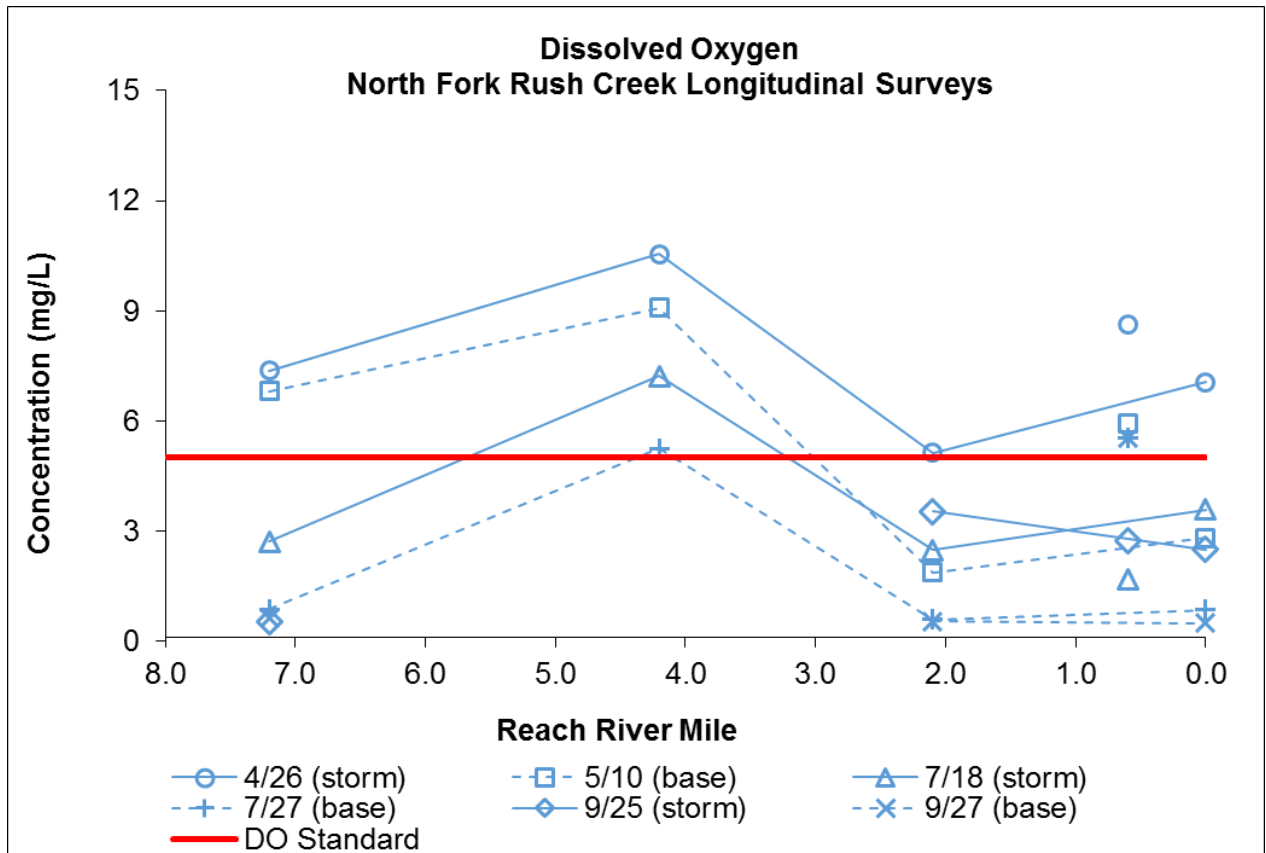
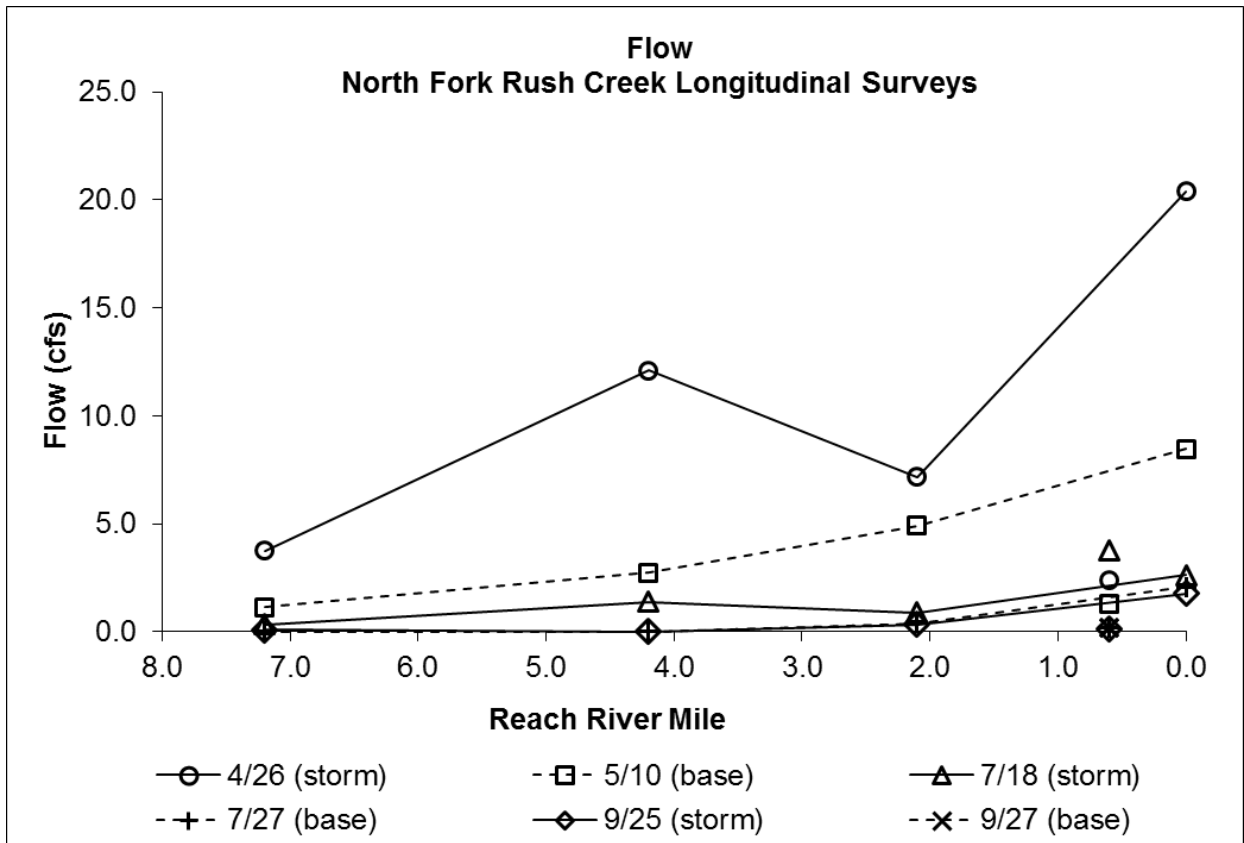
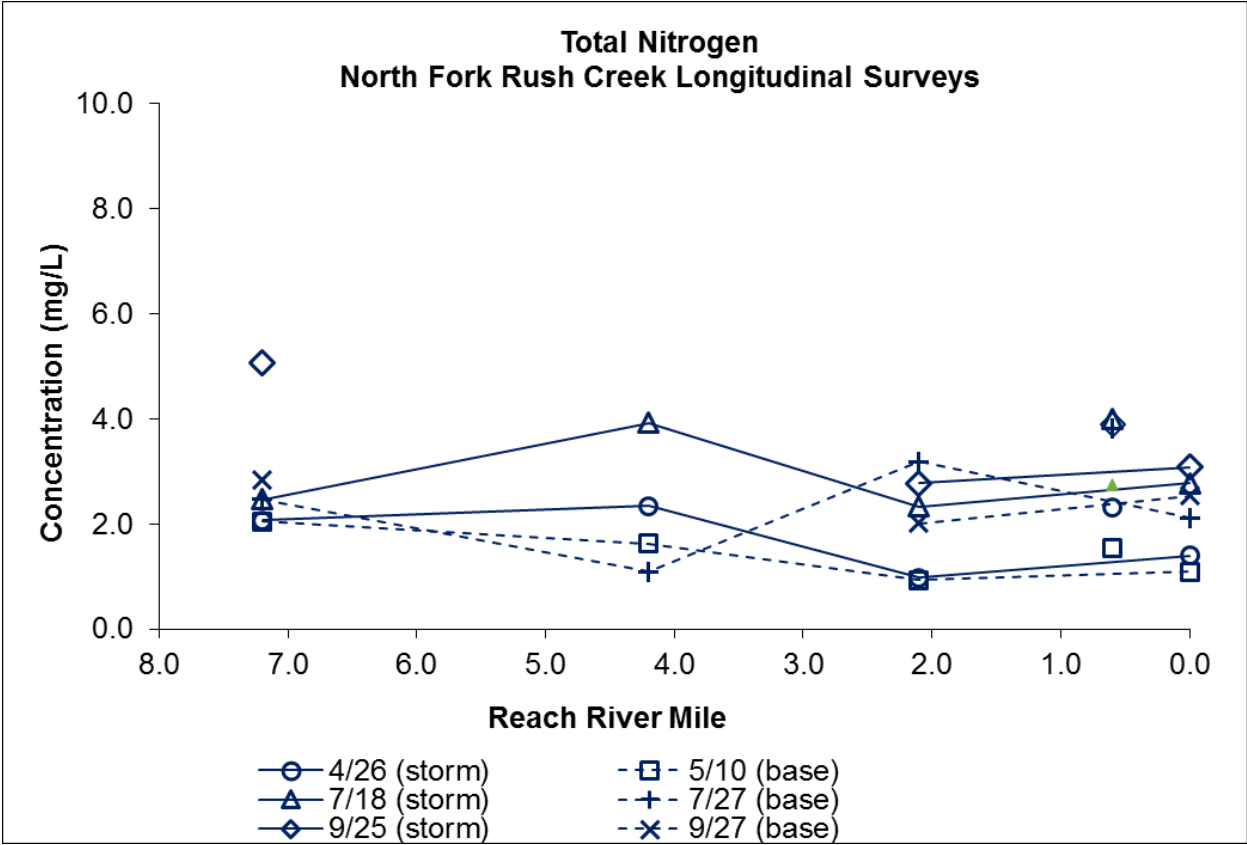
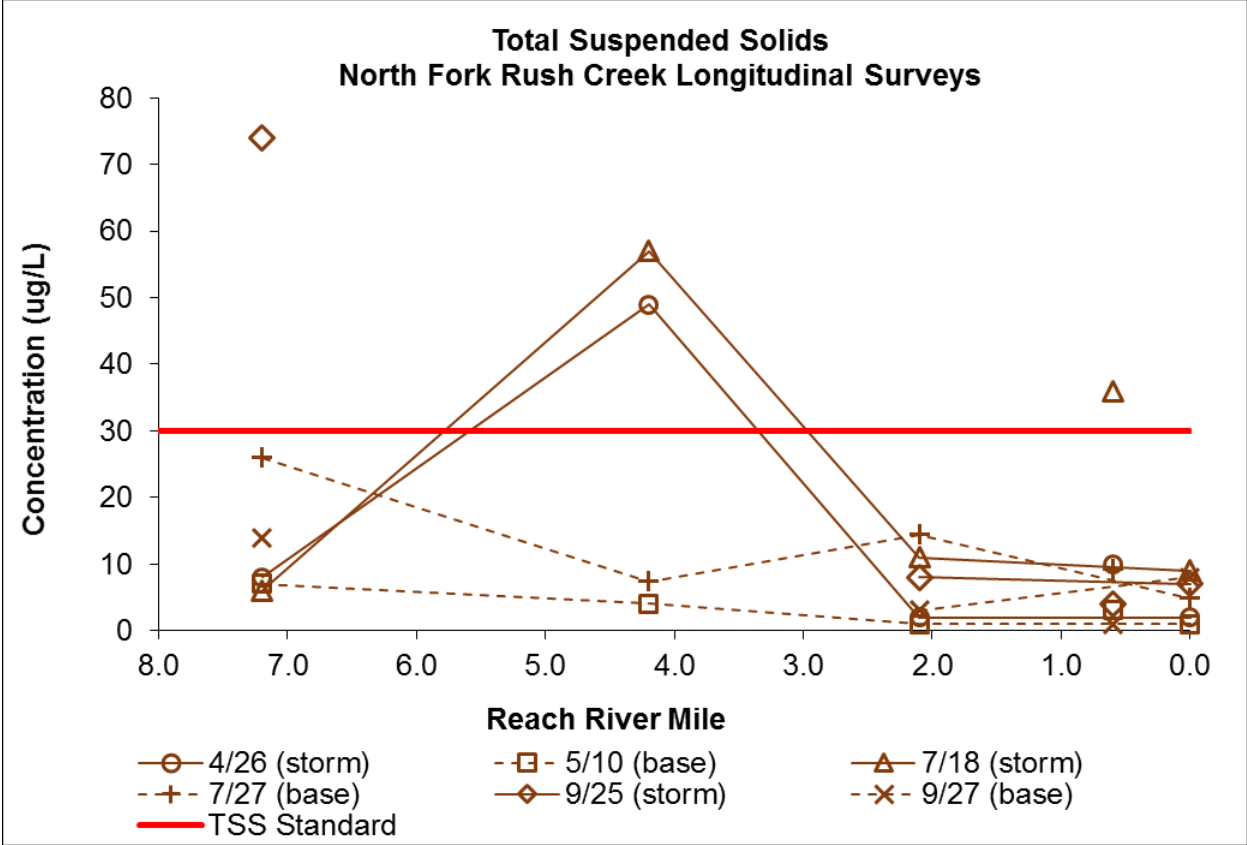
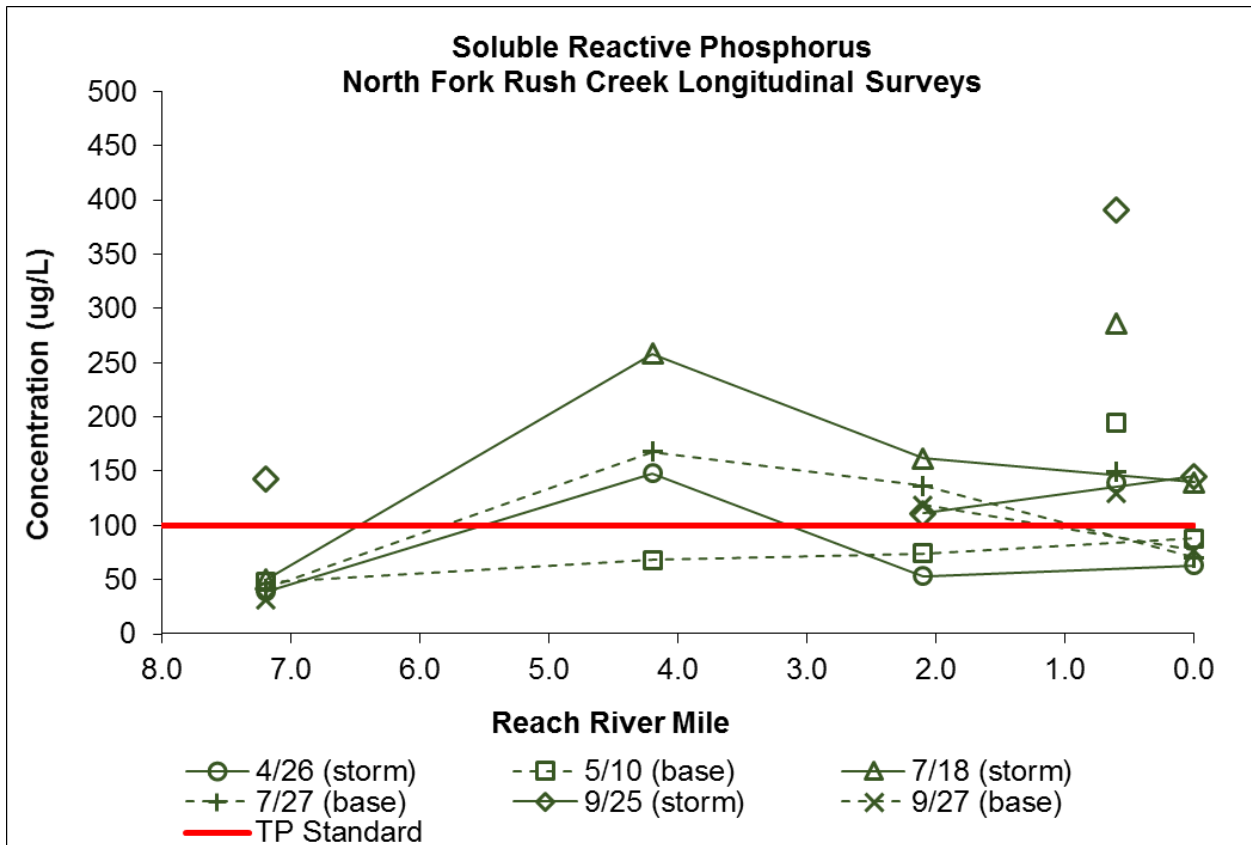
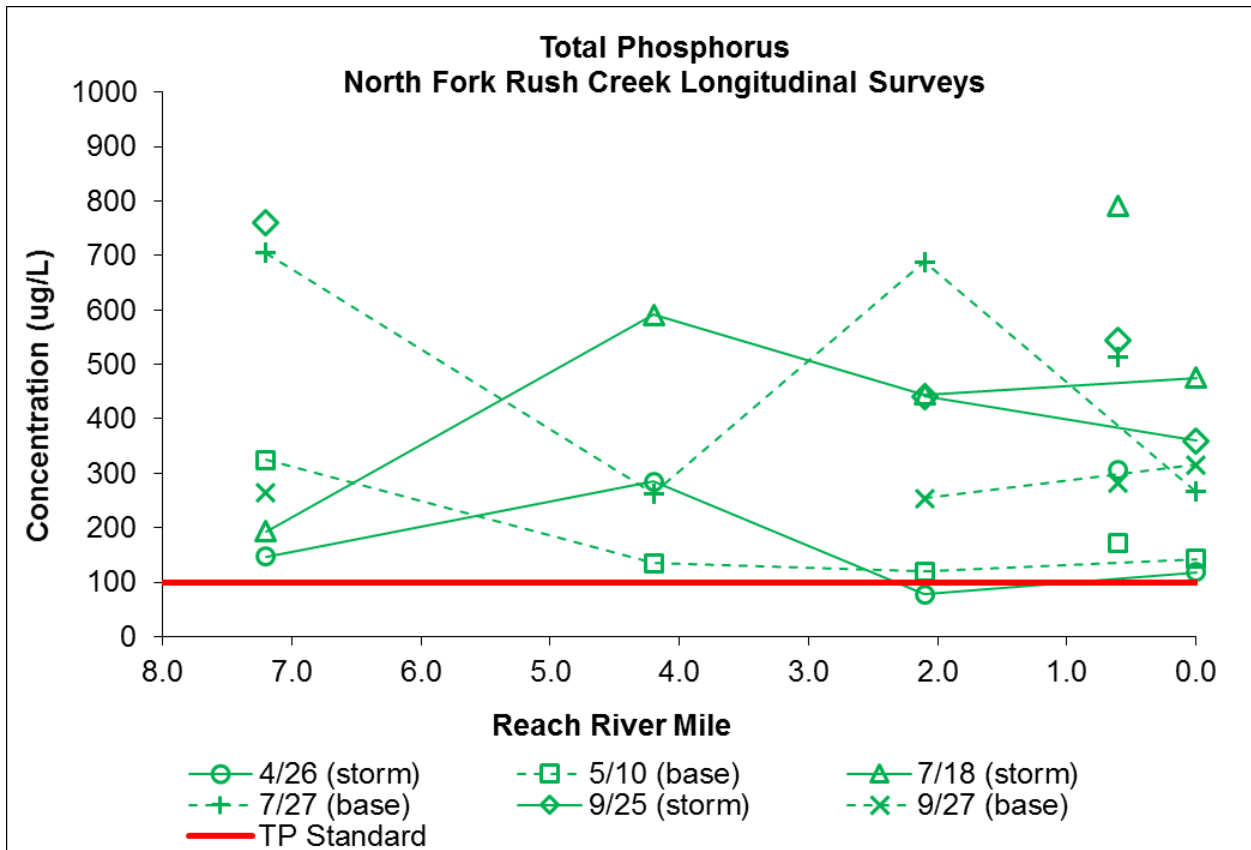


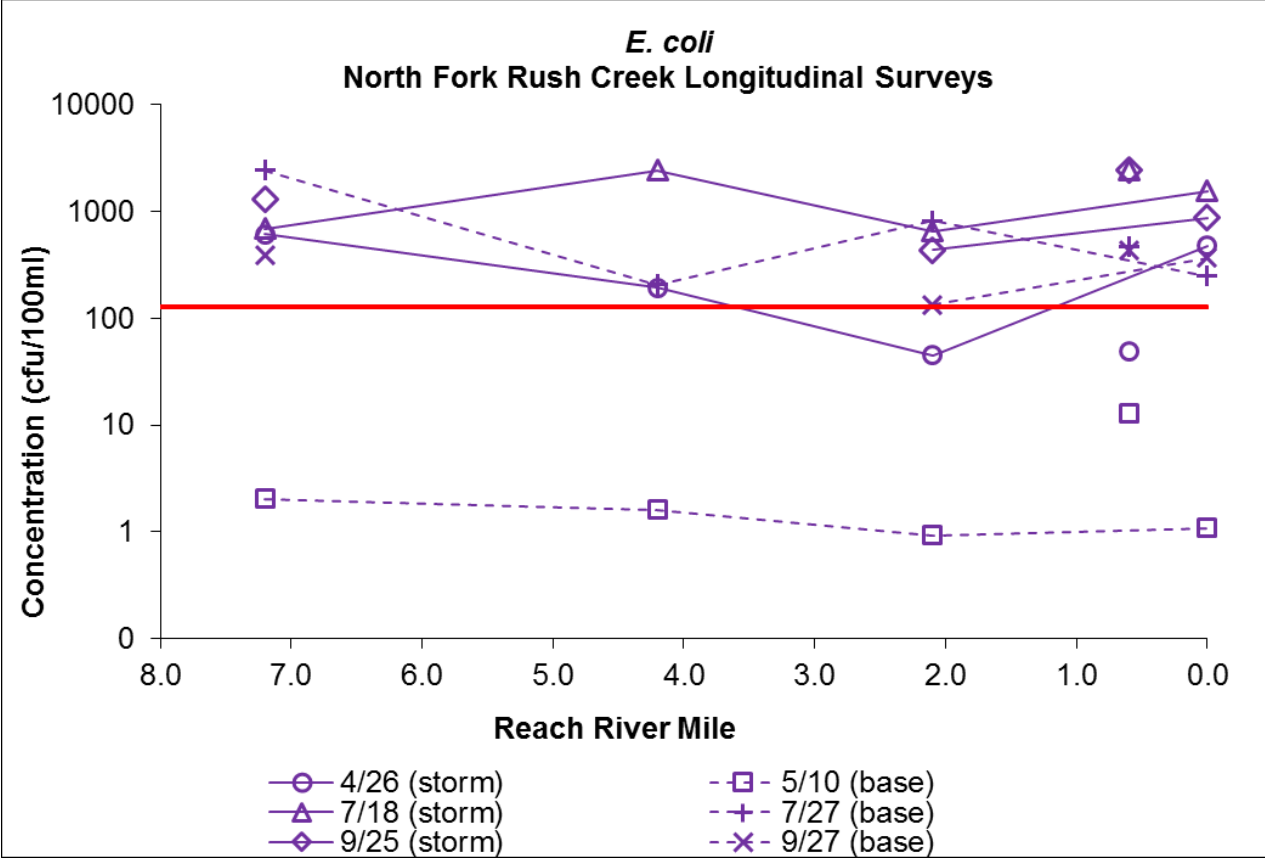
# **APPENDIX A**

## **Water Quality Monitoring Data**









# **APPENDIX B**

## **GIS Data used for Assessment**

**Table B-1: Specific data, tools, GIS layers compiled for Rush Creek SWA**

Tool	Type	Source	Notes/Description
303d Impairment List	Tabular Data (Assessment)	MPCA	Lake and stream impairments throughout watershed
SWAT	GIS and Tabular Data (Model Output)	Elm Creek TMDL Studies	SWAT predicted land use loading rates and delivery
State Funded Conservation Easements (RIM Reserve)	GIS Data (GIS Layer)	BWSR	
Minnesota Wetland Banking Program Easements	GIS Data (GIS Layer)	BWSR	
Restorable Wetlands Index (RWI)	GIS Data (GIS Layer)	University of Minnesota Duluth	Tool using readily available GIS data consisting of 5 primary layers to identify potential locations for wetland restorations
MPCA Registered Feedlots	GIS Data (GIS Layer)	MPCA	Only includes registered feedlot information
TRPD Feedlot Analysis	GIS Data (GIS Layer)	TRPD - Elm Creek TMDL	Livestock animal locations based on desktop (pictometry) analysis
National Wetlands Index (NWI)	GIS Data (GIS Layer)	MN DNR	Wetland index updated for southern and eastern Minnesota
State Aquatic Management Area Acquisitions	GIS Data (GIS Layer)	MN DNR	
State Aquatic Management Area Acquisitions	GIS Data (GIS Layer)	MN DNR	
Revised Universal Soil Loss Equation (RUSLE)	GIS Data (GIS Layer)	This study	The RUSLE was calculated for the entire Rush Creek SWA Study Area for the purposes of this study using the following GIS Layers: <ul style="list-style-type: none"> <li>• USGS NED, 2016</li> <li>• National Land Cover Dataset, USGS, 2015</li> <li>• SSURGO Soil Database</li> </ul>
Potential Tile Drained Areas	GIS Data (GIS Layer)	This study	Raster analysis using methodology developed by Brown (2009) to predict location of land drained by subsurface systems using the following GIS Layers: <ul style="list-style-type: none"> <li>• SSURGO Soil Database</li> <li>• National Land Cover Dataset, USGS, 2015</li> <li>• USGS NED, 2016</li> </ul>

# **APPENDIX C**

## **Detailed BMP Methodology and Assumptions**



### **Bioreactor BMP Design and Cost Assumptions**

<b>Design Inputs</b>	
DA	AC (site specific)
Bioreactor	SF (assume 5% of DA)
Length	FT (site specific)
Width	FT (site specific)
Depth	6 FT
Excavation Volume	CY (site specific)
Bioreactor Volume	CY (site specific)
Note: standard depth of bioreactor 4 FT, but excavate down to draitile so add 2 FT	

<b>Cost Estimate Assumptions</b>		
<b>Item</b>	<b>Unit</b>	<b>Cost</b>
<b>Construction Costs</b>		
Mobilization	LS	\$1,500
Control Structure	EA	\$1,500
Excavation	CY	\$5
Woodchip	CY	\$40
Drain Tile	LF	\$2
Liner	LF	\$10
Restoration & EC	LS	\$500
<b>Life-cycle Cost Considerations</b>		
Design, Contingency	EA	30% construction
Annual Maintenance	Annual	5% construction

### Grassed Waterway BMP Design and Cost Assumptions

Design Inputs	
DA	AC
Length	FT (site specific)
Bottom width	15 FT
Depth	1.5 FT
Side slope	1:6
Volume	CF (site specific)

Cost Estimate Assumptions		
Item	Unit	Cost
Construction Costs		
Mobilization	LS	\$ 1,500
Grading/Excavation	CY	\$ 5
Seeding	AC	\$ 250
Riprap	CY	\$ 150
Restoration & EC	LS	\$ 500
Life-cycle Cost Considerations		
Easement	AC	\$ 5,000
Design, Contingency	EA	30% construction
Annual Lost Production Costs	AC	\$ 800
Annual Maintenance	Annual	5% construction

### **Saturated Buffer BMP Design and Cost Assumptions**

<b>Design Inputs</b>	
DA	AC (site specific)
Length	FT (site specific)
Width	30 FT
Depth	1 FT
Pipe Diameter	4 IN
Pipe Flow	0.0743 CFS
Treatment Volume Capacity	39.8 AC-FT
Other Assumptions: - 60% pipe flow; n = 0.01; slope = 0.002 - 9 out of 12 months have pipe flow - Flow to BMP is 50/50 surface/subsurface	

<b>Cost Estimate Assumptions</b>		
<b>Item</b>	<b>Unit</b>	<b>Cost</b>
<b>Construction Costs</b>		
Mobilization	LS	\$1,500
Control Structure	EA	\$1,500
Anti-seep Collar	EA	\$500
Additional Tile	LF	\$2
Seeding	AC	\$250
Outlet RR	CY	\$150
Restoration & EC	LS	\$500
<b>Life-cycle Cost Considerations</b>		
Design, Contingency	EA	40% construction
Annual Maintenance	Annual	5% construction

### **ATI BMP Design and Cost Assumptions**

<b>Design Inputs</b>	
DA	AC (site specific)
ATI/DA	1/4
Other Assumptions: - Flow to BMP is 50/50 surface/subsurface	

<b>Cost Estimate Assumptions</b>		
<b>Item</b>	<b>Unit</b>	<b>Cost</b>
<b>Construction Costs</b>		
Mobilization	LS	\$1,500
ATI Installation	EA	\$600
<b>Life-cycle Cost Considerations</b>		
Design, Contingency	EA	30% construction
Annual Maintenance	Annual	5% construction

### Wetland Restoration (Depression Area) BMP Design and Cost Assumptions

Design Inputs	
DA	AC (site specific)
Dead Pool Area	AC (site specific)
Flood Pool Area	AC (1/2 Dead Pool)
Dead Pool Volume	AC-FT (site specific)
Flood Pool Volume	AC-FT (site specific)
Max Depth	FT (site specific)
Ave Depth	FT (1/3 Max Depth)
Treatment Volume Capacity	AC-FT (MN SW Manual)

Cost Estimate Assumptions		
Item	Unit	Cost
Construction Costs		
Mobilization	LS	\$1,500
Outlet Control Structure	EA	\$5,000
Seeding	AC	\$600
Breaking Tile Lines	EA	\$500
Life-cycle Cost Considerations		
Design, Contingency	EA	50% construction
Wetland Delineation	EA	\$2,500
Wetland Permitting	EA	\$3,000
Easement	AC	\$10,000
Annual Maintenance	Annual	\$150

## Wetland Restoration (Nutrient Removal Wetlands) BMP Design and Cost Assumptions

Design Inputs	
DA	AC (site specific)
Dead Pool Area	AC (site specific)
Flood Pool Area	AC (1/2 Dead Pool)
Dead Pool Volume	AC-FT (site specific)
Flood Pool Volume	AC-FT (site specific)
Max Depth	FT (site specific)
Ave Depth	FT (1/3 Max Depth)
Treatment Volume Capacity	AC-FT (MN SW Manual)

Cost Estimate Assumptions		
Item	Unit	Cost
Construction Costs		
Mobilization	LS	\$1,500
Outlet Control Structure	EA	\$5,000
Seeding	AC	\$600
Life-cycle Cost Considerations		
Design, Contingency	EA	\$10,000
Wetland Delineation	EA	\$3,000
Wetland Permitting	EA	\$3,500
Easement	AC	\$10,000
Annual Maintenance	Annual	\$150

# **APPENDIX D**

## **Potential BMPs by Management Unit**

**Table D-1: Complete list of potential BMPs for the Upper Rush Creek Management Unit**

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
ATI	DP-52	--	6.3	6.5	\$5,100	\$10,200	--	\$80	\$80	Low
ATI	DP-53	--	1.1	1.2	\$2,100	\$4,200	--	\$190	\$180	Low
ATI	DP-54	--	1.0	1.1	\$2,100	\$4,200	--	\$210	\$200	Low
ATI	DP-55	--	0.6	0.6	\$2,100	\$4,200	--	\$370	\$360	Med
ATI	DP-56	--	0.5	0.5	\$2,100	\$4,200	--	\$400	\$380	High
ATI	DP-57	--	0.7	0.7	\$2,100	\$4,200	--	\$310	\$300	High
ATI	DP-58	--	13.8	14.3	\$9,300	\$18,600	--	\$70	\$60	Med
ATI	DP-59	--	2.5	2.6	\$2,700	\$5,400	--	\$110	\$100	High
ATI	DP-60	--	0.4	0.4	\$2,100	\$4,200	--	\$550	\$530	Low
ATI	DP-61	--	8.4	8.7	\$6,300	\$12,600	--	\$80	\$70	Med
ATI	DP-62	--	2.0	2.1	\$2,700	\$5,400	--	\$140	\$130	Med
ATI	DP-63	--	1.3	1.3	\$2,100	\$4,200	--	\$170	\$160	Low
ATI	DP-64	--	11.8	12.2	\$8,100	\$16,200	--	\$70	\$70	Low
ATI	DP-65	--	8.5	8.8	\$6,300	\$12,600	--	\$70	\$70	Med
ATI	DP-66	--	3.1	3.2	\$3,300	\$6,600	--	\$110	\$100	High
ATI	DP-67	--	6.6	6.9	\$5,100	\$10,200	--	\$80	\$70	Low
ATI	DP-68	--	1.8	1.8	\$2,700	\$5,400	--	\$150	\$150	Low
Bioreactor	BR-6	--	5.8	4.1	\$11,000	\$21,900	--	\$190	\$270	Low
Bioreactor	BR-7	--	7.9	5.6	\$12,500	\$24,900	--	\$160	\$220	High
Bioreactor	BR-8	--	6.7	4.7	\$11,600	\$23,200	--	\$170	\$250	Med
Bioreactor	BR-9	--	6.1	4.3	\$11,200	\$22,400	--	\$180	\$260	Low
G. Waterway	GW-24	--	10.7	15.2	\$11,200	\$37,600	--	\$180	\$120	Med
G. Waterway	GW-25	--	5.2	7.4	\$7,500	\$21,100	--	\$200	\$140	Med
G. Waterway	GW-26	--	2.9	4.1	\$5,400	\$11,800	--	\$200	\$140	Med
G. Waterway	GW-27	--	7.5	10.7	\$9,100	\$28,200	--	\$190	\$130	Med
G. Waterway	GW-28	--	2.4	3.4	\$6,200	\$15,200	--	\$310	\$220	Med
G. Waterway	GW-29	--	11.9	16.9	\$12,500	\$43,300	--	\$180	\$130	High
G. Waterway	GW-30	--	5.4	7.7	\$6,400	\$16,300	--	\$150	\$110	High
G. Waterway	GW-31	--	6.9	9.8	\$8,800	\$26,900	--	\$200	\$140	Med



BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
G. Waterway	GW-32	--	4.2	6.0	\$7,600	\$21,400	--	\$250	\$180	Med
G. Waterway	GW-33	--	3.8	5.4	\$6,500	\$16,700	--	\$220	\$150	High
G. Waterway	GW-34	--	6.8	9.6	\$6,200	\$15,400	--	\$110	\$80	Med
G. Waterway	GW-35	--	11.1	15.8	\$14,900	\$53,900	--	\$240	\$170	Med
Sat. Buffer	SB-10	--	2.1	2.2	\$8,000	\$13,700	--	\$320	\$310	High
Sat. Buffer	SB-11	--	3.0	3.1	\$8,100	\$13,900	--	\$230	\$220	High
Sat. Buffer	SB-12	--	3.4	3.5	\$8,100	\$14,000	--	\$210	\$200	High
Sat. Buffer	SB-13	--	4.0	4.1	\$8,200	\$14,100	--	\$180	\$170	High
Sat. Buffer	SB-14	--	2.1	2.2	\$8,000	\$13,700	--	\$320	\$310	High
Sat. Buffer	SB-15	--	4.9	5.0	\$8,300	\$14,300	--	\$150	\$140	High
Sat. Buffer	SB-16	--	6.7	6.9	\$8,500	\$14,600	--	\$110	\$110	High
Sat. Buffer	SB-17	--	4.0	4.1	\$8,200	\$14,100	--	\$180	\$170	High
Sat. Buffer	SB-8	--	2.7	2.8	\$8,100	\$13,800	--	\$250	\$240	High
Sat. Buffer	SB-9	--	5.5	5.7	\$8,400	\$14,400	--	\$130	\$130	High
Wetland Rest.	WR-4	20.0	46.8	48.5	\$119,800	\$140,200	\$400	\$150	\$140	High
Wetland Rest.	DP-52	4.4	74.2	13.1	\$101,200	\$109,400	\$900	\$70	\$420	Low
Wetland Rest.	DP-53	2.7	0.6	2.3	\$25,200	\$26,100	\$4,600	\$2,050	\$560	Low
Wetland Rest.	DP-54	6.5	1.9	2.1	\$27,400	\$28,500	\$1,500	\$760	\$680	Low
Wetland Rest.	DP-55	6.6	1.6	1.2	\$29,700	\$31,100	\$1,100	\$1,000	\$1,330	Med
Wetland Rest.	DP-56	1.3	0.5	1.1	\$19,600	\$20,000	\$2,200	\$2,120	\$910	High
Wetland Rest.	DP-57	0.5	0.2	1.4	\$20,300	\$20,800	\$8,500	\$6,250	\$740	High
Wetland Rest.	DP-58	0.5	248.6	39.6	\$118,000	\$127,800	\$1,000	\$30	\$160	Med
Wetland Rest.	DP-59	5.9	2.4	5.2	\$28,200	\$29,400	\$3,000	\$600	\$280	High
Wetland Rest.	DP-60	0.7	0.5	0.8	\$21,300	\$21,900	\$1,500	\$2,020	\$1,390	Low
Wetland Rest.	DP-61	0.2	229.5	54.3	\$81,600	\$88,000	\$1,000	\$20	\$80	Med
Wetland Rest.	DP-62	1.8	2.9	4.1	\$36,800	\$38,900	\$2,600	\$670	\$470	Med
Wetland Rest.	DP-63	0.3	0.6	2.6	\$25,200	\$26,200	\$5,900	\$2,330	\$500	Low
Wetland Rest.	DP-64	0.9	225.5	35.5	\$105,500	\$114,100	\$900	\$30	\$160	Low
Wetland Rest.	DP-65	0.1	92.9	35.6	\$79,100	\$85,200	\$1,600	\$50	\$120	Med
Wetland Rest.	DP-66	0.4	3.2	6.6	\$35,400	\$37,300	\$3,700	\$580	\$280	High

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
Wetland Rest.	DP-67	1.4	17.6	13.7	\$50,700	\$54,100	\$2,000	\$150	\$200	Low
Wetland Rest.	DP-68	0.7	6.4	3.7	\$37,400	\$39,500	\$1,100	\$310	\$540	Low

**Table D-2: Complete list of potential BMPs for the Lake Jubert Management Unit**

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
ATIs	DP-41	--	5.0	4.5	\$3,300	\$6,600	--	\$70	\$70	Low
ATIs	DP-42	--	11.3	10.2	\$6,300	\$12,600	--	\$60	\$60	Low
ATIs	DP-43	--	1.7	1.5	\$2,100	\$4,200	--	\$120	\$140	Low
ATIs	DP-44	--	1.3	1.4	\$2,100	\$4,200	--	\$160	\$150	Low
ATIs	DP-45	--	18.8	17.0	\$9,300	\$18,600	--	\$50	\$50	Low
ATIs	DP-46	--	12.2	12.7	\$8,700	\$17,400	--	\$70	\$70	Low
ATIs	DP-47	--	2.4	2.2	\$2,700	\$5,400	--	\$110	\$120	Med
ATIs	DP-48	--	6.2	5.6	\$3,900	\$7,800	--	\$60	\$70	Med
ATIs	DP-49	--	0.5	0.5	\$2,100	\$4,200	--	\$400	\$450	Med
ATIs	DP-50	--	3.6	3.2	\$2,700	\$5,400	--	\$80	\$80	Med
ATIs	DP-51	--	2.8	2.5	\$2,700	\$5,400	--	\$100	\$110	Med
Bioreactor	BR-4	--	8.7	5.3	\$11,200	\$22,400	--	\$130	\$210	Low
Bioreactor	BR-5	--	7.4	4.5	\$10,500	\$21,000	--	\$140	\$230	Med
G. Waterway	GW-19	--	26.8	33.2	\$19,600	\$74,400	--	\$140	\$110	Low
G. Waterway	GW-20	--	2.9	3.6	\$5,600	\$12,700	--	\$220	\$180	Low
G. Waterway	GW-21	--	9.0	11.2	\$9,300	\$29,000	--	\$160	\$130	Low
G. Waterway	GW-22	--	7.9	9.8	\$8,400	\$25,100	--	\$160	\$130	Low
G. Waterway	GW-23	--	1.6	2.0	\$5,300	\$11,400	--	\$350	\$290	Low
Sat. Buffer	SB-7	--	3.5	3.1	\$8,000	\$13,800	--	\$200	\$220	High
Wetland Rest.	DP-41	0.2	0.7	3.1	\$21,900	\$22,600	\$5,900	\$1,720	\$360	Low
Wetland Rest.	DP-42	1.8	40.3	20.4	\$56,700	\$60,600	\$1,700	\$80	\$150	Low
Wetland Rest.	DP-43	1.8	6.2	3.1	\$33,300	\$35,100	\$1,000	\$280	\$570	Low
Wetland Rest.	DP-44	2.7	7.3	2.8	\$37,900	\$40,100	\$700	\$280	\$720	Low
Wetland Rest.	DP-45	10.0	375.3	34.0	\$123,400	\$133,700	\$700	\$20	\$200	Low
Wetland Rest.	DP-46	11.6	283.1	25.3	\$152,800	\$165,900	\$700	\$30	\$330	Low
Wetland Rest.	DP-47	14.9	71.6	4.3	\$298,000	\$325,000	\$1,100	\$230	\$3,740	Med
Wetland Rest.	DP-48	0.1	0.2	1.8	\$20,100	\$20,600	\$9,500	\$4,810	\$580	Med
Wetland Rest.	DP-49	0.8	0.8	0.9	\$23,200	\$23,900	\$1,500	\$1,430	\$1,270	Med
Wetland Rest.	DP-50	0.2	0.7	3.1	\$22,900	\$23,700	\$6,200	\$1,780	\$380	Med

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
Wetland Rest.	DP-51	1.6	8.6	5.0	\$37,900	\$40,000	\$1,300	\$230	\$400	Med

**Table D-3: Complete list of potential BMPs for the Lower Rush Creek Management Unit**

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
ATIs	DP-71	--	7.0	5.8	\$5,100	\$10,200	--	\$70	\$90	Low
ATIs	DP-72	--	9.6	7.9	\$6,300	\$12,600	--	\$70	\$80	Med
ATIs	DP-73	--	8.4	7.0	\$5,700	\$11,400	--	\$70	\$80	High
ATIs	DP-74	--	1.5	1.3	\$2,100	\$4,200	--	\$140	\$170	Low
ATIs	DP-75	--	4.3	3.6	\$3,300	\$6,600	--	\$80	\$90	Low
ATIs	DP-76	--	0.4	1.1	\$2,100	\$4,200	--	\$590	\$190	High
ATIs	DP-77	--	0.4	1.2	\$2,100	\$4,200	--	\$570	\$180	Med
ATIs	DP-78	--	6.2	5.1	\$4,500	\$9,000	--	\$70	\$90	Med
ATIs	DP-79	--	0.4	1.2	\$2,100	\$4,200	--	\$550	\$170	High
ATIs	DP-80	--	0.4	1.4	\$2,700	\$5,400	--	\$630	\$200	Low
ATIs	DP-81	--	8.6	12.7	\$7,500	\$15,000	--	\$90	\$60	High
ATIs	DP-82	--	3.3	4.8	\$3,900	\$7,800	--	\$120	\$80	High
ATIs	DP-83	--	0.5	1.3	\$4,500	\$9,000	--	\$840	\$340	Low
ATIs	DP-84	--	0.7	1.8	\$5,100	\$10,200	--	\$710	\$290	High
ATIs	DP-85	--	0.1	0.3	\$2,100	\$4,200	--	\$1,870	\$760	High
Bioreactor	BR-11	--	1.0	2.1	\$9,400	\$18,900	--	\$970	\$450	Med
Bioreactor	BR-12	--	1.7	1.7	\$8,300	\$16,600	--	\$480	\$480	Med
Bioreactor	BR-13	--	2.9	3.0	\$9,400	\$18,900	--	\$320	\$320	Med
G. Waterway	GW-38	--	5.8	6.6	\$8,200	\$24,100	--	\$210	\$180	High
G. Waterway	GW-39	--	4.0	4.6	\$7,200	\$19,900	--	\$250	\$220	Med
G. Waterway	GW-40	--	7.7	8.7	\$7,100	\$19,100	--	\$120	\$110	Med
G. Waterway	GW-41	--	4.5	5.1	\$7,300	\$20,100	--	\$220	\$200	Med
G. Waterway	GW-42	--	1.9	8.2	\$8,400	\$25,300	--	\$660	\$150	High
G. Waterway	GW-43	--	1.1	4.8	\$5,900	\$13,800	--	\$620	\$140	High
G. Waterway	GW-44	--	1.7	7.2	\$8,900	\$27,400	--	\$830	\$190	Low
G. Waterway	GW-45	--	3.3	6.6	\$6,100	\$15,000	--	\$230	\$110	Med
G. Waterway	GW-46	--	4.3	8.8	\$7,400	\$20,700	--	\$240	\$120	High
G. Waterway	GW-47	--	0.2	0.8	\$6,300	\$16,000	--	\$3,310	\$980	Med
G. Waterway	GW-48	--	0.4	1.2	\$6,200	\$15,400	--	\$2,150	\$640	Med

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
Sat. Buffer	SB-19	--	5.8	4.8	\$8,300	\$14,300	--	\$120	\$150	High
Sat. Buffer	SB-20	--	1.7	2.5	\$8,000	\$13,700	--	\$400	\$270	High
Sat. Buffer	SB-21	--	0.7	2.3	\$8,100	\$13,800	--	\$950	\$300	High
Sat. Buffer	SB-22	--	1.3	4.1	\$8,300	\$14,300	--	\$550	\$170	High
Sat. Buffer	SB-23	--	7.2	5.9	\$8,500	\$14,500	--	\$100	\$120	High
Sat. Buffer	SB-25	--	0.5	1.2	\$8,300	\$14,200	--	\$1,400	\$570	High
Sat. Buffer	SB-26	--	0.5	1.3	\$8,300	\$14,300	--	\$1,310	\$540	High
Wetland Rest.	DP-71	6.3	88.1	11.6	\$76,700	\$82,600	\$700	\$50	\$360	Low
Wetland Rest.	DP-72	0.2	0.7	2.7	\$25,000	\$25,900	\$6,000	\$1,830	\$480	Med
Wetland Rest.	DP-73	0.4	2.9	5.5	\$27,400	\$28,600	\$3,300	\$490	\$260	High
Wetland Rest.	DP-74	0.1	0.3	1.7	\$21,500	\$22,100	\$8,200	\$4,050	\$660	Low
Wetland Rest.	DP-75	1.0	8.3	7.1	\$41,400	\$43,900	\$2,300	\$270	\$310	Low
Wetland Rest.	DP-76	0.1	0.0	1.3	\$20,200	\$20,700	\$8,500	\$20,780	\$800	High
Wetland Rest.	DP-77	1.2	0.9	2.3	\$26,000	\$27,100	\$1,200	\$1,580	\$590	Med
Wetland Rest.	DP-78	1.7	21.3	10.3	\$39,000	\$41,200	\$1,200	\$100	\$200	Med
Wetland Rest.	DP-79	1.2	0.9	2.4	\$33,600	\$35,400	\$1,500	\$1,960	\$730	High
Wetland Rest.	DP-80	0.2	0.1	1.7	\$23,100	\$23,800	\$7,300	\$13,200	\$680	Low
Wetland Rest.	DP-81	5.3	219.8	60.9	\$97,000	\$104,800	\$1,000	\$20	\$90	High
Wetland Rest.	DP-82	1.6	26.7	24.1	\$44,000	\$46,800	\$1,400	\$90	\$100	High
Wetland Rest.	DP-83	2.6	2.8	2.6	\$72,400	\$77,900	\$1,500	\$1,410	\$1,480	Low
Wetland Rest.	DP-84	14.4	20.6	3.5	\$221,800	\$241,500	\$800	\$580	\$3,440	High
Wetland Rest.	DP-85	1.8	0.4	0.6	\$37,300	\$39,400	\$1,100	\$4,740	\$3,560	High
Wetland Rest.	WR-5	33.1	117.4	97.1	\$167,900	\$197,900	\$300	\$80	\$100	High

**Table D-4: Complete list of potential BMPs for the South Tributary Management Unit**

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
ATIs	DP-1	--	0.1	0.3	\$2,100	\$4,200	--	\$1,720	\$700	Low
ATIs	DP-10	--	1.9	2.0	\$2,700	\$5,400	--	\$140	\$140	Low
ATIs	DP-11	--	0.1	0.3	\$2,100	\$4,200	--	\$1,520	\$620	Low
ATIs	DP-12	--	0.3	0.7	\$2,700	\$5,400	--	\$960	\$390	Low
ATIs	DP-13	--	2.3	3.0	\$2,700	\$5,400	--	\$120	\$90	Med
ATIs	DP-14	--	0.3	0.7	\$2,700	\$5,400	--	\$990	\$400	Low
ATIs	DP-15	--	12.2	15.7	\$9,300	\$18,600	--	\$80	\$60	Low
ATIs	DP-16	--	2.7	3.5	\$3,300	\$6,600	--	\$120	\$100	Low
ATIs	DP-17	--	0.4	0.5	\$2,100	\$4,200	--	\$560	\$430	Low
ATIs	DP-18	--	2.9	3.8	\$3,300	\$6,600	--	\$110	\$90	Med
ATIs	DP-19	--	1.2	1.6	\$2,100	\$4,200	--	\$170	\$140	Med
ATIs	DP-2	--	0.0	0.1	\$2,100	\$4,200	--	\$7,300	\$2,970	Low
ATIs	DP-20	--	7.1	9.2	\$6,300	\$12,600	--	\$90	\$70	Med
ATIs	DP-21	--	0.6	0.7	\$2,100	\$4,200	--	\$380	\$290	Med
ATIs	DP-22	--	5.9	7.6	\$5,100	\$10,200	--	\$90	\$70	Med
ATIs	DP-23	--	13.6	17.6	\$10,500	\$21,000	--	\$80	\$60	Med
ATIs	DP-24	--	2.8	3.7	\$3,300	\$6,600	--	\$120	\$90	High
ATIs	DP-25	--	1.7	2.2	\$2,700	\$5,400	--	\$160	\$120	High
ATIs	DP-26	--	10.3	13.3	\$8,100	\$16,200	--	\$80	\$60	High
ATIs	DP-27	--	2.0	2.6	\$2,700	\$5,400	--	\$130	\$100	High
ATIs	DP-28	--	7.7	10.0	\$6,300	\$12,600	--	\$80	\$60	High
ATIs	DP-29	--	2.1	2.7	\$2,700	\$5,400	--	\$130	\$100	High
ATIs	DP-3	--	0.3	0.8	\$3,300	\$6,600	--	\$980	\$400	Low
ATIs	DP-30	--	2.1	2.7	\$2,700	\$5,400	--	\$130	\$100	High
ATIs	DP-31	--	1.2	1.6	\$2,100	\$4,200	--	\$170	\$130	Med
ATIs	DP-32	--	4.8	6.2	\$4,500	\$9,000	--	\$90	\$70	High
ATIs	DP-33	--	2.2	2.9	\$2,700	\$5,400	--	\$120	\$90	High
ATIs	DP-34	--	5.2	6.7	\$5,100	\$10,200	--	\$100	\$80	High
ATIs	DP-35	--	3.0	3.9	\$3,300	\$6,600	--	\$110	\$80	High

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
ATIs	DP-36	--	1.2	1.8	\$2,100	\$4,200	--	\$170	\$120	High
ATIs	DP-37	--	1.6	2.1	\$2,700	\$5,400	--	\$160	\$130	Low
ATIs	DP-38	--	4.2	5.4	\$4,500	\$9,000	--	\$110	\$80	High
ATIs	DP-39	--	2.4	3.1	\$3,300	\$6,600	--	\$140	\$110	High
ATIs	DP-4	--	0.8	2.0	\$5,700	\$11,400	--	\$700	\$280	Low
ATIs	DP-40	--	10.1	13.1	\$8,100	\$16,200	--	\$80	\$60	High
ATIs	DP-5	--	11.5	14.9	\$8,700	\$17,400	--	\$80	\$60	Med
ATIs	DP-6	--	0.5	1.3	\$3,900	\$7,800	--	\$760	\$310	Low
ATIs	DP-7	--	0.2	0.6	\$2,700	\$5,400	--	\$1,140	\$460	Low
ATIs	DP-8	--	0.3	0.7	\$3,300	\$6,600	--	\$1,090	\$440	Low
ATIs	DP-9	--	0.4	0.9	\$3,300	\$6,600	--	\$890	\$360	Low
Bioreactor	BR-1	--	0.7	1.1	\$11,200	\$22,400	--	\$1,650	\$990	Low
Bioreactor	BR-2	--	3.2	2.8	\$9,400	\$18,900	--	\$290	\$330	Med
Bioreactor	BR-3	--	6.8	5.9	\$12,300	\$24,500	--	\$180	\$210	High
G. Waterway	GW-1	--	3.6	6.3	\$7,100	\$19,300	--	\$270	\$150	Low
G. Waterway	GW-10	--	1.6	2.8	\$5,700	\$13,100	--	\$420	\$240	Med
G. Waterway	GW-11	--	1.5	2.7	\$5,800	\$13,400	--	\$440	\$250	Low
G. Waterway	GW-12	--	4.5	8.0	\$11,100	\$37,200	--	\$410	\$230	Med
G. Waterway	GW-13	--	3.0	5.3	\$6,200	\$15,200	--	\$250	\$140	Med
G. Waterway	GW-14	--	6.8	12.0	\$7,800	\$22,600	--	\$170	\$90	Med
G. Waterway	GW-15	--	47.4	84.1	\$17,700	\$66,200	--	\$70	\$40	Med
G. Waterway	GW-16	--	0.4	1.3	\$7,800	\$22,300	--	\$2,830	\$840	Low
G. Waterway	GW-17	--	0.5	1.7	\$8,200	\$24,000	--	\$2,430	\$720	Low
G. Waterway	GW-18	--	1.5	2.6	\$5,600	\$12,600	--	\$430	\$240	Med
G. Waterway	GW-2	--	20.6	36.6	\$11,100	\$36,800	--	\$90	\$50	Low
G. Waterway	GW-3	--	3.6	6.4	\$8,200	\$24,000	--	\$330	\$190	Low
G. Waterway	GW-4	--	3.8	6.8	\$7,700	\$22,000	--	\$290	\$160	Low
G. Waterway	GW-5	--	2.0	3.6	\$5,700	\$13,000	--	\$320	\$180	Low
G. Waterway	GW-6	--	7.5	13.2	\$8,400	\$25,100	--	\$170	\$90	Med
G. Waterway	GW-7	--	1.8	3.2	\$6,600	\$17,100	--	\$470	\$260	Med



BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
G. Waterway	GW-8	--	1.0	1.8	\$5,500	\$12,000	--	\$590	\$330	Med
G. Waterway	GW-9	--	4.3	7.6	\$6,600	\$17,000	--	\$200	\$110	Med
Sat. Buffer	SB-1	--	1.4	1.7	\$7,900	\$13,600	--	\$500	\$390	High
Sat. Buffer	SB-2	--	1.6	2.1	\$8,000	\$13,700	--	\$420	\$330	High
Sat. Buffer	SB-3	--	2.7	3.5	\$8,100	\$13,900	--	\$260	\$200	High
Sat. Buffer	SB-4	--	2.7	3.5	\$8,100	\$13,900	--	\$260	\$200	High
Sat. Buffer	SB-5	--	2.7	3.5	\$8,100	\$13,900	--	\$260	\$200	High
Sat. Buffer	SB-6	--	1.9	2.4	\$8,000	\$13,700	--	\$360	\$280	High
Wetland Rest.	DP-1	1.1	0.3	0.6	\$28,000	\$29,200	\$1,300	\$5,380	\$2,440	Low
Wetland Rest.	DP-10	0.6	2.2	4.0	\$29,000	\$30,300	\$2,600	\$690	\$380	Low
Wetland Rest.	DP-11	0.6	0.2	0.6	\$22,200	\$22,900	\$1,900	\$7,370	\$1,800	Low
Wetland Rest.	DP-12	1.8	1.0	1.4	\$39,900	\$42,300	\$1,200	\$2,080	\$1,530	Low
Wetland Rest.	DP-13	0.6	2.9	6.0	\$36,300	\$38,300	\$3,000	\$660	\$320	Med
Wetland Rest.	DP-14	1.2	0.6	1.3	\$31,700	\$33,300	\$1,400	\$2,590	\$1,240	Low
Wetland Rest.	DP-15	18.9	458.2	31.4	\$193,600	\$210,600	\$600	\$20	\$340	Low
Wetland Rest.	DP-16	0.7	5.3	9.9	\$36,600	\$38,700	\$2,800	\$370	\$190	Low
Wetland Rest.	DP-17	0.5	0.4	1.0	\$22,500	\$23,200	\$2,100	\$2,850	\$1,200	Low
Wetland Rest.	DP-18	0.3	0.7	3.6	\$25,000	\$25,900	\$5,200	\$1,840	\$360	Med
Wetland Rest.	DP-19	0.1	0.2	2.1	\$21,500	\$22,100	\$7,700	\$4,730	\$530	Med
Wetland Rest.	DP-2	0.5	0.0	0.1	\$21,100	\$21,700	\$2,100	\$35,830	\$7,670	Low
Wetland Rest.	DP-20	1.8	25.7	18.5	\$48,900	\$52,100	\$1,400	\$100	\$140	Med
Wetland Rest.	DP-21	0.7	0.8	1.4	\$20,500	\$21,000	\$1,500	\$1,330	\$740	Med
Wetland Rest.	DP-22	4.8	56.4	15.2	\$73,100	\$78,700	\$800	\$70	\$260	Med
Wetland Rest.	DP-23	13.3	363.6	35.2	\$169,100	\$183,800	\$700	\$30	\$260	Med
Wetland Rest.	DP-24	1.2	16.2	17.4	\$38,200	\$40,400	\$1,700	\$130	\$120	High
Wetland Rest.	DP-25	0.1	0.2	2.1	\$21,900	\$22,500	\$7,900	\$4,880	\$540	High
Wetland Rest.	DP-26	9.7	579.3	77.3	\$101,700	\$110,000	\$600	\$10	\$70	High
Wetland Rest.	DP-27	2.4	9.7	5.3	\$48,200	\$51,300	\$1,100	\$270	\$490	High
Wetland Rest.	DP-28	8.9	136.5	19.9	\$127,600	\$138,300	\$800	\$50	\$350	High
Wetland Rest.	DP-29	1.9	8.2	5.5	\$48,800	\$52,000	\$1,300	\$320	\$480	High

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
Wetland Rest.	DP-3	0.3	0.1	1.1	\$24,200	\$25,000	\$3,900	\$8,530	\$1,120	Low
Wetland Rest.	DP-30	0.4	1.7	5.5	\$26,900	\$28,000	\$3,500	\$830	\$260	High
Wetland Rest.	DP-31	0.8	2.0	3.1	\$26,300	\$27,400	\$1,700	\$690	\$440	Med
Wetland Rest.	DP-32	2.4	23.1	12.4	\$59,100	\$63,300	\$1,300	\$140	\$260	High
Wetland Rest.	DP-33	0.8	3.5	5.7	\$37,000	\$39,000	\$2,400	\$550	\$340	High
Wetland Rest.	DP-34	6.5	67.5	13.5	\$95,600	\$103,300	\$800	\$80	\$380	High
Wetland Rest.	DP-35	3.1	19.0	7.9	\$42,200	\$44,800	\$700	\$120	\$280	High
Wetland Rest.	DP-36	1.2	3.1	3.6	\$26,900	\$28,000	\$1,100	\$460	\$390	High
Wetland Rest.	DP-37	0.1	0.1	1.5	\$20,000	\$20,400	\$10,000	\$8,690	\$690	Low
Wetland Rest.	DP-38	0.9	7.8	10.8	\$36,700	\$38,800	\$2,100	\$250	\$180	High
Wetland Rest.	DP-39	0.3	1.3	4.9	\$28,300	\$29,500	\$4,400	\$1,170	\$300	High
Wetland Rest.	DP-4	3.5	17.2	12.1	\$69,800	\$75,000	\$1,100	\$220	\$310	Low
Wetland Rest.	DP-40	34.9	706.9	26.2	\$320,700	\$349,800	\$500	\$20	\$670	High
Wetland Rest.	DP-5	5.6	129.7	29.8	\$108,300	\$117,200	\$1,000	\$50	\$200	Med
Wetland Rest.	DP-6	4.0	4.1	2.5	\$77,800	\$83,800	\$1,000	\$1,020	\$1,670	Low
Wetland Rest.	DP-7	0.1	0.0	0.5	\$20,300	\$20,800	\$7,800	\$41,660	\$2,260	Low
Wetland Rest.	DP-8	1.2	0.7	1.5	\$35,200	\$37,100	\$1,500	\$2,480	\$1,250	Low
Wetland Rest.	DP-9	0.7	0.5	1.8	\$31,700	\$33,300	\$2,300	\$3,180	\$920	Low
Wetland Rest.	WR-1	17.8	62.4	80.7	\$70,000	\$74,700	\$200	\$60	\$50	High
Wetland Rest.	WR-2	9.8	25.3	32.7	\$64,100	\$70,600	\$400	\$140	\$110	High
Wetland Rest.	WR-3	126.8	156.9	202.8	\$713,900	\$867,300	\$300	\$280	\$210	High

**Table D-5: Complete list of potential BMPs for the Lake Henry Management Unit**

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
ATIs	DP-69	--	10.5	16.9	\$7,400	\$14,800	--	\$70	\$40	Low
ATIs	DP-70	--	1.4	3.2	\$3,300	\$6,600	--	\$240	\$100	Med
G. Waterway	GW-36	--	4.1	13.5	\$7,300	\$20,400	--	\$200	\$80	Low
G. Waterway	GW-37	--	16.5	27.0	\$7,500	\$21,000	--	\$60	\$40	Low
Sat. Buffer	SB-18	--	2.3	5.2	\$8,400	\$14,300	--	\$320	\$140	High
Wetland Rest.	DP-69	1.1	32.0	34.1	\$35,500	\$37,400	\$1,700	\$60	\$50	Low
Wetland Rest.	DP-70	5.6	15.6	6.4	\$66,900	\$71,900	\$600	\$230	\$560	Med

**Table D-6: Complete list of potential BMPs for the Tilton’s Management Unit**

BMP Type	BMP ID	Estimated Benefits			Construction Cost	20-Year Life Cycle Cost	Life Cycle Cost Benefit			Delivery Potential
		Storage (acre-ft)	TSS (tons/yr)	TP (lbs/yr)			Storage (\$/acre-ft)	TSS (\$/ton)	TP (\$/lb)	
ATIs	DP-86	--	0.2	0.3	\$2,100	\$4,200	--	\$1,290	\$760	Low
ATIs	DP-87	--	0.1	0.2	\$2,100	\$4,200	--	\$1,760	\$1,030	High
ATIs	DP-88	--	1.3	2.2	\$4,500	\$9,000	--	\$350	\$200	High
ATIs	DP-89	--	0.5	0.9	\$2,700	\$5,400	--	\$540	\$310	Med
ATIs	DP-90	--	0.9	1.5	\$3,300	\$6,600	--	\$380	\$220	Med
Bioreactor	BR-14	--	1.5	1.7	\$11,000	\$21,900	--	\$730	\$630	Med
G. Waterway	GW-49	--	1.7	3.9	\$9,500	\$30,100	--	\$910	\$390	Low
G. Waterway	GW-50	--	2.3	5.4	\$9,000	\$27,600	--	\$590	\$250	Low
G. Waterway	GW-51	--	1.5	3.4	\$6,600	\$16,900	--	\$580	\$250	Low
Sat. Buffer	SB-27	--	0.8	1.3	\$8,100	\$13,900	--	\$890	\$520	High
Sat. Buffer	SB-28	--	0.8	1.3	\$8,100	\$13,900	--	\$890	\$520	High
Sat. Buffer	SB-29	--	1.4	2.4	\$8,400	\$14,400	--	\$510	\$300	High
Sat. Buffer	SB-30	--	0.8	1.3	\$8,100	\$13,900	--	\$890	\$520	High
Wetland Rest.	DP-86	0.9	0.3	0.6	\$26,000	\$27,000	\$1,500	\$4,690	\$2,440	Low
Wetland Rest.	DP-87	0.6	0.1	0.4	\$21,800	\$22,400	\$1,900	\$7,960	\$2,740	High
Wetland Rest.	DP-88	0.6	1.2	3.4	\$36,100	\$38,100	\$3,100	\$1,570	\$560	High
Wetland Rest.	DP-89	0.8	0.8	1.7	\$26,200	\$27,300	\$1,600	\$1,620	\$790	Med
Wetland Rest.	DP-90	2.1	3.6	3.0	\$50,900	\$54,300	\$1,300	\$750	\$910	Med