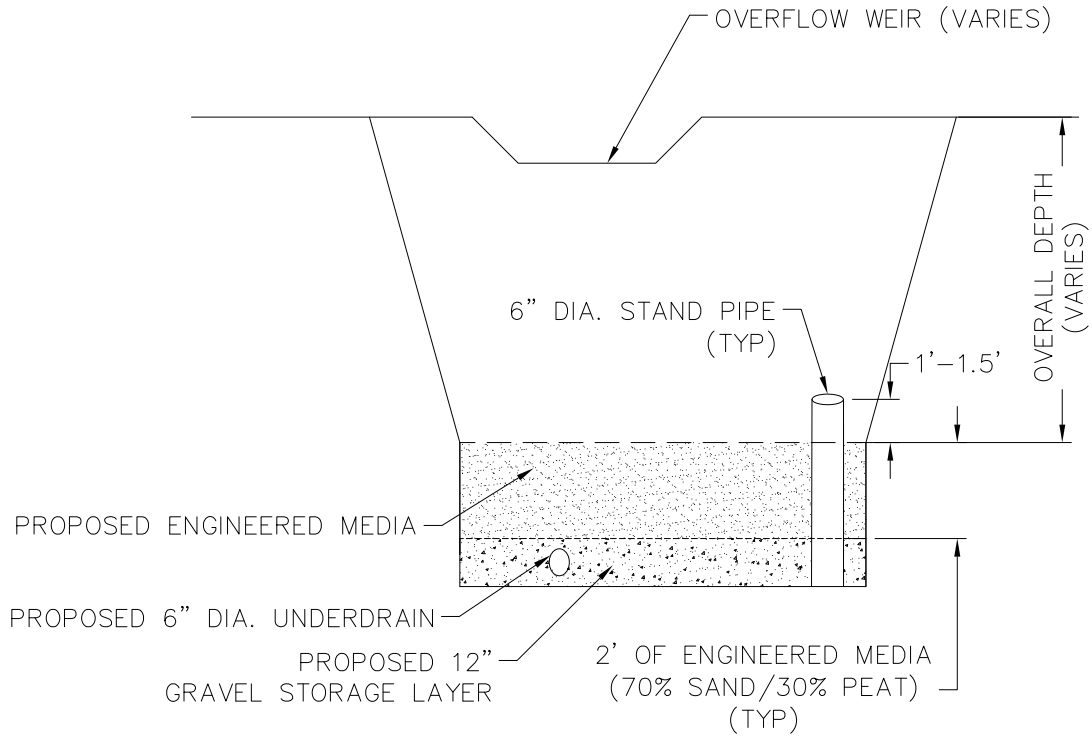
Ruekert·Mielke

RM811PB



BIO-RETENTION DEVICE ALTERNATIVE TYPICAL CROSS-SECTION

NO SCALE

CGDT-BIOFILTRATION DEVICE 24

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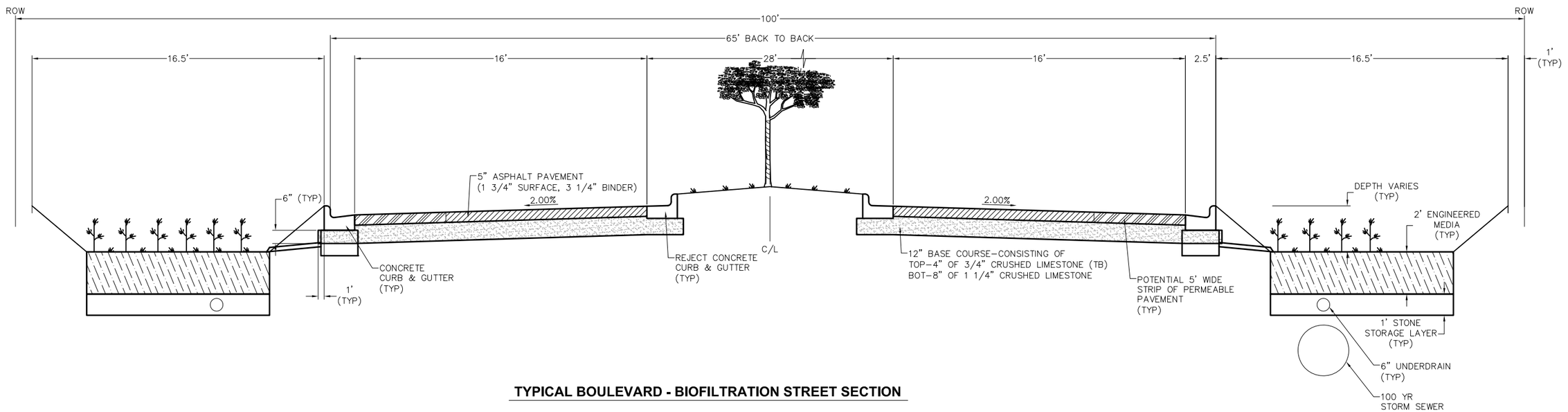
Ruekert·Mielke

RM1117LB

THACKERY TRAIL POTENTIAL
BIOFILTRATION CROSS SECTION

CITY OF OCONOMOWOC
WAUKESHA COUNTY, WISCONSIN



TYPICAL BOULEVARD - BIOFILTRATION STREET SECTION

DATE: DECEMBER 2015

SOURCE: R|M
BASEMAP SOURCE: WAUKESHA PARKS & LAND USE

Ruekert·Mielke
engineering solutions for a working world

Dec 29, 2015 10:31am PLOTTED BY: dklemm SAVED BY: dklemm
G:\C30\4792186\dwg\Cross-Thackeray Trail-TS-with BioFiltration.dwg Layout1
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Appendix C

Alternatives Cost Estimates

City of Oconomowoc Storm Water Quality Alternatives

Present Worth Cost Estimate Summary -- December, 2015

Reachshed	Component Description	Project Cost	Incremental Annual O & M Cost	Present Worth Cost
City Wide Street Sweeping	Increase Sweeping to Once Every Two Weeks	-	$246,600	$4,873,311
	Increase Sweeping to Once Per Week	-	$493,200	$9,746,622
Oconomowoc River Reachshed (Upstream)	PA-1 (Industrial Pond)	$557,090	$18,400	$1,151,829
	PA-2 (Summit Avenue Pond)	$450,161	$10,950	$774,768
	PA-3 (Hospital Pond)	$236,218	$5,950	$410,505
	PA-10 (Riverside Park Wet Pond)	$33,560	$1,050	$62,285
	PA-10 (Riverside Park Biofiltration Device)	$299,065	$3,800	$447,425
Oconomowoc River Reachshed (Downstream)	PA-4 (Gas Station Pond)	$665,366	$8,250	$991,483
	PA-5 (Whitman Park Pond)	$301,274	$7,850	$528,622
	Thackeray Trail Reconstruction	$2,792,463	$3,350	$3,555,457
	PA-6 (Serve Facility Pond)	$441,379	$8,950	$725,057
	PA-7 (Forest Street Pond)	$484,703	$12,450	$846,995
	PA-8 (Champion Field Wet Pond)	$597,240	$14,950	$1,036,083
	PA-9 (Church Wet Pond)	$177,720	$3,250	$285,092
	PA-9 (Church Biofiltration Device)	$405,465	$4,400	$592,045
	PA-11 (Armory Wet Pond)	$488,000	$12,250	$847,243
	PA-11 (Armory Biofiltration Device)	$123,200	$2,000	$192,734
Battle Creek	PA-12 (Heritage Heights Park Pond Retrofit)	$598,220	$17,500	$1,086,694

City of Oconomowoc
Economic Analysis of Proposed Alternative #1
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	14954.5	$ 299,090.37	$ 7,500.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	50.0	$ 5,000.00	$ 450.00	50
Pumping Station (Electrical/Mechanical)	L.S.	$ 150,000.00	1.0	$ 150,000.00	$ 10,000.00	25
Pumping Station (Structural)	L.S.	$ 100,000.00	1.0	$ 100,000.00	$ 450.00	50
		Totals		$ 557,090.37	$18,400.00	
		Present Worth Factor (50-year)			19.3668	
		Present Worth Factor (25-year)			14.6393	
		Present Worths		$ 557,090.37	$ 455,466.48	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	557,090.37
Legal, Engineering, & Contingencies (25%)		139,272.59
Subtotal - Estimated Project Cost	$	696,362.96
Present Worth of O&M (50 Year)		455,466.48
Total Present Worth	**$**	**1,151,829.45**

City of Oconomowoc
Economic Analysis of Proposed Alternative #2
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	21008.1	$ 420,161.48	$10,500.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	270.0	$ 27,000.00	$ 450.00	50
		Totals		$ 450,161.48	$10,950.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 450,161.48	$ 212,066.32	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	450,161.48
Legal, Engineering, & Contingencies (25%)		112,540.37
Subtotal - Estimated Project Cost	$	562,701.85
Present Worth of O&M (50 Year)		212,066.32
Total Present Worth	**$**	**774,768.17**

City of Oconomowoc
Economic Analysis of Proposed Alternative #3
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	10910.9	$ 218,217.78	$ 5,500.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	150.0	$ 15,000.00	$ 450.00	50
		Totals		$ 236,217.78	$5,950.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 236,217.78	$ 115,232.38	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	236,217.78
Legal, Engineering, & Contingencies (25%)		59,054.44
Subtotal - Estimated Project Cost	$	295,272.22
Present Worth of O&M (50 Year)		115,232.38
Total Present Worth	**$**	**410,504.60**

City of Oconomowoc
Economic Analysis of Proposed Alternative #4
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction (Contaminated Soil Removal)	C.Y.	$ 40.00	15684.1	$ 627,365.93	$ 7,800.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	350.0	$ 35,000.00	$ 450.00	50
		Totals		$ 665,365.93	$8,250.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 665,365.93	$ 159,775.99	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	665,365.93
Legal, Engineering, & Contingencies (25%)		166,341.48
Subtotal - Estimated Project Cost	$	831,707.41
Present Worth of O&M (50 Year)		159,775.99
Total Present Worth	**$**	**991,483.40**

City of Oconomowoc
Economic Analysis of Proposed Alternative #5
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	14788.7	$ 295,774.07	$ 7,400.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	25.0	$ 2,500.00	$ 450.00	50
		Totals		$ 301,274.07	$7,850.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 301,274.07	$ 152,029.28	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	301,274.07
Legal, Engineering, & Contingencies (25%)		75,318.52
Subtotal - Estimated Project Cost	$	376,592.59
Present Worth of O&M (50 Year)		152,029.28
Total Present Worth	**$**	**528,621.87**

City of Oconomowoc
Economic Analysis of Thackeray Trail Reconstruction
Construct New Cross-Section Including Biofiltration

Description: Construct New Cross-Section Including Biofiltration

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Plant Plugs	S.F.	$ 3.00	13851.0	$ 41,553.00	$ 2,800.00	50
6-Inch Underdrain	L.F.	$ 25.00	5500.0	$ 137,500.00		50
Standpipe Outlet Structure	E.A.	$ 400.00	32.0	$ 12,800.00		50
Engineered Cross-Section Material	C.Y.	$ 70.00	1539.0	$ 107,730.00	$ 550.00	50
Biofiltration Area Construction	C.Y.	$ 20.00	5144.0	$ 102,880.00		50
Full Depth Road Reconstruct (32' wide)	L.F.	$ 300.00	5500.0	$ 1,650,000.00		50
Concrete Curb and Gutter	L.F.	$ 20.00	11000.0	$ 220,000.00		50
100-Year Storm Pipe (48-inch)	L.F.	$ 160.00	2750.0	$ 440,000.00		50
72" Storm Manhole	E.A.	$ 4,000.00	10.0	$ 40,000.00		50
Storm Inlet	E.A.	$ 2,000.00	20.0	$ 40,000.00		50
		Totals		$ 2,792,463.00	$3,350.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 2,792,463.00	$ 64,878.74	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$ 2,792,463.00
Legal, Engineering, & Contingencies (25%)	698,115.75
Subtotal - Estimated Project Cost	$ 3,490,578.75
Present Worth of O&M (50 Year)	64,878.74
Total Present Worth	**$ 3,555,457.49**

City of Oconomowoc
Economic Analysis of Proposed Alternative #6
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	16969.0	$ 339,379.26	$ 8,500.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	990.0	$ 99,000.00	$ 450.00	50
		Totals		$ 441,379.26	$8,950.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 441,379.26	$ 173,332.74	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	441,379.26
Legal, Engineering, & Contingencies (25%)		110,344.81
Subtotal - Estimated Project Cost	$	551,724.07
Present Worth of O&M (50 Year)		173,332.74
Total Present Worth	**$**	**725,056.82**

City of Oconomowoc
Economic Analysis of Proposed Alternative #7
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	23960.1	$ 479,202.96	$ 12,000.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	25.0	$ 2,500.00	$ 450.00	50
		Totals		$ 484,702.96	$12,450.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 484,702.96	$ 241,116.50	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	484,702.96
Legal, Engineering, & Contingencies (25%)		121,175.74
Subtotal - Estimated Project Cost	$	605,878.70
Present Worth of O&M (50 Year)		241,116.50
Total Present Worth	**$**	**846,995.20**

City of Oconomowoc
Economic Analysis of Proposed Alternative PA-8
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility PA-8

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	29087.0	$ 581,740.00	$ 14,500.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	125.0	$ 12,500.00	$ 450.00	50
		Totals		$ 597,240.00	$14,950.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 597,240.00	$ 289,533.46	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	597,240.00
Legal, Engineering, & Contingencies (25%)		149,310.00
Subtotal - Estimated Project Cost	$	746,550.00
Present Worth of O&M (50 Year)		289,533.46
Total Present Worth	**$**	**1,036,083.46**

City of Oconomowoc
Economic Analysis of Proposed Alternative PA-9
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility PA-9

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	5536.0	$ 110,720.00	$ 2,800.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	640.0	$ 64,000.00	$ 450.00	50
		Totals		$ 177,720.00	$3,250.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 177,720.00	$ 62,942.06	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	177,720.00
Legal, Engineering, & Contingencies (25%)		44,430.00
Subtotal - Estimated Project Cost	$	222,150.00
Present Worth of O&M (50 Year)		62,942.06
Total Present Worth	**$**	**285,092.06**

City of Oconomowoc
Economic Analysis of Alternative PA-9
Construct New Biofiltration Device

Description: PA-9 Biofiltration Device

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Plantings	E.A.	$ 5.00	17161.0	$ 85,805.00	$ 3,400.00	50
6-Inch Underdrain	L.F.	$ 25.00	250.0	$ 6,250.00		50
Standpipe Outlet Structure	E.A.	$ 1,500.00	1.0	$ 1,500.00		50
Engineered Cross-Section Material	C.Y.	$ 70.00	1907.0	$ 133,490.00	$ 550.00	50
Biofiltration Area Construction	C.Y.	$ 20.00	5721.0	$ 114,420.00		50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	640.0	$ 64,000.00	$ 450.00	50
		Totals		$ 405,465.00	$4,400.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 405,465.00	$ 85,213.86	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	405,465.00
Legal, Engineering, & Contingencies (25%)		101,366.25
Subtotal - Estimated Project Cost	$	506,831.25
Present Worth of O&M (50 Year)		85,213.86
Total Present Worth	**$**	**592,045.11**

City of Oconomowoc
Economic Analysis of Proposed Alternative PA-10
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility PA-10

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	1103.0	$ 22,060.00	$ 600.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	85.0	$ 8,500.00	$ 450.00	50
		Totals		$ 33,560.00	$1,050.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 33,560.00	$ 20,335.13	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	33,560.00
Legal, Engineering, & Contingencies (25%)		8,390.00
Subtotal - Estimated Project Cost	$	41,950.00
Present Worth of O&M (50 Year)		20,335.13
Total Present Worth	**$**	**62,285.13**

City of Oconomowoc
Economic Analysis of Alternative PA-10
Construct New Biofiltration Device

Description: PA-10 Biofiltration Device

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Plantings	E.A.	$ 5.00	14161.0	$ 70,805.00	$ 2,800.00	50
6-Inch Underdrain	L.F.	$ 25.00	500.0	$ 12,500.00		50
Standpipe Outlet Structure	E.A.	$ 1,500.00	1.0	$ 1,500.00		50
Engineered Cross-Section Material	C.Y.	$ 70.00	1574.0	$ 110,180.00	$ 550.00	50
Biofiltration Area Construction	C.Y.	$ 20.00	4779.0	$ 95,580.00		50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	85.0	$ 8,500.00	$ 450.00	50
		Totals		$ 299,065.00	$3,800.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 299,065.00	$ 73,593.79	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	299,065.00
Legal, Engineering, & Contingencies (25%)		74,766.25
Subtotal - Estimated Project Cost	$	373,831.25
Present Worth of O&M (50 Year)		73,593.79
Total Present Worth	**$**	**447,425.04**

City of Oconomowoc
Economic Analysis of Proposed Alternative PA-11
Construct New Wet Detention Facility

Description: Construct New Wet Detention Facility PA-11

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	23625.0	$ 472,500.00	$ 11,800.00	50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	125.0	$ 12,500.00	$ 450.00	50
		Totals		$ 488,000.00	$12,250.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 488,000.00	$ 237,243.14	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	488,000.00
Legal, Engineering, & Contingencies (25%)		122,000.00
Subtotal - Estimated Project Cost	$	610,000.00
Present Worth of O&M (50 Year)		237,243.14
Total Present Worth	**$**	**847,243.14**

City of Oconomowoc
Economic Analysis of Alternative PA-11
Construct New Biofiltration Device

Description: PA-11 Biofiltration Device

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Plantings	E.A.	$ 5.00	4900.0	$ 24,500.00	$ 1,000.00	50
6-Inch Underdrain	L.F.	$ 25.00	400.0	$ 10,000.00		50
Standpipe Outlet Structure	E.A.	$ 1,500.00	1.0	$ 1,500.00		50
Engineered Cross-Section Material	C.Y.	$ 70.00	544.0	$ 38,080.00	$ 550.00	50
Biofiltration Area Construction	C.Y.	$ 20.00	1831.0	$ 36,620.00		50
Inlet/Outlet Storm Sewer	L.F.	$ 100.00	125.0	$ 12,500.00	$ 450.00	50
		Totals		$ 123,200.00	$2,000.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 123,200.00	$ 38,733.57	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	123,200.00
Legal, Engineering, & Contingencies (25%)		30,800.00
Subtotal - Estimated Project Cost	$	154,000.00
Present Worth of O&M (50 Year)		38,733.57
Total Present Worth	**$**	**192,733.57**

City of Oconomowoc
Economic Analysis of Proposed Alternative PA-12
Retrofit Existing Infiltration Basin

Description: Retrofit Existing Infiltration Basin PA-12

i= 4.625% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Outlet Structure	E.A.	$ 3,000.00	1.0	$ 3,000.00		50
Wet Detention Facility Construction	C.Y.	$ 20.00	29761.0	$ 595,220.00	$ 17,500.00	50
		Totals		$ 598,220.00	$17,500.00	
		Present Worth Factor			19.3668	
		Present Worths		$ 598,220.00	$ 338,918.77	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	598,220.00
Legal, Engineering, & Contingencies (25%)		149,555.00
Subtotal - Estimated Project Cost	$	747,775.00
Present Worth of O&M (50 Year)		338,918.77
Total Present Worth	**$**	**1,086,693.77**

City of Oconomowoc
Economic Analysis of the Existing Street Sweeping Program
Street Sweeping Once Every Four Weeks - Battle Creek Reachshed

Description: Street Sweeping Once Every Four Weeks

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Four Weeks (9x/year; 20 miles/pass)	Mile	$ 100.00	20.0		$ 18,000.00	50
			Totals	$ -	$18,000.00	
			Present Worth Factor		19.7620	
			Present Worth	$ -	$ 355,716.14	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	-
Legal, Engineering, & Contingencies (25%)		-
Subtotal - Estimated Project Cost	$	-
Present Worth of O&M (50 Year)		355,716.14
Total Present Worth	**$**	**355,716.14**

City of Oconomowoc
Economic Analysis of the Existing Street Sweeping Program
Street Sweeping Once Every Four Weeks - Oconomowoc River Reachshed (Downstream)

Description: Street Sweeping Once Every Four Weeks

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Four Weeks (9x/year; 54 miles/pass)	Mile	$ 100.00	54.0		$ 48,600.00	50
			Totals	$ -	$48,600.00	
			Present Worth Factor		19.7620	
			Present Worth	$ -	$ 960,433.58	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	-
Legal, Engineering, & Contingencies (25%)		-
Subtotal - Estimated Project Cost	$	-
Present Worth of O&M (50 Year)		960,433.58
Total Present Worth	**$**	**960,433.58**

City of Oconomowoc
Economic Analysis of the Existing Street Sweeping Program
Street Sweeping Once Every Four Weeks - Oconomowoc River Reachshed (Upstream)

Description: Street Sweeping Once Every Four Weeks

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Four Weeks (9x/year; 49 miles/pass)	Mile	$ 100.00	49.0		$ 44,100.00	50
		Totals Present Worth Factor		$ -	$44,100.00 19.7620	
		Present Worth		$ -	$ 871,504.54	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	-
Legal, Engineering, & Contingencies (25%)		-
Subtotal - Estimated Project Cost	$	-
Present Worth of O&M (50 Year)		871,504.54
Total Present Worth	**$**	**871,504.54**

City of Oconomowoc
Economic Analysis of the Existing Street Sweeping Program
Street Sweeping Once Every Four Weeks - Upper Nemahbin Reachshed

Description: Street Sweeping Once Every Four Weeks

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Four Weeks (9x/year; 14 miles/pass)	Mile	$ 100.00	14.0		$ 12,600.00	50
			Totals	$ -	$12,600.00	
			Present Worth Factor		19.7620	
			Present Worth	$ -	$ 249,001.30	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	-
Legal, Engineering, & Contingencies (25%)		-
Subtotal - Estimated Project Cost	$	-
Present Worth of O&M (50 Year)		249,001.30
Total Present Worth	**$**	**249,001.30**

City of Oconomowoc
Economic Analysis of the Recommended Improvements for Street Sweeping
Street Sweeping Once Every Two Weeks - Battle Creek Reachshed

Description: Street Sweeping Once Every Two Weeks

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Two Weeks (18x/year; 20 miles/pass)	Mile	$ 100.00	20.0		$ 36,000.00	50
			Totals	$ -	$36,000.00	
			Present Worth Factor		19.7620	
			Present Worth	$ -	$ 711,432.28	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	-
Legal, Engineering, & Contingencies (25%)		-
Subtotal - Estimated Project Cost	$	-
Present Worth of O&M (50 Year)		711,432.28
Total Present Worth	**$**	**711,432.28**

City of Oconomowoc
Economic Analysis of the Recommended Improvements for Street Sweeping
Street Sweeping Once Every Two Weeks - Oconomowoc River Reachshed (Downstream)

Description: Street Sweeping Once Every Two Weeks

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Two Weeks (18x/year; 54 miles/pass)	Mile	$ 100.00	54.0		$ 97,200.00	50
			Totals	$ -	$97,200.00	
			Present Worth Factor		19.7620	
			Present Worth	$ -	$ 1,920,867.16	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$ -
Legal, Engineering, & Contingencies (25%)	-
Subtotal - Estimated Project Cost	$ -
Present Worth of O&M (50 Year)	1,920,867.16
Total Present Worth	**$ 1,920,867.16**

City of Oconomowoc
Economic Analysis of the Recommended Improvements for Street Sweeping
Street Sweeping Once Every Two Weeks - Oconomowoc River Reachshed (Upstream)

Description: Street Sweeping Once Every Two Weeks

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Two Weeks (18x/year; 49 miles/pass)	Mile	$ 100.00	49.0		$ 88,200.00	50
			Totals	$ -	$88,200.00	
			Present Worth Factor		19.7620	
			Present Worth	$ -	$ 1,743,009.09	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$ -
Legal, Engineering, & Contingencies (25%)	-
Subtotal - Estimated Project Cost	$ -
Present Worth of O&M (50 Year)	1,743,009.09
Total Present Worth	**$ 1,743,009.09**

City of Oconomowoc
Economic Analysis of the Recommended Improvements for Street Sweeping
Street Sweeping Once Every Two Weeks - Upper Nemahbin Reachshed

Description: Street Sweeping Once Every Two Weeks

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Two Weeks (18x/year; 14 miles/pass)	Mile	$ 100.00	14.0		$ 25,200.00	50
			Totals	$ -	$25,200.00	
			Present Worth Factor		19.7620	
			Present Worth	$ -	$ 498,002.60	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	-
Legal, Engineering, & Contingencies (25%)		-
Subtotal - Estimated Project Cost	$	-
Present Worth of O&M (50 Year)		498,002.60
Total Present Worth	**$**	**498,002.60**

City of Oconomowoc
Economic Analysis of the Recommended Improvements for Street Sweeping
Street Sweeping Once Every Week - Battle Creek Reachshed

Description: Street Sweeping Once Every Week

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Week (36x/year; 20 miles/pass)	Mile	$ 100.00	20.0		$ 72,000.00	50
			Totals	$ -	$72,000.00	
			Present Worth Factor		19.7620	
			Present Worth	$ -	$ 1,422,864.56	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	-
Legal, Engineering, & Contingencies (25%)		-
Subtotal - Estimated Project Cost	$	-
Present Worth of O&M (50 Year)		1,422,864.56
Total Present Worth	**$**	**1,422,864.56**

City of Oconomowoc
Economic Analysis of the Recommended Improvements for Street Sweeping
Street Sweeping Once Every Week - Oconomowoc River Reachshed (Downstream)

Description: Street Sweeping Once Every Week

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Week (36x/year; 54 miles/pass)	Mile	$ 100.00	54.0		$ 194,400.00	50
			Totals	$ -	$194,400.00	
			Present Worth Factor		19.7620	
			Present Worth	$ -	$ 3,841,734.31	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	-
Legal, Engineering, & Contingencies (25%)		-
Subtotal - Estimated Project Cost	$	-
Present Worth of O&M (50 Year)		3,841,734.31
Total Present Worth	**$**	**3,841,734.31**

City of Oconomowoc
Economic Analysis of the Recommended Improvements for Street Sweeping
Street Sweeping Once Every Week - Oconomowoc River Reachshed (Upstream)

Description: Street Sweeping Once Every Week

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Week (36x/year; 49 miles/pass)	Mile	$ 100.00	49.0		$ 176,400.00	50
			Totals Present Worth Factor	$ -	$176,400.00 19.7620	
			Present Worth	$ -	$ 3,486,018.17	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$ -
Legal, Engineering, & Contingencies (25%)	-
Subtotal - Estimated Project Cost	$ -
Present Worth of O&M (50 Year)	3,486,018.17
Total Present Worth	**$ 3,486,018.17**

City of Oconomowoc
Economic Analysis of the Recommended Improvements for Street Sweeping
Street Sweeping Once Every Week - Upper Nemahbin Reachshed

Description: Street Sweeping Once Every Week

i= 4.500% Item Description	Unit	Unit Price	Initial Quantity	Initial Cost	Annual Incremental O & M	Serv. Life
Street Sweeping Once Every Week (36x/year; 14 miles/pass)	Mile	$ 100.00	14.0		$ 50,400.00	50
		Totals Present Worth Factor		$ -	$50,400.00 19.7620	
		Present Worth		$ -	$ 996,005.19	

Summary of Estimated Present Worth Costs

Total Estimated Construction Cost	$	-
Legal, Engineering, & Contingencies (25%)		-
Subtotal - Estimated Project Cost	$	-
Present Worth of O&M (50 Year)		996,005.19
Total Present Worth	**$**	**996,005.19**

Appendix D

Infiltration Field Test Reports

Infiltration Rate Field Test -- Data Summary

Test # 1	**Air Temp: 59 F**	**Water Temp: 68.5 F**	**Outer ring: 24" Diameter**
Date:10/01/2015	**Testers Initials: MB1**	**Weather: Mostly Sunny**	**Inner ring: 12" Diameter**
Client: Oconomowoc		**Test Location: 1265 Wall Street GS-1 Swale was 5.7:1**	

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Time of Day (Military)		Incremental Time (hours)	Cumulative Time (hours)	Water Level Before Filling (inches)		Water Added (inches)		Water Level After Filling (inches)		Cumulative Infiltration (inches)		Inner Ring Infiltration Rate (inches/hour)	
Hrs.	Min.			Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Incremental Rate	Cumulative Rate
13	10		0.00	12.00	12.00			12.00	12.00				
13	45	0.58	0.58	10.00	12.00	2.00	2.00	12.00	14.00	2.00	0.00	0.00	0.00
14	15	0.50	1.08	12.00	12.00	0.00	0.00	12.00	12.00	2.00	2.00	4.00	1.85
14	35	0.33	1.42	11.00	12.00	1.00	1.00	12.00	13.00	3.00	2.00	0.00	1.41
15	10	0.58	2.00	12.00	12.00	0.00	0.00	12.00	12.00	3.00	3.00	1.71	1.50

Infiltration Rate Field Test -- Data Summary

Test # 2	**Air Temp: 59 F**	**Water Temp: 68 F**	**Outer ring: 24" Diameter**
Date: 10/01/2015	**Testers Initials: MB1**	**Weather: Partly Sunny**	**Inner ring: 12" Diameter**
Client: Oconomowoc City 47-10022		**Test Location: N.E. of 1351 West 2nd Street GS-2 Swale is 2.9:1**	

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Time of Day (Military)		Incremental Time (hours)	Cumulative Time (hours)	Water Level Before Filling (inches)		Water Added (inches)		Water Level After Filling (inches)		Cumulative Infiltration (inches)		Inner Ring Infiltration Rate (inches/hour)	
Hrs.	Min.			Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Incremental Rate	Cumulative Rate
12	45		0.00	12.00	12.00			12.00	12.00				
13	20	0.58	0.58	11.50	11.50	0.50	0.50	12.00	12.00	0.50	0.50	0.86	0.86
14	5	0.75	1.33	11.00	11.00	1.00	1.00	12.00	12.00	1.50	1.50	1.33	1.13
14	25	0.33	1.67	12.00	12.00	0.00	0.00	12.00	12.00	1.50	1.50	0.00	0.90
14	45	0.33	2.00	12.00	12.00	0.00	0.00	12.00	12.00	1.50	1.50	0.00	0.75

Infiltration Rate Field Test -- Data Summary

Test # 3	Air Temp: 56 F	Water Temp: 67.2 F	Outer ring: 24" Diameter	Ruekert·Mielke engineering solutions for a working world
Date: 10/01/2015	Testers Initials: MB1	Weather: Partly Sunny	Inner ring: 12" Diameter	
Client: Oconomowoc City 47-10022		Test Location: 34927 Allen Road GS-3	Swale is 10.7:1	

Time of Day (Military)		Incremental Time (hours)	Cumulative Time (hours)	Water Level Before Filling (inches)		Water Added (inches)		Water Level After Filling (inches)		Cumulative Infiltration (inches)		Inner Ring Infiltration Rate (inches/hour)	
Hrs.	Min.			Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Incremental Rate	Cumulative Rate
16	30		0.00	12.00	12.00			12.00	12.00				
		0.67											
17	10		0.67	9.50	9.50	2.50	2.50	12.00	12.00	2.50	2.50	3.75	3.75
		0.58											
17	45		1.25	8.00	8.50	4.00	3.50	12.00	12.00	6.50	6.00	6.00	4.80
		0.75											
18	30		2.00	9.00	9.00	0.00	0.00	9.00	9.00	9.50	9.00	4.00	4.50

Infiltration Rate Field Test -- Data Summary

Test # 4	**Air Temp: 56 F**	**Water Temp: 63.8 F**	**Outer ring: 24" Diameter**
Date: 10/02/2015	**Testers Initials: MB1**	**Weather: Partly Sunny**	**Inner ring: 12" Diameter**
Client: Oconomowoc City 47-10022		**Test Location: 769 Thackery Trail GS-4 Swale is 2:1**	

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Time of Day (Military)		Incremental Time (hours)	Cumulative Time (hours)	Water Level Before Filling (inches)		Water Added (inches)		Water Level After Filling (inches)		Cumulative Infiltration (inches)		Inner Ring Infiltration Rate (inches/hour)	
Hrs.	Min.			Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Incremental Rate	Cumulative Rate
8	20		0.00	12.00	12.00			12.00	12.00				
8	35	0.25	0.25	10.50	11.00	1.50	1.00	12.00	12.00	1.50	1.00	4.00	4.00
8	50	0.25	0.50	12.00	12.00	0.00	0.00	12.00	12.00	1.50	1.00	0.00	2.00
9	5	0.25	0.75	10.50	11.00	1.50	1.00	12.00	12.00	3.00	2.00	4.00	2.67
9	20	0.25	1.00	11.00	11.50	1.00	0.50	12.00	12.00	4.00	2.50	2.00	2.50
9	35	0.25	1.25	10.50	11.00	1.50	1.00	12.00	12.00	5.50	3.50	4.00	2.80
9	50	0.25	1.50	11.00	11.00	1.00	1.00	12.00	12.00	6.50	4.50	4.00	3.00
10	5	0.25	1.75	11.00	11.50	1.00	0.50	12.00	12.00	7.50	5.00	2.00	2.86
10	20		2.00	11.50	11.50	0.00	0.00	11.50	11.50	8.00	5.50	2.00	2.75

Infiltration Rate Field Test -- Data Summary

Test # 05	**Air Temp: 69**	**Water Temp: 63.3**	**Outer ring: 24" Diameter**
Date: 20151105	**Testers Initials: MB1**	**Weather: Cloudy-Windy**	**Inner ring: 12" Diameter**
Client: Oconomowoc		**Test Location: Southeast corner of Rivers Edge Pkwy & River Lind Dr. GS-5**	

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Time of Day (Military)		Incremental Time (hours)	Cumulative Time (hours)	Water Level Before Filling (inches)		Water Added (inches)		Water Level After Filling (inches)		Cumulative Infiltration (inches)		Inner Ring Infiltration Rate (inches/hour)	
Hrs.	Min.			Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Incremental Rate	Cumulative Rate
13	40		0.00	15.00	15.00			15.00	15.00				
13	55	0.25	0.25	12.00	12.00	3.00	3.00	15.00	15.00	3.00	3.00	12.00	12.00
14	10	0.25	0.50	13.00	13.00	2.00	2.00	15.00	15.00	5.00	5.00	8.00	10.00
14	25	0.25	0.75	13.00	13.00	2.00	2.00	15.00	15.00	7.00	7.00	8.00	9.33
14	40	0.25	1.00	12.50	13.00	2.50	2.00	15.00	15.00	9.50	9.00	8.00	9.00
14	55	0.25	1.25	13.00	13.00	2.00	2.00	15.00	15.00	11.50	11.00	8.00	8.80
15	10	0.25	1.50	13.00	13.00	2.00	2.00	15.00	15.00	13.50	13.00	8.00	8.67
15	25	0.25	1.75	13.00	13.00	2.00	2.00	15.00	15.00	15.50	15.00	8.00	8.57
15	40												

Infiltration Rate Field Test -- Data Summary

Test # 6	**Air Temp: 56 F**	**Water Temp: 67.6 F**	**Outer ring: 24" Diameter**
Date:10/01/2015	**Testers Initials: MB1**	**Weather: Partly Sunny**	**Inner ring: 12" Diameter**
Client: Oconomowoc City 47-10022		**Test Location: 3481 N Paganica Ct. GS-6 Swale is 8:1**	

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Time of Day (Military)		Incremental Time (hours)	Cumulative Time (hours)	Water Level Before Filling (inches)		Water Added (inches)		Water Level After Filling (inches)		Cumulative Infiltration (inches)		Inner Ring Infiltration Rate (inches/hour)	
Hrs.	Min.			Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Outer Ring	Inner Ring	Incremental Rate	Cumulative Rate
16	0		0.00	12.00	12.00			12.00	12.00				
16	45	0.75	0.75	9.00	9.00	3.00	3.00	12.00	12.00	3.00	3.00	4.00	4.00
17	30	0.75	1.50	9.00	11.00	3.00	1.00	12.00	12.00	6.00	4.00	1.33	2.67
18	0	0.50	2.00	10.00	11.00	0.00	0.00	10.00	11.00	8.00	5.00	2.00	2.50

Appendix E

SWPPP For City Public Works Facilities

City of Oconomowoc Storm Water Pollution Prevention Plans for Municipal Properties

Prepared by: Ruekert & Mielke, Inc.

December, 2015

Site: **630 S. Worthington Street, Oconomowoc, WI**

Contact info.: **Mark Frye, Director of Public Works**

262-569-2184

mfrye@oconomowoc-wi.gov

Site Description

The property located at 630 S. Worthington Street is central location for public works department activities and storage. The main garage, salt shed, and outdoor storage areas are utilized by public works staff. In addition, other city departments also use the fueling center, storage sheds and outdoor storage areas, including the police department and the parks and recreation department.

Jefferson Street and Worthington Street border the site on the north and east. The property to the south is the Oconomowoc Utilities building. Champion Field is west of the site, with an artificially constructed ditch to the Oconomowoc River running immediately west of the salt shed and outdoor storage area. Storm sewer from Jefferson Street discharges to the north end of this tributary, which then flows 430 feet to the south end of the city property. From there the ditch makes a 90 degree turn to the west and flows approximately 325 feet to the confluence with the Oconomowoc River. Riparian wetlands are shown adjacent to the constructed ditch on the Wisconsin Wetland Inventory. The ditch lies in Matherton Silt Loam, which has hydric inclusions. A wetland delineation in the field would need to be conducted to conclusively determine which areas, if any, should be identified as wetlands adjacent to this previously constructed ditch.

The yard and buildings are approximately 5 acres in size, and are organized to minimize clutter and reduce potential runoff concerns. Staff have aggressively cleared and organized areas of the yard during 2015, reducing the amount and type of materials stored outside that would otherwise be subject to rain and snow melt. Temporary storage of parks department items such as park benches / tables, garbage/ recycling barrels, etc., occupy space until crews deliver these items to different parks in the spring.

Runoff Prevention Practices and Maintenance Activities

The City of Oconomowoc has been covered under the WPDES Municipal Storm Sewer Discharge Permit WI-S050075 since 2006. During the first permit term, city staff developed and submitted a Storm Water Pollution Prevention Plan (SWPPP) for the public works yard, which helped identify efficiencies and pollution prevention practices that could be installed to protect the nearby water resources. Staff have gone further in removing discarded materials that have been stored in the yard for many years and consolidating other items into smaller, more manageable areas, thus removing potential sources of pollution. Removing outdated equipment and consolidating materials on site also means fewer runoff prevention practices are necessary, and less time installing, maintaining and inspecting these practices associated with this task. Remaining materials that are stored outdoors are primarily items that would typically be used outdoors, such as sign posts, barricades, winterized weed harvesting equipment, etc.

The City of Oconomowoc has previously evaluated the potential for runoff pollution resulting from the public works yard, and has implemented measures to reduce the impacts of this source to the nearby rivers and wetlands. The following actions and improvements have been implemented at the 630 Worthington Street yard:

- Hydroworks separator (to capture suspended solids, oil and trash)
- Street sweeping
- Swales to constructed ditch
- Grated inlet box at top of swale
- Bays around stockpiled material
- Salt shed
- Drains in main garage lead to sanitary sewer

Maintenance of these practices is critical to proper functioning. As debris and pollutants are captured, excess amounts can become a source of pollution rather than a treatment system if rain and snow melt continue to flow through the device without inspections or maintenance. Any inspections and maintenance should be documented and recorded for comparison and evaluation of the practice in the future.

The Hydroworks separator is designed to capture suspended solids, oil and trash. There are 2 structures currently located at the public works yard:

1) southeast of the fueling center

2) immediately north of the constructed ditch.

Hydroworks Separator near fueling center.

Typical residential or urban land use would require maintenance approximately once every two years, but installations in industrial land uses such as the public works yard should ideally be inspected and maintained in the spring and again in the fall, but at least once each year.

The yard is swept periodically and as needed, depending on recent activities in the yard. Material captured in the street sweeper is typically disposed of at a landfill.

The grass along either side of the constructed ditch tributary to the Oconomowoc River is mowed throughout the summer. There are grass swales between the paved area of the yard and the ditch to drain runoff from the yard. One of these swales has a grated inlet box at the top of the swale where it meets the pavement. Accumulated debris should be removed from the box on a regular basis to allow runoff to flow through the device.

Stockpiles of loose aggregate is stored away from the ditch and wetlands, with runoff flowing toward the south property line through a vegetated area. Additional bulk storage piles are kept in 3-sided bays. Any material that spills or is tracked away from the immediate storage area is swept up and deposited back onto the piles.

Loose salt that spills or is tracked away from the shed entrance during delivery is swept up and placed in the shed. Any excess salt the spills during loading of trucks during a snow / ice event is also swept up and placed back in the salt shed. The shed itself is designed to meet the requirements of ch. Trans 207, Wisconsin Administrative Code.

The floor drains in the main garage are connected to the sanitary sewer system, rather than the storm sewer system. Any fluids from vehicle maintenance or other activities inside the garage are directed to the wastewater treatment plant. Floor drains are cleared of debris on an as-needed basis.

Recommendations to Enhance Runoff Protection

City staff have previously taken steps to implement runoff control practices and to minimize the materials that could be sources of runoff pollution at the public works yard on Worthington Street. Current recommendations include:

1. Allowing grass to grow longer in the swale leading from the paved area to the constructed ditch, to filter particles in runoff prior to discharging to the ditch.
2. Revise and distribute a spills plan for the site, specifically highlighting the fueling center. The spills plan for the fueling area should be shared with other departments whose staff utilize this area.

Inspections

Routine visual inspections are conducted every few months, with a full inspection at least once per year. Items noted on the inspection reports are corrected as soon as possible. The yard is evaluated on a recurring basis to improve operations. Specific inspection sheets for the Hydrdoflow Separator device are included at the back of this SWPPP.

Employee Training

Public works department training is an on-going activity for staff. Changes in procedure are communicated with appropriate staff, and new staff receive training on safety procedures and overall operations of the department. Any portions of the SWPPP, including the spills plan, that affect staff in other departments will be shared with those departments.

Spills Plan

Dry materials that spill are swept up and either disposed of or placed for future use, if possible. (Example: dry salt spilled on the ground can be swept up and put back in the salt pile for use in the future.) Liquids that spill on the ground are absorbed, with the absorption materials disposed of properly depending on then liquid. The spills plan for the fueling center includes information on when to contact authorities to contain and control a spill. (Example: contact Department of Natural Resources for fuel spills that get into the tributary ditch southeast of the fueling center.)

New staff are educated on the spills plan when they start, and any policy changes are communicated to appropriate staff at the time of the changes. As part of the Storm Water Pollution Prevention Plan, the spills plan will be evaluated yearly and any changes will be summarized in the city's MS4 annual report.

Site: **2nd Avenue Site (Southeast Corner of Chaffee Road and Reddellein Road)**

Contact info.: **Mark Frye, Director of Public Works**

262-569-2184

mfrye@oconomowoc-wi.gov

Site Description

This 12+ acre site is the future home of the public works yard. Demands for space at the current public works yard will determine when this site will be developed. Site plans have been developed and permitted, including a proposed storm water pond on the northwest side of the site. Once the site has been developed and city operations start occurring here, a Storm Water Pollution Prevention Plan (SWPPP) will be developed for this site. (see attached site plan.)

Life comes NATURALLY here

Recommended Practices
Exhibit 14

Public Works Yard Storm Water Pollution Prevention Plan (SWPPP)

630 S. Worhtington Street
Oconomowoc, WI 53066

1. Allow grass to grow longer in swales and along tributary to filter pollutants.

2. Develop and distribute spills plan to staff.

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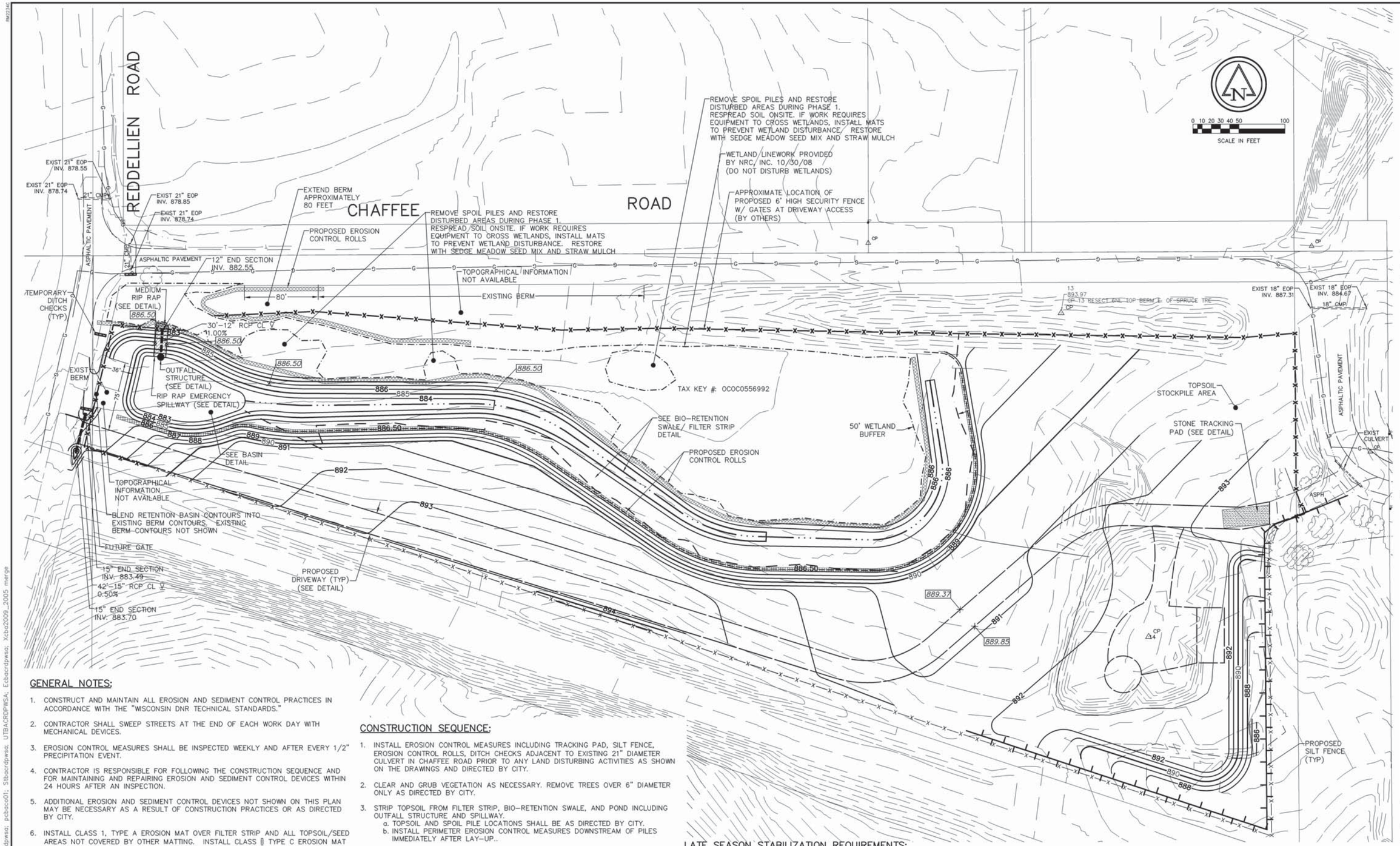
0 50 100 200 300
Feet

Date: December, 2015

Ruekert · Mielke



GENERAL NOTES:

1. CONSTRUCT AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL PRACTICES IN ACCORDANCE WITH THE "WISCONSIN DNR TECHNICAL STANDARDS."
2. CONTRACTOR SHALL SWEEP STREETS AT THE END OF EACH WORK DAY WITH MECHANICAL DEVICES.
3. EROSION CONTROL MEASURES SHALL BE INSPECTED WEEKLY AND AFTER EVERY 1/2" PRECIPITATION EVENT.
4. CONTRACTOR IS RESPONSIBLE FOR FOLLOWING THE CONSTRUCTION SEQUENCE AND FOR MAINTAINING AND REPAIRING EROSION AND SEDIMENT CONTROL DEVICES WITHIN 24 HOURS AFTER AN INSPECTION.
5. ADDITIONAL EROSION AND SEDIMENT CONTROL DEVICES NOT SHOWN ON THIS PLAN MAY BE NECESSARY AS A RESULT OF CONSTRUCTION PRACTICES OR AS DIRECTED BY CITY.
6. INSTALL CLASS 1, TYPE A EROSION MAT OVER FILTER STRIP AND ALL TOPSOIL/SEED AREAS NOT COVERED BY OTHER MATTING. INSTALL CLASS [] TYPE C EROSION MAT WITHIN BIO-SWALE AND RETENTION BASIN.
7. APPLY TEMPORARY RESTORATION MEASURES ON ALL DISTURBED AREAS WITHIN 7 DAYS AFTER DISTURBANCE IS COMPLETED, IF AREAS TO REMAIN INACTIVE FOR MORE THAN 30 DAYS.
8. EROSION CONTROL ROLLS TO REMAIN IN PLACE AS PERMANENT RESTORATION.
9. TRACKING PAD SHALL REMAIN TO BECOME PORTION OF PROPOSED PERMANENT DRIVEWAY.
10. DEWATERING SHALL COMPLY WITH DNR TECHNICAL STANDARD 1061.
11. THE SITE CONTAINS EXISTING WETLANDS WHICH WERE DELINEATED AND ARE SHOWN ON THE DRAWINGS. CONTRACTOR SHALL NOT DISTURB, DREDGE, OR FILL WETLANDS.

CONSTRUCTION SEQUENCE:

1. INSTALL EROSION CONTROL MEASURES INCLUDING TRACKING PAD, SILT FENCE, EROSION CONTROL ROLLS, DITCH CHECKS ADJACENT TO EXISTING 21" DIAMETER CULVERT IN CHAFFEE ROAD PRIOR TO ANY LAND DISTURBING ACTIVITIES AS SHOWN ON THE DRAWINGS AND DIRECTED BY CITY.
2. CLEAR AND GRUB VEGETATION AS NECESSARY. REMOVE TREES OVER 6" DIAMETER ONLY AS DIRECTED BY CITY.
3. STRIP TOPSOIL FROM FILTER STRIP, BIO-RETENTION SWALE, AND POND INCLUDING OUTFALL STRUCTURE AND SPILLWAY.
   a. TOPSOIL AND SPOIL PILE LOCATIONS SHALL BE AS DIRECTED BY CITY.
   b. INSTALL PERIMETER EROSION CONTROL MEASURES DOWNSTREAM OF PILES IMMEDIATELY AFTER LAY-UP..
4. CONSTRUCT THE BUFFER STRIP, BIO-RETENTION SWALE AND POND.
   a. INSTALL EROSION CONTROL ROLLS, EROSION MATTING AND STABILIZE THE BUFFER STRIP, BIO-RETENTION SWALE AND POND WITH NATIVE SEED MIX.
5. GRADE SITE INCLUDING BERMS, CONSTRUCT DRIVEWAY AND/OR STORAGE PADS AS DIRECTED BY CITY OR AS SHOWN IN PHASING PLAN.
6. RESTORE ALL DISTURBED AREAS WITHIN 7 DAYS OF FINAL GRADING INCLUDING TOPSOIL AND/OR SPOIL PILES TO REMAIN FOR FUTURE PHASE CONSTRUCTION.
7. REMOVE TEMPORARY EROSION CONTROL MEASURE AFTER SITE HAS ACHIEVED STABILIZATION (100% GRASS COVERAGE WITH 70% DENSITY). RESTORE DISTURBED AREAS AROUND REMOVED EROSION CONTROL MEASURES.

LATE SEASON STABILIZATION REQUIREMENTS:

THE CONSTRUCTION SITE MUST BE PERMANENTLY OR TEMPORARILY STABILIZED BY NOVEMBER 1 OF EACH YEAR. CRITERIA FOR STABILIZATION ARE:

1. SEEDING OF ALL DISTURBED AREAS WITH PERMANENT VEGETATION BY SEPTEMBER 15, WITH APPROPRIATE FOLLOW UP TO ADDRESS EROSION PROBLEMS, WASHOUT, ETC.
2. SEEDING OF ALL DISTURBED AREAS WITH TEMPORARY SEED MIX (OATS, WINTER WHEAT, ANNUAL RYE) BY OCTOBER 15, WITH APPROPRIATE FOLLOW UP TO ADDRESS EROSION PROBLEMS, WASHOUT, ETC. PERMANENT SEED MIX MUST THEN BE IMPLEMENTED BY JUNE 1 OF THE FOLLOWING YEAR. SEEDING RATES AND MIXES SHALL CONFORM SPECIFICATION 02900-CHAFEE ROAD DPW STORAGE YARD.
3. IF THE OCTOBER 15 DEADLINE IS MISSED, COVERAGE OF ALL DISTURBED AREAS BY NOVEMBER 1 WITH:
   a. TOPSOIL, SEED, AND THE MATERIAL CALLED FOR IN THE APPROVED STABILIZATION PLANS, WHERE TOPSOIL, SEED, AND EROSION CONTROL MATTING IS CALLED FOR.
   b. TOPSOIL, SEED, AND TYPE A SOIL STABILIZER FROM THE WISDOT PRODUCT ACCEPTABILITY LIST OR OTHER METHOD APPROVED BY THE OWNER FOR ALL AREAS WHERE SEED, TOPSOIL, AND MULCH IS CALLED FOR IN THE APPROVED PLANS.

REVISIONS
7
6
5
4
3
2
1

TOWN: 8N RANGE: 17E SECTION(s): 31 SE & SW

Ruekert·Mielke
engineering solutions for a working world
W233 N2080 Ridgeview Parkway • Waukesha, WI 53188-1020
(262) 542-5733 • Fax: (262) 542-5631 • www.ruekert-mielke.com

DPW STORAGE YARD
GRADING AND EROSION CONTROL
CITY OF OCONOMOWOC
WAUKESHA COUNTY, WISCONSIN

DESIGNED BY: DB2
DRAFTED BY: MEM
CHECKED BY: CMG
DATE: JULY, 2009
FILE NO.
4792118.200

BID SET

SHEET NO.
2

Jul 16, 2009 2:46pm PLOTTED BY: dklemm SAVED BY: dklemm
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IMAGES: G:\SHT\RMGraphic.jpg;
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Hydroworks® Hydroguard

Operations & Maintenance Manual

Version 1.3

Introduction

The Hydroguard is a state of the art hydrodynamic separator. Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The Hydroguard is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their Hydroguard.

Hydroworks® HG Operation

The Hydroworks HG separator is unique since it treats both high and low flows in one device, but maintains separate flow paths for low and high flows. Accordingly, high flows do not scour out the fines that are settled in the low flow path since they are treated in a separate area of the device as shown in Figure 1.

The HG separator consists of three chambers:

1. an inner chamber that treats low or normal flows
2. a middle chamber that treats high flows
3. an outlet chamber where water is discharged to the downstream storm system

Under normal or low flows, water enters the middle chamber and is conveyed into the inner chamber by momentum. Since the inner chamber is offset to one side of the structure the water strikes the wall of the inner chamber at a tangent creating a vortex within the inner chamber. The vortex motion forces solids and floatables to the middle of the inner chamber. The water spirals down the inner chamber to the outlet of the inner chamber which is located below the inlet of the inner chamber and adjacent to the wall of the structure but above the floor of the structure. Floatables are trapped since the outlet of the inner chamber is submerged. The design maximizes the retention of settled solids since solids are forced to the center of the inner chamber by the vortex motion of water while the outlet of the inner chamber draws water from the wall of the inner chamber.

The water leaving the inner chamber continues into the middle chamber, again at a tangent to the wall of the structure. The water is then conveyed through an outlet baffle wall (high and low baffle). This enhances the collection of any floatables or solids not removed by the inner chamber. Water flowing through the baffles then enters the outlet chamber and is discharged into the downstream storm drain.

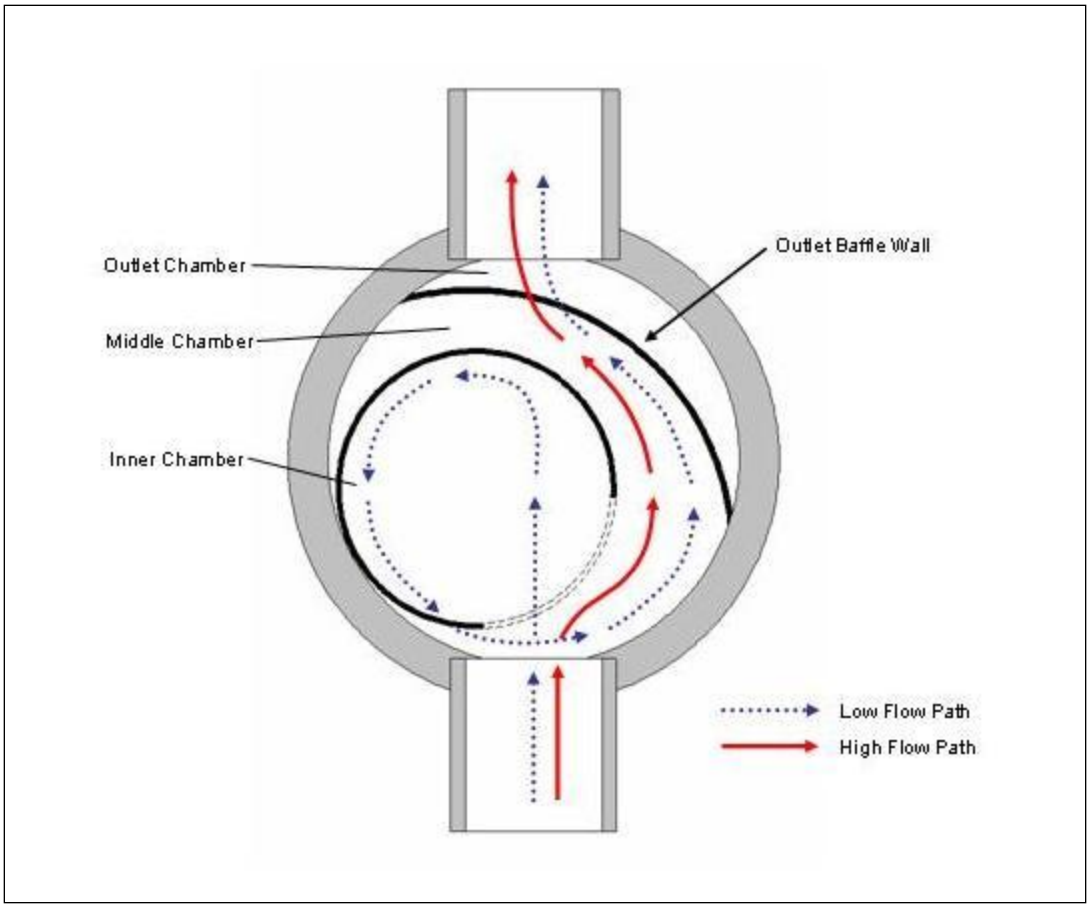


Figure 1. Hydroworks HG Operation – Plan View

During high flows, the flow rate entering the inner chamber is restricted by the size of the inlet opening to the inner chamber. This restriction of flow rate into the inner chamber prevents scour and re-suspension of solids from the inner chamber during periods of high flow. This is important since fines, which are typically considered highly polluted, are conveyed during low/normal flows.

The excess flow is conveyed directly into the middle chamber where it receives treatment for floatables and solids via the baffle system. This treatment of the higher flow rates is important since trash and heavier solids are typically conveyed during periods of higher flow rates. The Hydroworks HG separator is revolutionary since it incorporates low and high flow treatment in one device while maintaining separate low and high flow paths to prevent the scour and re-suspension of fines.

Figure 2 is a profile view of the HG separator showing the flow patterns for low and high flows.

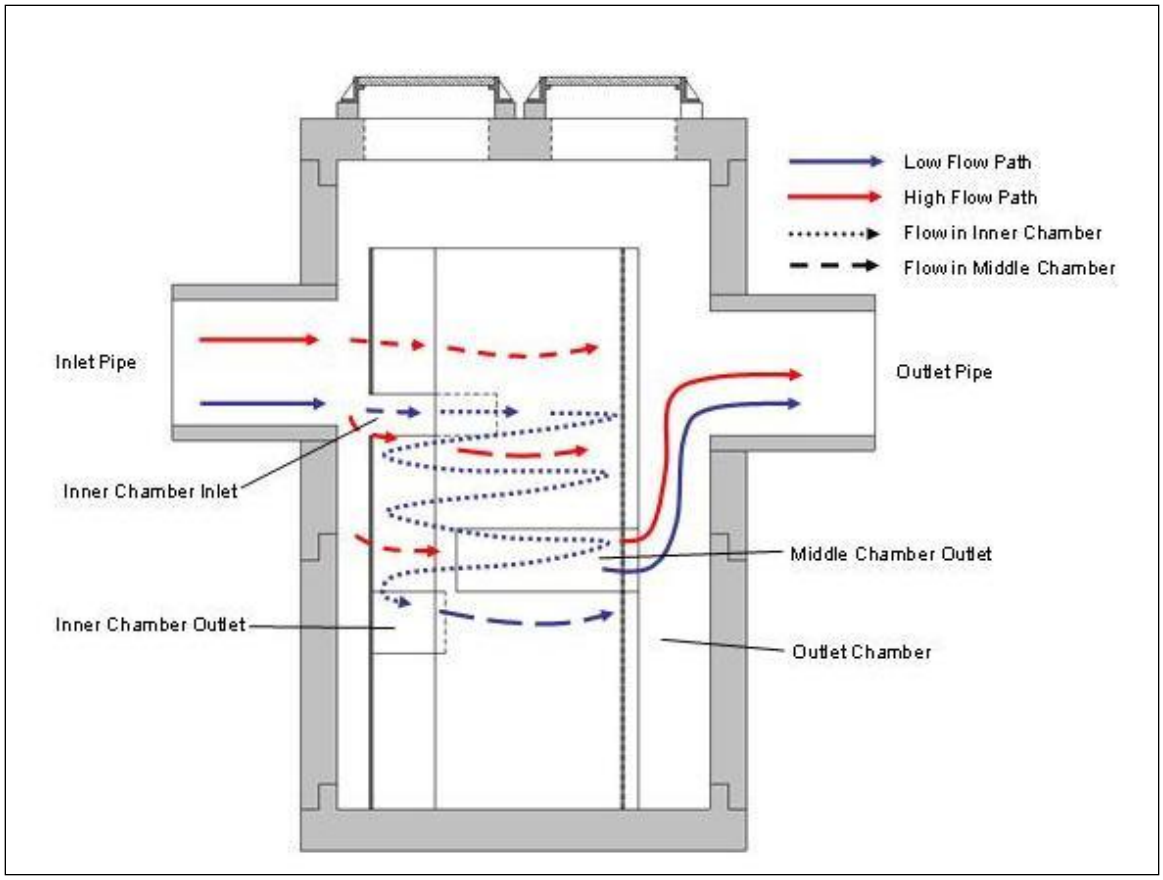
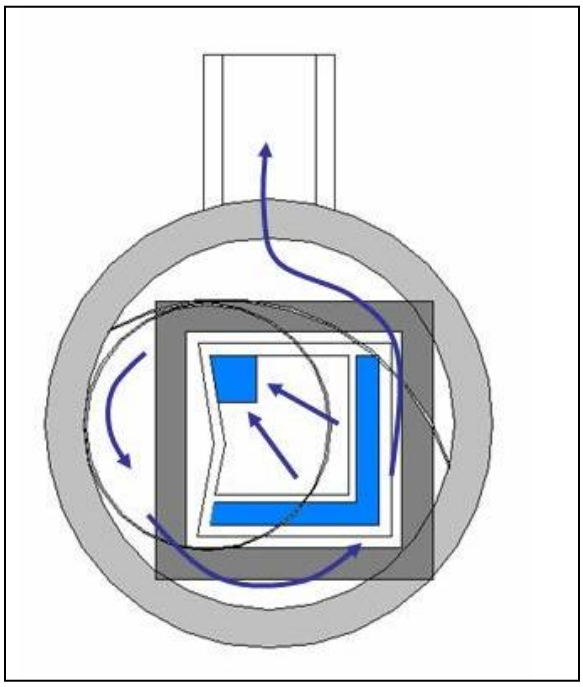


Figure 2. Hydroworks HG Operation – Profile View

The HG 4i is an inlet version of the HG 4 separator. There is a catch-basin grate on top of the HG 4i. Water flows directly into the inner chamber of the HG 4i through the catch-basin grate on top of the structure. The grate is oversized to allow maintenance of the entire structure. A funnel that sits underneath the grate on the top cap of the concrete itself directs the water into the inner chamber during normal flows and the middle chamber during high flows. Figures 3 and 4 show the flow paths for the HG 4i separator.

The inlet funnel is sloped towards the corner inlet and hence the wall of the inner chamber. Water moves in a circular direction in the inner chamber since water enters tangentially along the wall of the inner chamber due to the sloping funnel.

Water continues moving in a circular motion (vortex) through the rest of the structure (through the middle chamber and baffle wall) until it is discharged from the separator.



During periods of peak flow the water will back up from the corner inlet and overflow into two side overflow troughs which discharge directly into the middle chamber. These overflow troughs are covered from the surface such that water cannot directly fall through them (i.e. water must back up to enter the overflow troughs).

Accordingly this funnel provides the same separate flow paths for low and high flow as the other Hydroguard separators.

The whole funnel is removed for inspection and cleaning providing.

Figure 3. Hydroworks HG 4i Normal Flow Path

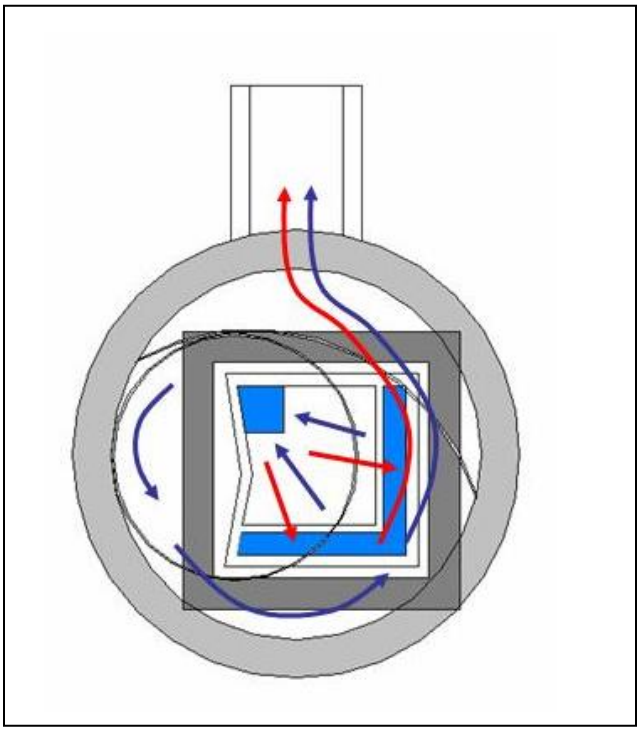


Figure 4. Hydroworks HG 4i Peak Flow Path

Inspection

Procedure

Although all parts of the Hydroguard should be inspected, inspection and maintenance should focus on the inner and middle chambers since this is where the pollutants (floatable and sinking) will accumulate.

Floatables

A visual inspection can be conducted for floatables by removing the covers and looking down into the separator. Multiple covers are provided on Hydroworks HG units to access all areas of the separator (The HG 4 may have a single larger 32" (800mm) cover due to the lack of space for multiple 24" (600mm) covers). Separators with an inlet grate (HG4i or custom separator) will have a plastic funnel located under the grate or on the top cap of the concrete that must be removed through the frame prior to inspection or maintenance. If you are missing a funnel please contact Hydroworks at the numbers provided at the end of this document.

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. The unit should be inspected for TSS through each of the access covers. Several readings (2 or 3) should be made at each access cover to ensure that an accurate TSS depth measurement is recorded.

Frequency

Construction Period

The HG separator should be inspected every two weeks and after every large storm (over 0.5" (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HG separator should be inspected once per year for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized (storage piles, exposed soils) areas the HG separator should be inspected more frequently (4 times per year). The initial annual inspection will indicate the required future frequency of maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HG unit is typically maintained using a vactor truck or clam shell bucket. There are numerous companies that can maintain the HG separator. Envirocalm, LLC, an affiliate company of Hydroworks offers inspection and maintenance services and can inspect and maintain the HG separator. (www.envirocalm.com).

Disposal of the contents of the separator depend on local requirements. Maintenance of a Hydroworks HG unit will typically take 1 to 2 hours.

Frequency

Construction Period

A HG separator can fill with construction sediment quickly during the construction period. The Hydroguard must be maintained during the construction period when the depth of TSS/sediment reaches 30” (750 mm). It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the open water surface on the inlet side of the outlet baffle wall.

The HG separator should be maintained at the end of the construction period, prior to operation for the post-construction period.

Post-Construction Period

The Hydroguard was independently tested by Alden Research Laboratory in 2008. A HG6 was tested for scour with initial sediment loads of 4.6 ft^3 and 9.3 ft^3. The results from these tests were almost identical. Therefore, the 9.3 ft^3 sediment load was used as 50% of the maximum sediment depth for maintenance in the calculation of the maintenance interval for the HG6 separator based on the NJDEP maintenance interval equation.

Maintenance Interval (months) = 3.565 x (Sediment Storage) / (MTFR x TSS Removal)

Maintenance Interval (HG6) = 3.565 x 9.3 / (1.81x 0.60) = 30 months

All values (flow, sediment storage) can be scaled by the surface area making the sediment depths and maintenance intervals equal for all separators.

The separator was loaded with the sediment in the inner chamber and middle chamber with the majority of sediment (80%) located in the inner chamber. The inner chamber for area represents approximately 44% of the separator surface area. The inner chamber is 4 ft (1200 mm) in diameter in the HG6. Therefore the 50% sediment depth for the HG6 in the inner chamber would be:

9.3 ft^3 x 0.80 / (3.14 x 4 ft^2) x 12 in/ft = 7.1 inches (175 mm)

Accordingly the 100% sediment volume would represent 14.2” (350 mm) of sediment depth in the inner chamber.

The HG separator must be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the open water surface on the inlet side of the outlet baffle wall. It should also be maintained once the accumulated TSS/sediment depths are greater than 14” (350 mm) in the inner chamber. For typical stabilized post-construction sites (parking lots, streets) it is anticipated that maintenance will be required annually or once every two years. More frequent or less frequent maintenance will be required depending on individual site conditions (traffic use, stabilization, storage piles, etc.). The long term maintenance frequency can be established based on the maintenance requirements during the first several years of operation if site conditions do not change.

HYDROGUARD INSPECTION SHEET

Date _____
Date of Last Inspection _____

Site _____
City _____
State _____
Owner _____

GPS Coordinates _____

Date of last rainfall _____

Site Characteristics	**Yes**	**No**
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

Hydroguard	**Yes**	**No**
Incorrect access orientation	☐ ***	☐
Obstructions in the inlet or outlet	☐ *	☐
Missing internal components	☐ **	☐
Improperly installed internal components	☐ **	☐
Improperly installed inlet or outlet pipes	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐

Water level depth below outlet pipe invert _____"

Routine Measurements

Floating debris depth	**< 0.5" (13mm)**	☐	**>0.5" 13mm)**	☐*
Floating debris coverage	**< 25% of surface area**	☐	**> 25% surface area**	☐ *
Sludge depth	**< 14" (350mm)**	☐	**> 14" (350mm)**	☐ *****

Other Comments: _____
_____
_____

* Maintenance required
** Repairs required
*** Further investigation is required

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please fax a copy of the completed checklist to Hydroworks at 888-783-7271 for our records.

Hydroworks® Hydroguard

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks Hydroguard to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the separator has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 50 S 21st St., Kenilworth, NJ 07033 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks Hydroguard are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the Hydroguard, or the cost of other goods or services related to the purchase and installation of the Hydroguard. For this Limited Warranty to apply, the Hydroguard must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the Hydroguard arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the Hydroguard, whether the claim is based upon contract, tort, or other legal basis.

Appendix F

Waukesha County Storm Water and Recycling Education Program DRAFT Workplan &
BMP Maintenance Fact Sheets

Waukesha County Storm Water and Recycling Education Program
2016 Workplan

This workplan describes a public information and education program that complies with the Municipal Permit conditions of NR216 as approved by the DNR. The program is organized by target audience. For each target audience, programs goals, activities and the general roles of the County and the local Community are described.

The Education Advisory Committee is chaired and coordinated by the County, with representation from participating communities. The Committee will meet at least 2 times per year to review the status of activities, evaluate their success and make work plan revisions, as needed. Subcommittees may be formed to plan or carry out certain activities, as needed. Some activities will be phased into the program, as noted below.

To comply with the Municipal Permit, all communities are required to carry out minimum assigned tasks, as described below. Staff in the larger communities are expected to participate more in program planning and implementation. To encourage public participation in the development and implementation of the work plan, the County will post the plan on their web page for comment and contact local environmental, civic and other interested groups or individuals and encourage their involvement. Each community must provide the County with contact information for applicable local groups or interested individuals.

Target Audience: Contractors, Builders, Developers, Consultants & Municipal Staff

Goal: *Increase understanding of and compliance with local ordinance requirements for construction site erosion control and post-construction storm water management. Provide technical training for plan development and Best Management Practice (BMP) design, installation and maintenance. Promote environmentally sensitive land development methods.*

1. Workshops – The County will conduct one workshop in 2016 on April 14th. The County will lead program development, implementation, advertisement and post-workshop evaluation efforts, as needed.

    - *Community role: Assist the County in program planning, promotion and implementation, including providing e-mail lists for local target audiences, distributing advertising materials locally, and finding presenters and local examples of target BMPs. Communities may also be asked to serve on a planning committee.*

    Goal: To have at least 75 workshop participants with good evaluation rating (3.5 or higher)

2. Newsletters – The County will write periodic newsletter articles for the Metropolitan Builders Association (or similar groups), focusing on local nonpoint pollution control problems, solutions, on-going program efforts and success stories that affect their industry.

    - *Community role: Provide the County with ideas for related articles on local activities, events or success stories*

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    Goal: To work with MBA on newsletter articles as opportunities arise.

3. Education Opportunities – In addition to sharing webinar and education opportunities with local MS4 communities, notices will be sent to developers and builders when appropriate opportunities arise.

Target Audience: General Public

Goal: *Increase public understanding of the processes and negative impacts that urban storm water runoff and illicit discharges have on the local water resources and what each person can do to address the problem. Promote changes in behavior and the adoption of practices such as native landscaping, rain barrels, rain gardens, green roofs, environmentally sensitive lawn, pet and car care, riparian land management, yard waste composting, water quality monitoring, hazardous waste management and other related practices.*

1. Storm Drain Stenciling – The County will provide stencils, paint and educational door hangers, or permanent markers with adhesive and coordinate their distribution and use by youth groups and adult organizations to apply the message "Dump No Waste – Drains to River/Lake" on local storm drain inlets. Educational door hangers will be provided for homes in stenciled areas to educate residents about storm drains.

    - *Community role: Promote the activity locally, provide the County with contacts for local youth and civic groups, and facilitate local approvals as needed. Notify the County if you do not want permanent markers applied by volunteers.*

    Goal: To have a least 2 groups participate in stenciling

2. News Releases/Newsletters/Recognition — The County will prepare seasonal news releases and articles for local newspapers and Community newsletters announcing water quality related activities, programs and services. The County will also provide information through the "Recycling & Clean Water Newsletter", a four page newsletter mailed to over 100,000 homes in the county. Tax inserts will also be made available to communities.

    - *Community role: Provide the County with contacts for local media, people or businesses that deserve recognition, and other ideas for news releases and articles. Assist with writing local articles or local versions of County articles. Disseminate articles locally through Community newsletters, civic groups, etc. Help obtain permission to include tax insert with municipality tax mailing.*

    Goal: To send at least 2 press releases per year

3. Presentations – The County will provide a speaker, accompanied by a Power Point presentation or video for local civic groups and other organizations with a choice of water related topics. Groups such as churches, scouts and 4-H would be appropriate targets as well as Kiwanis, Lions Club and Chambers of Commerce. These groups provide opportunity for public involvement and participation as required in your permit, with opportunities to link in to displays, handouts, stenciling and others.

    - *Community role*: *Promote the service locally and forward presentation requests to the County. Identify local opportunities, coordinate with local events, and assist with implementation duties per the work plan.*

    Goal: To speak to at least 5 groups other than schools and to provide at least one merit badge class for Boy Scouts

4. Displays/Handouts – The County will provide fully developed displays and handout materials for local special events or building lobbies and entryways. The County will also coordinate the transportation of the display and train local staff in setup. Displays will be tailored to address seasonally specific issues, such as lawn care, fall leaf collection, etc.

The most successful venues for the display have been library events, family movie night in the park, events for kids and pancake breakfasts.

- *Community role: Schedule local display opportunities with the County. Coordinate local setup, maintenance and take down with the County.*

Goal: To use the display in at least 15 of the 25 participating communities

5. Web Page – The County will create and maintain web pages that provide information on the above noted practices, promote their use, and direct citizens to related local services, events and demonstration sites. Related fact sheets and informational flyers will also be made available for download.

- *Community role: Direct local citizens to the County web pages and incorporate links into Community web pages to promote related County service and events.*

Goal: To promote local links to webpages

6. Businesses – The County will work through local chambers of commerce to educate businesses on recycling and clean water practices. This will happen through a variety of avenues depending on the chamber. Examples of Chamber activities might include business after 5:00 gatherings, 20/20 education events, newsletter articles, booths at events and more. We will maintain our memberships in Oconomowoc and Hartland.

Some Chambers are open to the development of Green Business Awards. We will be looking to incorporate storm water components into these awards as much as possible.

- *Community role: To refer groups with business ties such as rotary and Kiwanis to the County*

Goal: To be involved in 1 new Chamber of Commerce

7. Rain Garden Grants/Technical Assistance – The County will continue participating in the Graham Martin Foundation Rain Garden Grant to provide low cost plants for rain gardens. The County will administer available grant funds to green schools and targeted project areas.

In addition, at least one rain garden workshop will be offered to educate people about the function and design of rain gardens.

- *Community role: Request targeted areas as opportunities arise.*

Goal: To have at least 10 participants in the rain garden grant program, hold one rain garden workshop and one rain barrel sale.

8. Hazardous Waste/Used Oil Collection – To prevent improper disposal and water pollution, the County will continue to promote and support three permanent household and agricultural hazardous waste collection sites in Waukesha, Muskego and Menomonee Falls, and periodically host temporary collection sites in other Communities, as funding allows *(per separate agreements between the County and the Community)*. Used motor oil and oil filters will also continue to be collected at Community recycling drop off sites.

- *Community role: Promote the collection sites locally and direct citizens to the County web site for more information.*

Goal: Collect at least 200,000 pounds of hazardous waste from either permanent or temporary collection facilities, and to host at least 2 Green Cleaning events.

9. Yard Waste Composting – To reduce water pollution from improperly disposed leaves and grass clippings, the County will promote home composting of yard wastes and continue to offer a County-owned drop-off site for Community yard waste collection programs at no cost to the Community for processing *(per separate agreements between the County and the Community)*. At the drop-off site, yard wastes are composted and used for mine reclamation purposes.

- *Community role: Collect yard waste from citizens and transport to the County composting facility in the Town of Genesee.*

Goal: Compost approximately 2500 tons of yard waste and host one compost bin sale.

10. Citizen Stream Monitoring – The County will offer interested citizens the opportunity to monitor a local stream site once a month from May to October. The County will train and equip participants to collect temperature, turbidity, biotic index, flow and dissolved oxygen data. This activity educates participants while collecting useful water quality data for monitoring program progress.

- *Community role: Promote locally and direct interested citizens to the County.*

Goal: To maintain monitoring at 20 sites throughout the County and provide at least one training opportunity for new volunteers.

11. Education for Homeowners Associations – The County has created a set of three flyers with information for homeowners associations on wet ponds, infiltration, and bioretention information. Municipalities required to do education to this target audience should make these flyers available to their homeowners associations.

A special education project for the drainage area through Mukwonago Park is being planned for early spring. The BMP brochures will be presented as well as rain garden and rain barrel discounts offered.

- Community Role: Request additional areas for targeted projects in future.

Goal: To promote BMP maintenance brochures through one targeted event

Target Audience: School Teachers & Students

Goal: *Have teachers learn the negative impacts that urban storm water runoff and illicit discharges have on the local water resources, and what they and their students can do to address the problem. Incorporate into related indoor and outdoor classroom activities and implement runoff pollution control practices on school property.*

1. Teacher Training – The County will provide Project WET (Water Education for Teachers) training and curriculum guides for teachers. Project WET is supplemental water education that can be used in science, math, art, physical education and other areas. All activities are hands-on and water related. In addition, training on soils, water and natural resources/recycling will be provided at a separate summer training opportunity for teachers.
    - *Community role: Promote training locally and direct interested teachers to the County.*

2. Presentations – The County will provide a speaker and Power Point presentation for classrooms to discuss local water quality issues, including actions that students and their families can take to reduce nonpoint pollution.
    - *Community role: Promote presentations locally and direct interested teachers to the County.*

3. Green Schools – The County will help participating schools work through the DNR's "Green & Healthy Schools" program. Assist school teams with completing the "water" and "school grounds" inventories, making recommendations for controlling runoff and reducing water usage. The County may also provide some grant dollars to help implement the recommendations and move toward state certification. Through the years, a total of 59 schools have received funding and help through the County. *(Note: Separate agreement required between the school and the County.)*
    - *Community role: Promote program locally and direct interested schools to the County.*

4. Stream Monitoring – Offer local teachers the opportunity to expose students to a one-time field trip for stream monitoring. Students would collect temperature, turbidity, biotic index, flow and dissolved oxygen. This type of monitoring is primarily designed to educate students on water quality issues and the techniques used to measure the impacts of land use on water quality.
    - *Community role: Promote program locally and direct interested teachers to the County.*

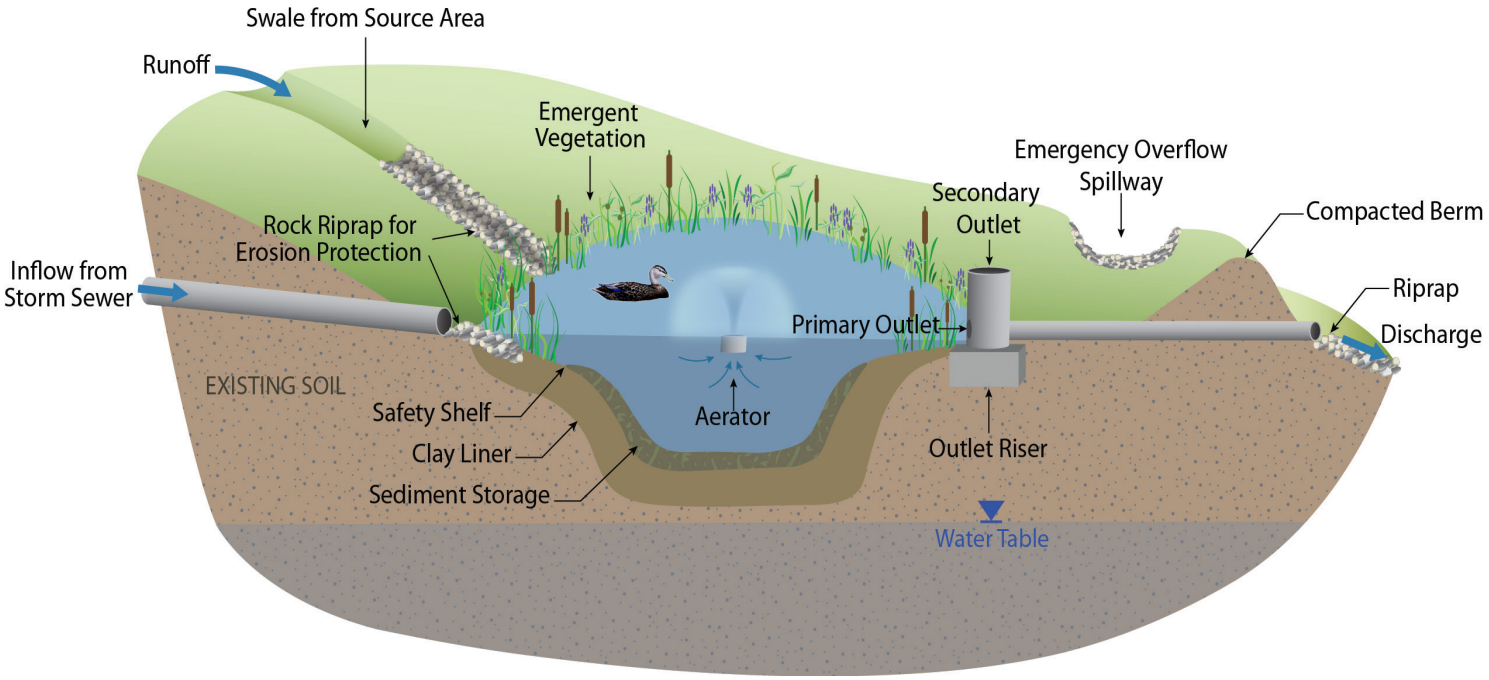
    Goal: To reach at least 1400 students through presentations and field experiences. In addition, reach at least 12 teachers through training opportunities.

STORMWATER PONDS

Guidelines for Maintenance

A **stormwater pond** is a best management practice (BMP) that collects and holds storm runoff to remove pollutants carried by the water before they enter our rivers and lakes. Water reaches the stormwater pond through a combination of underground pipes, ditches and overland flow. Once the runoff enters the stormwater pond, sediment and other pollutants settle to the bottom. The water that entered as polluted runoff leaves the pond gradually, resulting in cleaner water draining into our lakes and streams and reduced flooding problems downstream.

Stormwater ponds are carefully designed to hold and treat runoff. Over time, the pond fills in with sediments and begins to lose its ability to remove pollutants. A smaller "forebay" may be present, which may fill up with sediment first. Maintenance is needed for the pond to continue to function the way it was designed, to protect our lakes and streams. Maintenance is also required by an agreement on file with the municipality.



NOT TO SCALE

Illustrations by Geosyntec Consultants, Inc.

ANNUAL MAINTENANCE FOR STORMWATER PONDS

DO-IT-YOURSELF

There are some maintenance jobs that can—and should—be regularly attended to by the owner of the stormwater pond. This includes:

- Remove vegetation/debris obstructions around the outlet pipes and trash rack. Outlets come in a variety of shapes and designs and may look different from the drawing on page 1.
- Check the sediment depth—most easily done through hole in ice when frozen. Many ponds will have a forebay where the runoff flows in, intended to trap the bulk of the sediment and which will fill up first.(See page 3.)
- Record water levels including depth along the safety shelf. This is best done by reading a depth gauge that is permanently mounted in the pond.
- Visually assess water quality and estimate percent weed/algae cover in early and late summer.
- Remove trash, litter and invasive plants. Cattails or reeds around the edge of the pond (safety shelf) help deter children and geese from entering the water and should be left uncut.
- Remove trees sprouting along the embankments. Left to grow, tree roots threaten the structural integrity of the embankments.
- Be sure to check the engineering design before doing any digging. Ponds often have a clay or synthetic lining that could be punctured or damaged resulting in a pond that no longer holds water.
- Inspect any fencing or signage for damage.
- Replace spent mosquito control devices.
- Invite bats to the area by installing bat houses to provide natural mosquito control.
- Aeration is sometimes added for algae control. While it helps with the aesthetics of a pond, it detracts from the sediment trapping abilities. Turn off aerators during rain or snow melt periods to allow settling of sediment.

ENLIST A PROFESSIONAL

Besides the maintenance that owners can do, a qualified inspector should be hired to annually inspect the pond and check for the following:

- The condition of the pipes, swales or structures where water flows into and out of the basin.
- Erosion of sideslopes, embankments, inlet/outlet, and emergency spillway, including the condition of rock riprap and underlying fabric.
- The condition of the pond liner (if present). Patch holes and remove burrowing animals, if necessary.
- The presence of invasive species. Develop a plan for their removal if necessary.
- The permanent pool elevation and sediment depth by surveying and referencing to a vertical benchmark (known elevation).
- Soft spots or settling that may have occurred in the embankment.

For a sample inspection report, visit the Waukesha County website at www.waukeshacounty.gov/cleanwater.

CHECKING SEDIMENT DEPTH

Simply use an ice auger to drill a hole and insert a measuring pole or rod into the hole to get the total depth. If distance from water surface to top of sediment is less than 3 feet, refer to a professional for advice on possible sediment removal. A reference to as-built surveys and design water levels is necessary. You may have less than 3 feet if water levels are low, so record water from the depth gauge levels at the same time. (See page 2.)

MANAGING THE WATERSHED: WHAT HOMEOWNERS CAN DO

Many stormwater ponds are owned by a group of landowners and maintained through a homeowner association within a subdivision. In addition to maintaining the ponds, there are actions that each homeowner can take to manage the land that drains to the ponds. The following will help extend the life of the ponds and reduce water pollution at the same time:

- Regularly sweep litter and grass clippings off sidewalks, driveways, streets and parking lots.
- Test the soil in landscaped areas, and follow recommended application rates for fertilizers and pesticides.
- Pick up after pets. This also helps keep excess nutrients and bacteria out of the pond.
- Minimize salt application to impervious areas. Salt generally passes through the pond soils, damaging the plants and polluting the receiving surface and groundwater resources.
- Prevent sediment from leaving construction sites. The more sediment that enters the pond, the sooner it will require expensive soil restoration or replanting.

Ponds that fill up with sediment over time will have to be cleaned out, requiring expensive maintenance like dredging. Proper care and maintenance of your pond will extend its life.

Enforcement of Stormwater Pond Maintenance

Maintenance responsibilities for stormwater ponds are usually documented as a deed restriction or a maintenance agreement that was recorded on the property when the pond was built. Maintenance can also be required through a local ordinance to meet clean water laws. The local municipality or stormwater utility district is the likely regulatory agency for maintenance. Either way, the regulatory agency can require the owner(s) of a stormwater pond to perform and report inspections and to complete repairs and maintenance activities as needed. If the owner(s) fails to comply, the regulatory agency may resort to citations or other enforcement measures, or may perform the maintenance activities itself and recover the costs through special charges on the property tax bill.

Developed by Waukesha County Department of Parks & Land Use with funding from the Wisconsin Department of Natural Resources (2015).

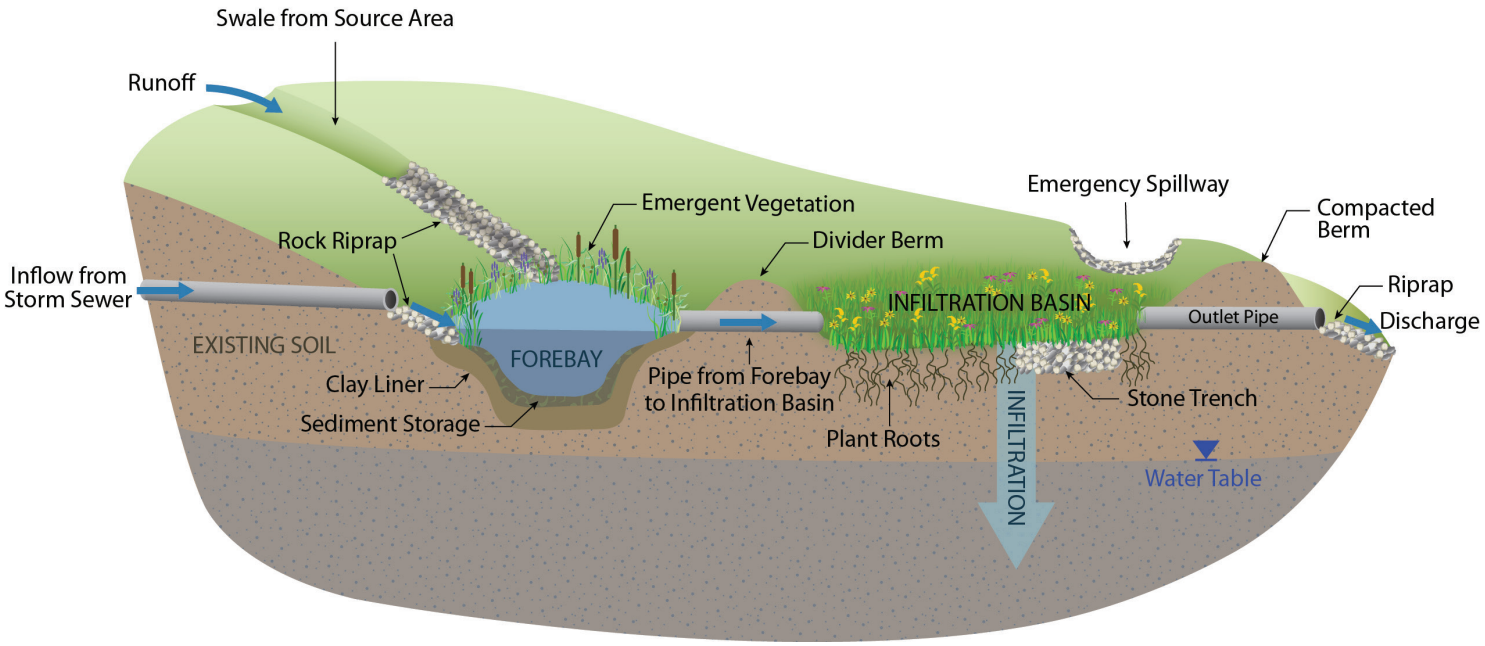
INFILTRATION BASINS

Guidelines for Maintenance

An **infiltration basin** is a storm water best management practice (BMP) designed to capture runoff and let it soak into the ground—a process called infiltration. The basin is carefully engineered to infiltrate runoff volumes from the specific land area, or watershed that drains to the basin. Runoff will enter the infiltration basin through a combination of underground pipes, ditches and overland flow. A small pond, or forebay, is usually constructed at the inflow area to trap sediment and attached pollutants before entering the infiltration basin. This can help prevent plugging the soils in the infiltration basin.

The bottom of the infiltration basin is flat, wide and planted with vegetation specifically designed to encourage infiltration (see page 2). There may be a stone-filled trench constructed within the basin bottom or near the perimeter to further enhance infiltration, especially during frozen ground periods. The basin will usually have an overflow pipe and an emergency spillway to handle runoff events that exceed the design capacity. The infiltration basin is generally designed not to pond runoff in the basin for more than a few days at a time.

An infiltration basin may act like a leaky pond, but they are very effective at protecting local lakes, rivers and downstream properties from water pollution and flooding caused by urban runoff. Infiltrating runoff also helps replenish the groundwater, the source of drinking water for 80% of Wisconsin residents. Groundwater also supports water levels in local lakes and base flows in streams, especially during periods of dry weather.



Note: Rain gardens are essentially small infiltration basins. They are designed to capture and infiltrate runoff from small watersheds such as a rooftop, driveway or small parking lot. Some roadside or backyard swales are also designed as small infiltration practices.

NOT TO SCALE

Illustrations by Geosyntec Consultants, Inc.

THE NATIVE LANDSCAPE

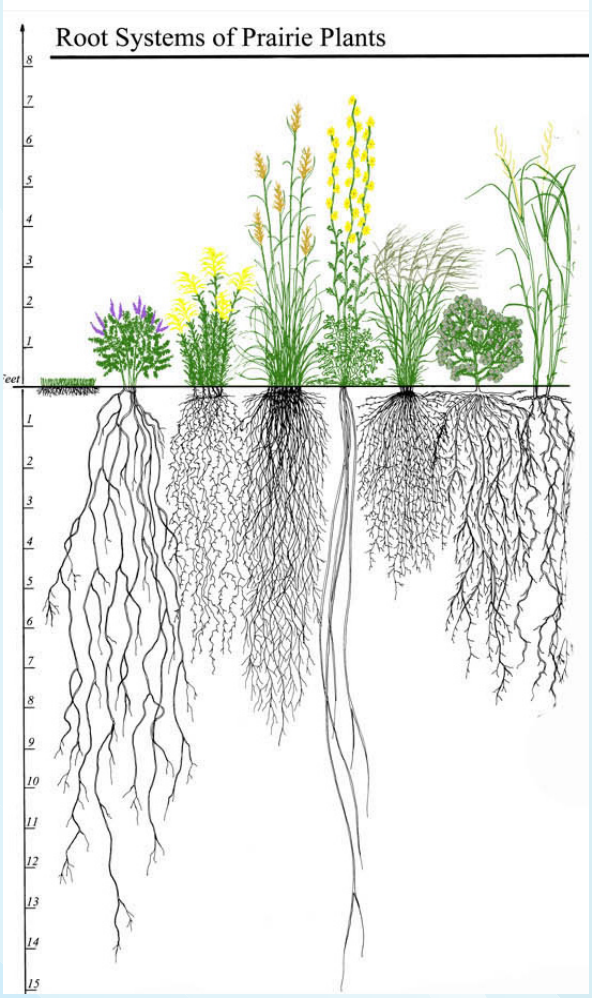


Image Source: Conservation Resource Institute

Before our landscape was developed, very little rainfall actually ran off the ground. Most of it soaked into the soil, where it was either used by plants or became part of the groundwater system. Native plants are used in infiltration basins to help replicate some of these conditions. Native plants have very deep root systems with as much as two-thirds of the plant being underground. This massive root system improves the soil, creating more pathways for infiltration, and making the basin more effective at soaking up runoff and filtering pollutants. By comparison, turf grass (pictured at far left in the illustration) only has a few inches of root mass. Other benefits of using native plants include:

- Creating habitat and food sources for birds, butterflies, bees and other wildlife.
- Absorbing more nutrients in runoff like phosphorous and nitrogen, which cause algae blooms and excessive weed growth in lakes and streams.
- Improving aesthetics of the infiltration basin, providing year round interest and color with a mix of wildflowers and grasses.
- Reducing maintenance needs (once established), such as mowing, watering (plants are drought resistant), or use of fertilizer or pesticide.

MANAGING THE WATERSHED: WHAT HOMEOWNERS CAN DO

Many infiltration basins are owned by a group of landowners and maintained through a homeowner association within a subdivision. In addition to maintaining the basin, there are actions that each homeowner can take to manage the land that drains to the basin. The following will help extend the life of the basin and reduce water pollution at the same time:

- Regularly sweep litter and grass clippings off sidewalks, driveways, streets and parking lots.
- Test the soil in landscaped areas, and follow recommended application rates for fertilizers and pesticides.
- Pick up after pets. This also helps keep excess nutrients and bacteria out of the basin.
- Minimize salt application to impervious areas. Salt generally passes through the basin soils, damaging the plants and polluting the receiving surface and groundwater resources.
- Prevent sediment from leaving construction sites. The more sediment that enters the basin, the sooner it will require expensive soil restoration or replanting.

MAINTENANCE FOR INFILTRATION BASINS

DO-IT-YOURSELF

There are some maintenance jobs that can—and should—be regularly attended to by the owner of the infiltration basin. This includes:

- Inspect and remove debris in the forebay, or near the inflow or outlet pipes, stone trench and spillway.
- Remove weeds by carefully spot-applying herbicide rather than by pulling. This is because pulling weeds disturbs the soil and provides an opening for invasive species to grow.
- Remove excessive dead plant material in the early spring.
- Replant with different species if an original plant dies out. The original plant may have been unsuitable for the soil type or degree of wetness.
- Water native plants during establishment only. Once established, watering won't be necessary.

ENLIST A PROFESSIONAL

Besides the maintenance that an owner can do, a qualified inspector should be hired annually to inspect and repair the following, as needed:

- The condition of the forebay, including the amount of sediment build-up or liner damage. Take soil cores if needed to evaluate liner. Patch holes and remove burrowing animals, if necessary.
- The condition of the pipes, swales or structures where water flows into and out of the basin.
- Erosion of side slopes, embankments, inlet/outlet, and emergency spillway, including the condition of rock riprap and underlying filter fabric.
- Detect the presence of invasive species. Develop a plan for their removal if necessary.
- Soft spots or settling that may have occurred in the embankment.
- Diagnose any reported prolonged ponding (more than three days). Evaluate the condition of the soils, taking core samples and testing infiltration rates, if needed.
- Burn every-other-year in April where feasible. Otherwise, mow in late spring or very early summer to a height of 4 to 6 inches. The purpose is to cut the weeds before they can go to seed, and do it before the native plants start to really shoot up. This cutting height generally requires a brush hog or similar device. A normal lawn mower will cut it too short.
- Remove any large trees growing in the embankment and re-compact the soil as needed.
- Develop plans to repair damaged structures, plantings or forebay liners, to remove sediment or enhance soil infiltration rates (aeration, tillage, etc.), if necessary.

For a sample inspection report, visit: www.waukeshacounty.gov/cleanwater.

Enforcement of Infiltration Basin Maintenance

Maintenance responsibilities for infiltration basins are usually documented as a deed restriction or a maintenance agreement that was recorded on the property when the basin was built. Maintenance can also be required through a local ordinance to meet clean water laws. The local municipality or storm water utility district is the likely regulatory agency for maintenance. Either way, the regulatory agency can require the owner(s) of an infiltration basin to perform and report inspections and to complete repairs and maintenance activities as needed. If the owner(s) fails to comply, the regulatory agency may resort to citations or other enforcement measures, or may perform the maintenance activities itself and recover the costs through special charges on the property tax bill.

Developed by Waukesha County Department of Parks & Land Use with funding from the Wisconsin Department of Natural Resources (2015).

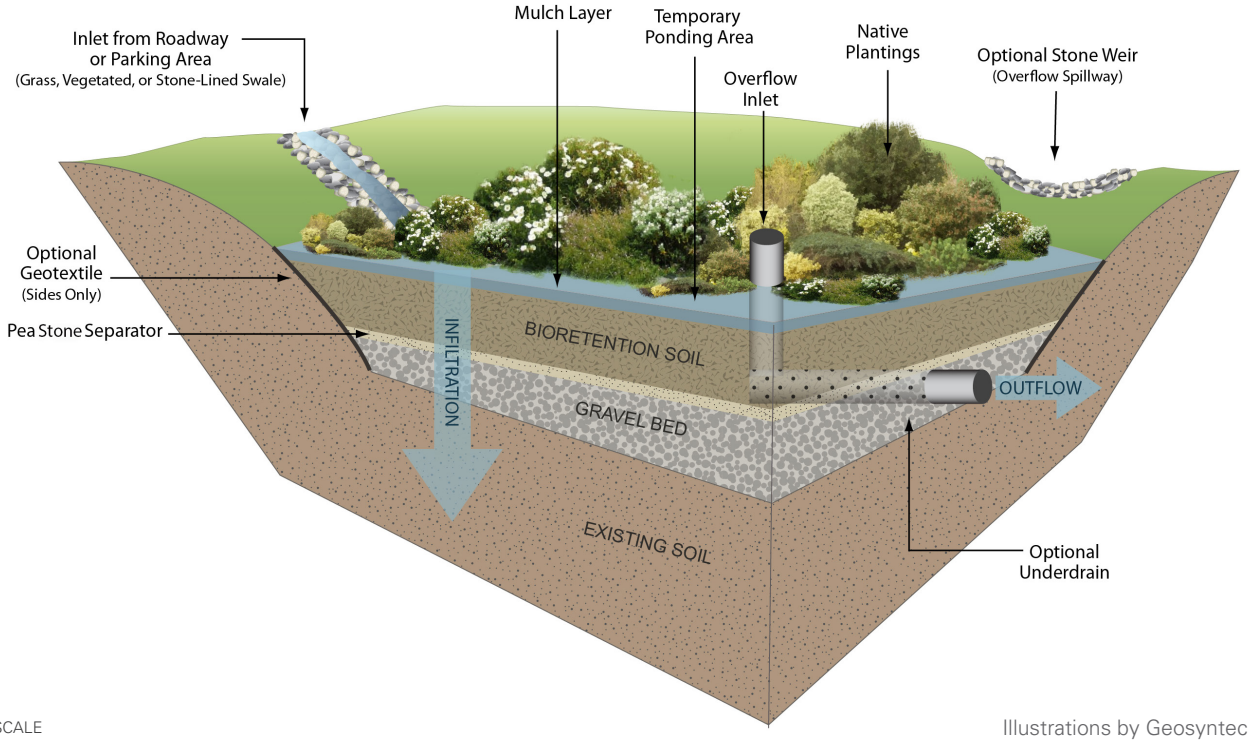
BIORETENTION BASINS

Guidelines for Maintenance

A **bioretention basin** is a storm water best management practice (BMP) that uses an engineered soil mix to reduce water pollution in urban runoff before it enters our lakes and streams. Runoff reaches the basin through a combination of underground pipes, ditches and overland flow. A bioretention basin is carefully designed to capture and treat runoff from small watersheds, usually less than two acres in size. Runoff will generally pond on the surface of the basin up to one foot in depth, but for no more than three days before it infiltrates. An overflow pipe and/or spillway will handle runoff events that exceed the design capacity. A small catch basin may be located near the inflow to trap sediment and other debris before it enters the basin.

In bioretention basins, the existing soil has been replaced with an engineered soil mix containing a high percentage of sand, intended to encourage infiltration and filter pollutants in the runoff. Under the engineered soil layer is a gravel bed that serves to temporarily store runoff, allowing it to infiltrate the underlying native soil. A perforated drainage pipe at the top of the gravel layer allows excess water to flow out of the basin, if necessary.

With this design, bioretention basins are commonly used in areas where the existing soil has a limited ability to absorb runoff. During the growing season, a cover of tall grasses and native wildflowers help make this BMP very effective at reducing water pollution, as illustrated below.



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Illustrations by Geosyntec Consultants, Inc.

THE NATIVE LANDSCAPE

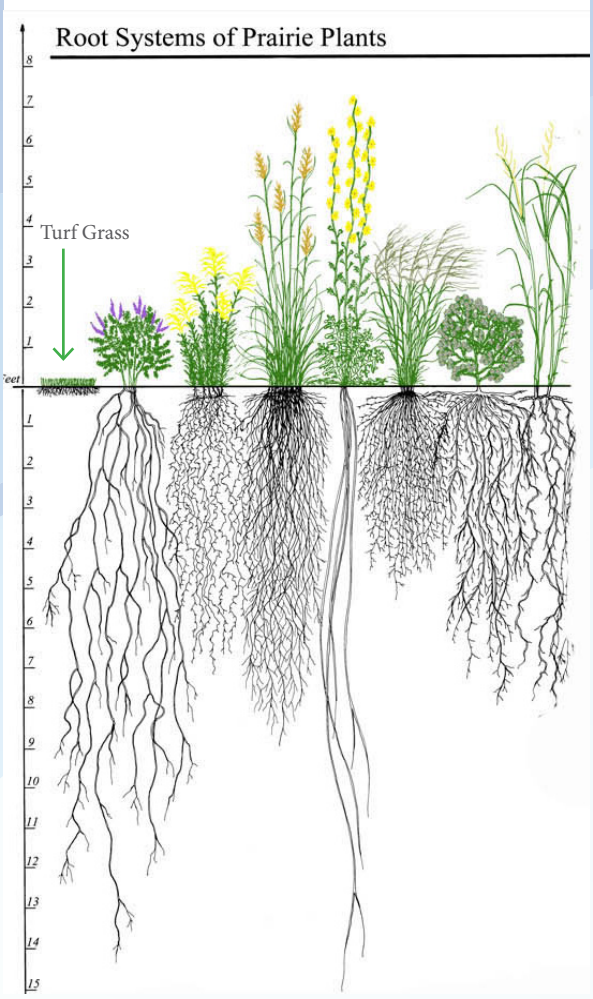


Image Source: Conservation Resource Institute

Before our landscape was developed, very little rainfall actually ran off the ground. Most of it soaked into the soil, where it was either used by plants or became part of the groundwater system. Native plants are used in bioretention basins to help replicate some of these conditions. Native plants have very deep root systems with as much as two-thirds of the plant being underground. This massive root system improves the soil, creating more pathways for infiltration, and making the basin more effective at soaking up runoff and filtering pollutants. By comparison, turf grass only has a few inches of root mass. Other benefits of using native plants include:

- Creating habitat and food sources for birds, butterflies, bees and other wildlife.
- Absorbing more nutrients in runoff like phosphorous and nitrogen, which cause algae blooms and excessive weed growth in lakes and streams.
- Improving aesthetics of the bioretention basin, providing year-round interest and color with a mix of wildflowers and grasses.
- Reducing maintenance needs (once established), such as mowing, watering (plants are drought resistant), or use of fertilizer or pesticide.

MANAGING THE WATERSHED: WHAT PROPERTY OWNERS CAN DO

In addition to maintaining the bioretention basin, there are actions that owners can take to manage the land that drains to the basin. The following will help extend the life of the basin and reduce water pollution at the same time:

- Regularly sweep litter and grass clippings off sidewalks, driveways, streets and parking lots.
- Test the soil in landscaped areas, and follow recommended application rates for fertilizers and pesticides.
- Pick up after pets to keep excess nutrients and bacteria out of the basin.
- Minimize salt application to impervious areas. Salt generally passes through the basin soils, damaging the plants and polluting the receiving surface and ground water resources.
- Prevent sediment from leaving construction sites. The more sediment that enters the basin, the sooner it will require expensive maintenance like replacing the engineered soil.

MAINTENANCE FOR BIORETENTION BASINS

DO-IT-YOURSELF

There are some maintenance jobs that can —and should —be regularly attended to by the owner of the bioretention basin. This includes:

- Inspect and remove debris and sediment in the inflow area or near the overflow pipe and spillway.
- Repair any erosion in the embankment or other areas. Staked erosion matting works best. Use plant plugs to replace native plants.
- Water native plants during establishment only. Once established, watering won't be necessary.
- Remove small trees and weeds by carefully spot-applying herbicide rather than by pulling. This is because pulling them disturbs the soil and provides an opening for invasive species to grow.
- Remove excessive dead plant material in the early spring.
- Replant with different species if an original plant dies out. The original plant may have been unsuitable for the soil type or degree of wetness.

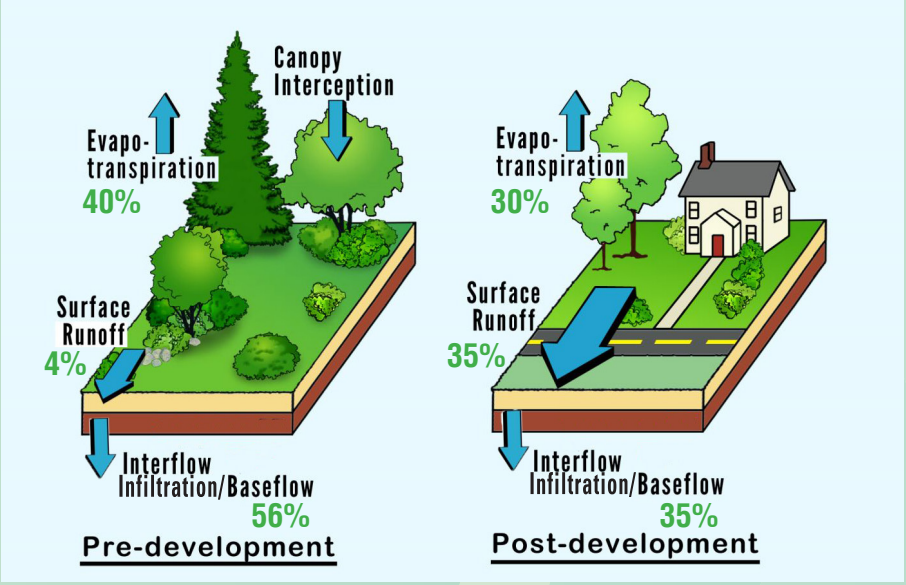
ENLIST A PROFESSIONAL

Besides the maintenance that an owner can do, a qualified inspector should be hired annually to inspect and repair the following, as needed:

- The underdrain system, checking for obstructions like roots, sediment or animal nests.
- The condition of outlet structures, checking for obstructions or damage.
- The observation pipe (if there is one), checking during dry spells to see if runoff is infiltrating out of the gravel storage layer.
- The condition of embankments, looking for soft spots, settling and erosion.
- Diagnose any reported prolonged ponding (more than THREE days).
- Collect soil cores to evaluate engineered soil and gravel layers, if necessary.
- Remove accumulated sediment on the surface, replace engineered soil, and/or reestablish native vegetation, as needed to improve performance.
- Burn every-other-year in April where feasible. Otherwise, mow in late spring or very early summer to a height of 4 to 6 inches. The purpose is to cut the weeds before they can go to seed, and do it before the native plants start to really shoot up. This cutting height generally requires a brush hog or similar device. A normal lawn mower will cut it too short.

For a sample inspection report, visit the Waukesha County website at www.waukeshacounty.gov/cleanwater.

Development greatly increases the amount of runoff. Runoff carries many different pollutants to our water bodies. At the same time, the amount of water that is able to soak into the ground and replenish groundwater is greatly reduced. About 80% of the population of Wisconsin relies on groundwater for their drinking water.



Enforcement of Biorention Maintenance

Maintenance responsibilities for bioretention basins are usually documented as a deed restriction or a maintenance agreement that was recorded on the property when the basin was built. Maintenance can also be required through a local ordinance to meet clean water laws. The local municipality or storm water utility district is the likely regulatory agency for maintenance. Either way, the regulatory agency can require the owner(s) of a bioretention basin to perform and report inspections and to complete repairs and maintenance activities as needed. If the owner(s) fails to comply, the regulatory agency may resort to citations or other enforcement measures, or may perform the maintenance activities itself and recover the costs through special charges on the property tax bill.

Developed by Waukesha County Department of Parks & Land Use with funding from the Wisconsin Department of Natural Resources (2015).

Appendix G

2015 Phosphorous Monitoring Reports for Battle Creek & Rosenow Creek

Water Action Volunteers

2015 Total Phosphorus Monitoring Program

Battle Creek at BB

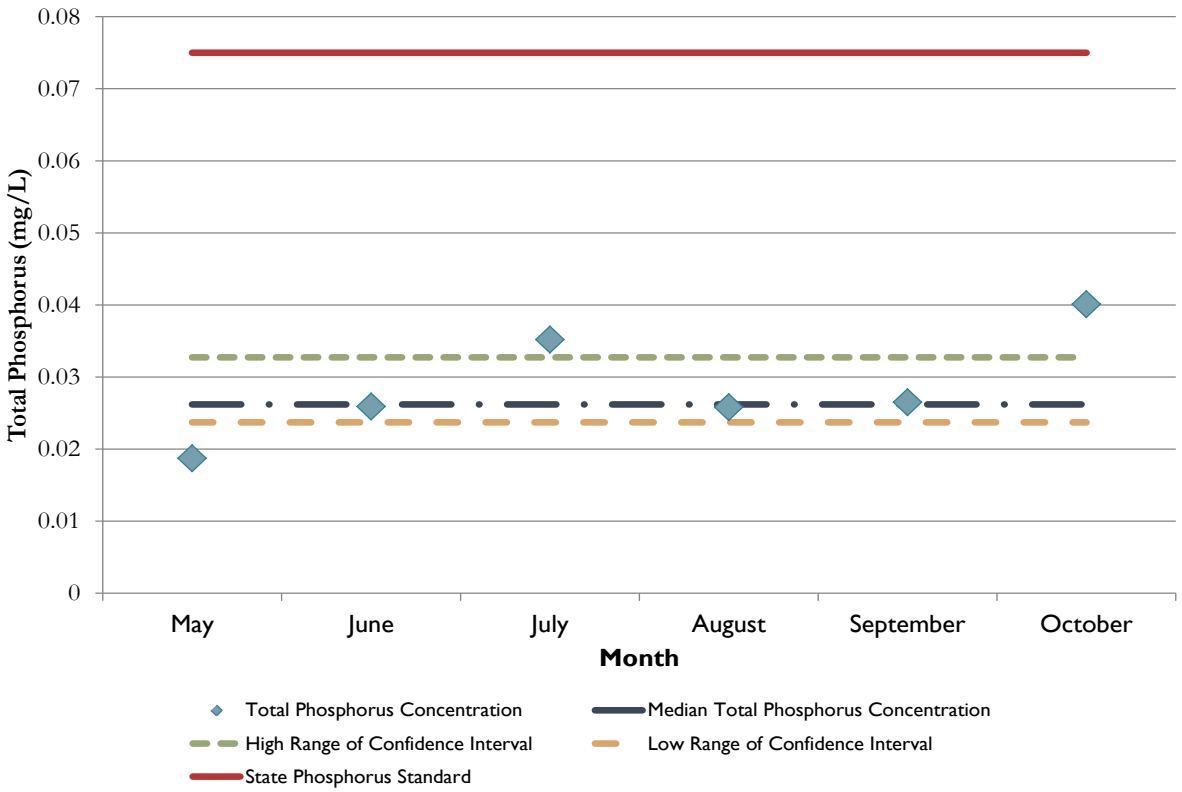
Richard Schlondrop

TP Criteria Met

Monitoring Site Quick Facts	
SWIMS Station ID	10029971
WBIC	848300
County	Waukesha
Watershed	Oconomowoc River
Watershed Area	130.86 sq miles
Total Stream Miles	136.99
Downstream Waterbody	Oconomowoc River

2015 Monitoring Results	
Minimum TP Value	0.0187 mg/L
Maximum TP Value	0.0401 mg/L
Median TP Value	0.0262 mg/L
No. Samples > 0.075mg/L	0

Map Legend ★ - Sampling Location for 2015



In 2015, the WAV program opened funding to active volunteers that were concerned about elevated total phosphorus levels in their local streams. WAV staff screened volunteer applications requesting funding to monitor phosphorus to ensure that data had not already been collected, and to allow available funds to be shared as broadly as possible. In a partnership with the Office of the Great Lakes, the result is that 97 WAV sites are currently being monitored by volunteers through this fantastic effort!

Why Phosphorus?

Phosphorus is an essential nutrient responsible for plant growth, but it is also the most visible, widespread water pollutant in Wisconsin lakes. Small increases in phosphorus levels can bring about substantial increases in aquatic plant and algae growth, which in turn can reduce the recreational use and aquatic biodiversity When the excess plants die and are decomposed, oxygen levels in the water drop dramatically which can lead to fish kills.

Additionally, one of the most common impairments in Wisconsin's streams is excess sediments that cover stream bottoms. Since phosphorus moves attached to sediments, it is intimately connected with this source of pollution in our streams. Phosphorus originates naturally from rocks, but its major sources in streams and lakes today are usually associated with human activities: soil erosion, human and animal wastes, septic systems, and runoff from farmland or lawns. Phosphorus-containing contaminants from urban streets and parking lots such as food waste, detergents, and paper products are also potential sources of phosphorus pollution from the surrounding landscape. The impact that phosphorus can have in streams is less apparent than in lakes due to the overall movement of water, but in areas with slow velocity, where sediment can settle and deposit along the bottom substrate, algae blooms can result.

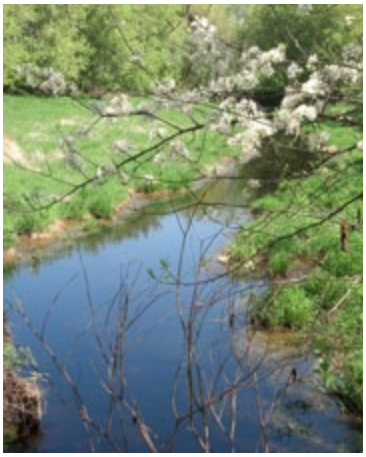




Photo credits to Matt Berg, David Seligman, Linda Warren, Adrian Konell, and Lindsey Albright (front)

Volunteer Monitoring Protocol

To assess in stream phosphorus levels, WAV volunteers collected water samples that were analyzed for total phosphorus (TP) at the State Lab of Hygiene during the growing season (May through October). Following Wisconsin Department of Natural Resources (WDNR) methods, six phosphorus water samples were collected at each monitoring site - one per month for each of the six months during the growing season, The water samples were collected approximately 30 days apart and no samples were collected within 15 days of one another.

A stream site is considered "impaired" if: 1) the lower 90% confidence limit of the sample median exceeds the state TP criterion of 0.075 mg/L or 0.1 mg/L or 2) there is corroborating WDNR biological data to support an adverse response in the fish or macroinvertebrate communities. If there is insufficient data for either of these requirements, more data will need to be collected in subsequent years before an impairment decision can be made. A site is designated as a "watch water" if the median total phosphorus concentration falls within the confidence limit and a site is considered to have "met criteria" is the upper limit of the confidence interval does not exceed the criterion.

PROJECT PARTNERS

WISCONSIN DEPT. OF NATURAL RESOURCES

Water Action Volunteers

ENVIRONMENTAL RESOURCES CENTER

UW Extension
University of Wisconsin-Extension

Water Action Volunteers

2015 Total Phosphorus Monitoring Program

Rosenow Creek at Wadebridge Road

Dan Holzmiller

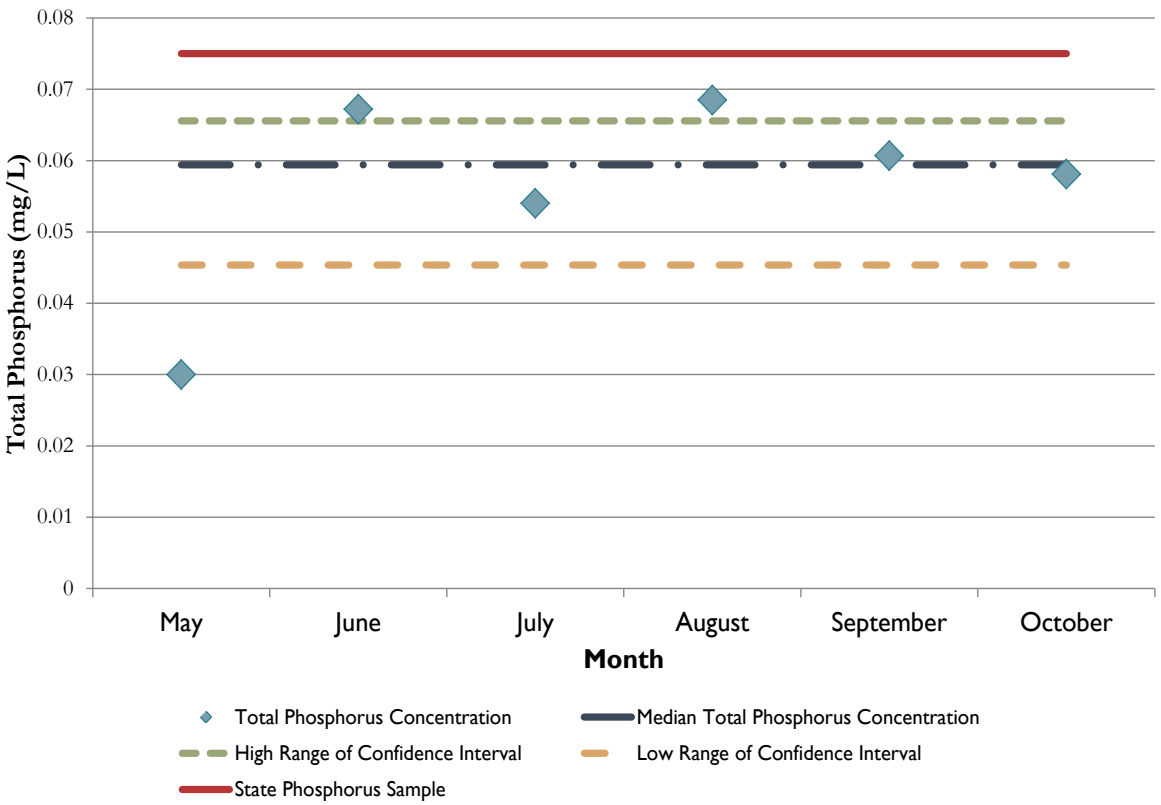
TP Criteria Met

Monitoring Site Quick Facts	
SWIMS Station ID	10032302
WBIC	848900
County	Waukesha
Watershed	Oconomowoc
Watershed Area	130.86 sq miles
Total Stream Miles	136.99
Downstream Waterbody	Lac La Belle

2015 Monitoring Results	
Minimum TP Value	0.03 mg/L
Maximum TP Value	0.0685 mg/L
Median TP Value	0.06 mg/L
No. Samples > 0.075mg/L	0

Map Legend ★ - Sampling Location for 2015

Total Phosphorus Concentration per Month



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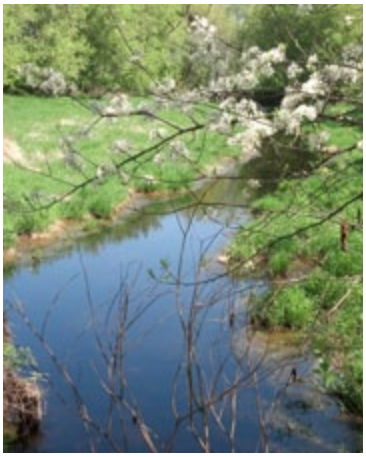


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Appendix H

City of Oconomowoc Adaptive Management Plan

December 2015

OCONOMOWOC WATERSHED PROTECTION PROGRAM

CITY OF OCONOMOWOC
WAUKESHA COUNTY, WISCONSIN

DECEMBER 2015

Copy of this Adaptive Management report can be obtained from the City of Oconomowoc or WDNR.

RUEKERT/MIELKE
W233 N2080 Ridgeview Parkway
Waukesha, Wisconsin 53188-1020