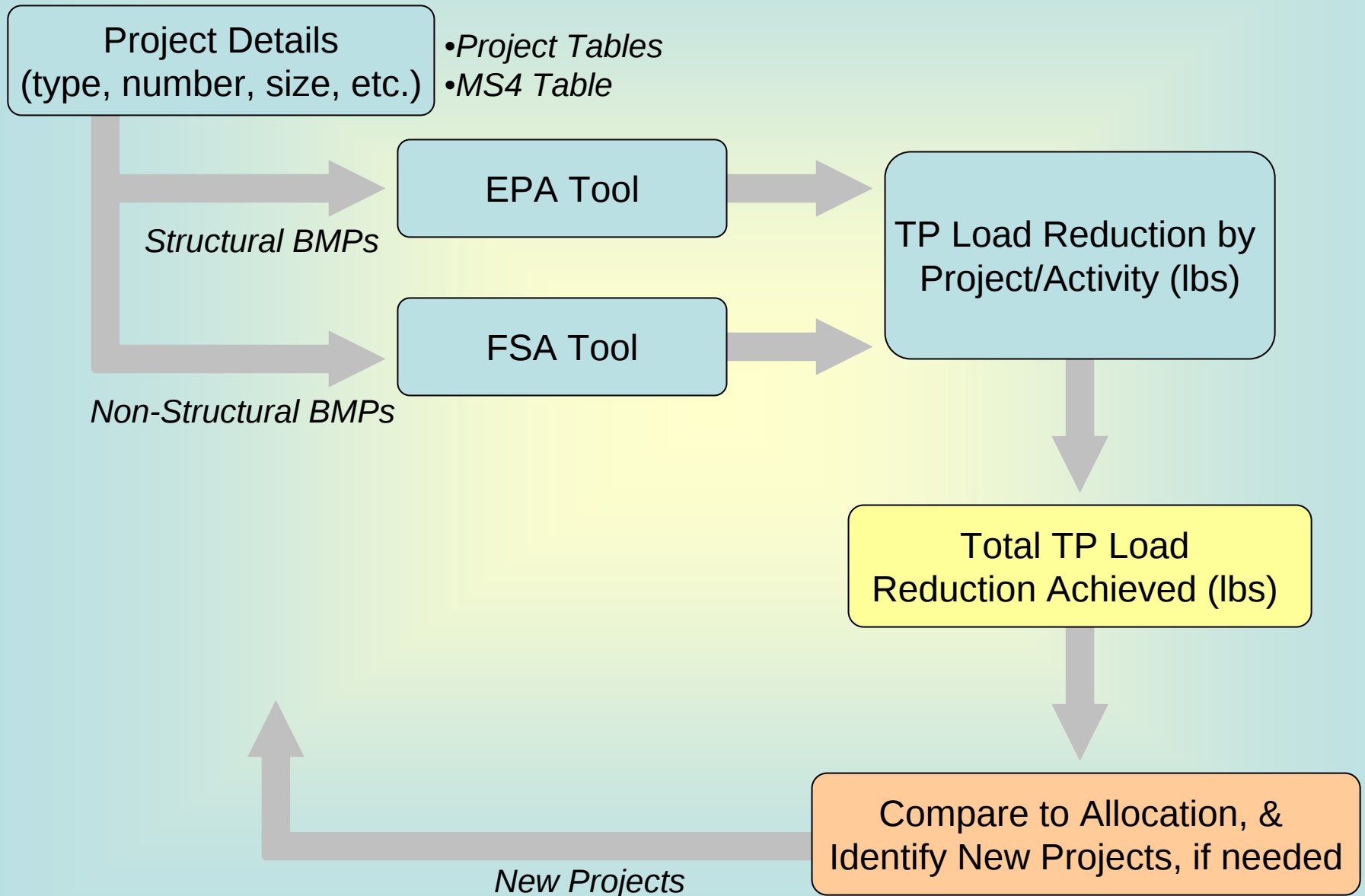


Calculation of BMP Load Reductions for Jesup Allocations: Suggested Approach

Lake Jesup, Crane Strand, Long Branch BMAP
Technical Working Group
November 29, 2007

J. Gihring

Big Picture



Project Table (jurisdiction-specific)

Entity	Subbasin	Project Name	Project Footprint (Acres)	Treatment Area (Acres)	Land Use In Treatment Area (acres)						Estimated Load Reduction-TP (lbs/yr)
					Comm.	Multi-Fam.	Resid.	Ag	Vacant	Open Space	
Orlando	Howell Creek	Lake Rowena Screening Facility & Alum Stormwater Treatment	0.25	538	120	90	300	0	3	25	Values from EPA Tool (Structural BMPs)
Orlando	Howell Creek	Mills Avenue Retrofit	0.1	108	20	10	70	0	5	3	
Orlando	Howell Creek	Overbrook Stormwater Improvements	5.1	236	24	50	150	0	12	0	

MS4 Table (jurisdiction-specific)

Category	MS4 Performance Measure Description	Units	Value (2005-2006 Annual Report)	Estimated TP Load Reductions (lbs)
Operations and Maintenance of Structural	Sediment & debris removal structure maintenance (CDS units, baffle boxes, pollution control boxes, catch basins, inlets, etc.)	# inspected	24314	Values from FSA Tool
		# maintained	7355	
	Outfalls, control structures, spillways, & weirs	# inspected		Values from FSA Tool
		# maintained		
	Open drainage system maintenance (swales, ditches, canals)	linear feet inspected	3113 ac (linear feet?)	Values from FSA Tool
		linear feet maintained		
	MS4 pipes	linear feet inspected	29450	Values from FSA Tool
		linear feet maintained	1706 repaired/replaced	
	Ponds / sediment basins (wet & dry)	# inspections	3756	(Non-Structural BMPs & Operations/Maintenance)
		# cleaned/maintained	3756	
Roadways	Street sweeping	# inspections	384	(Non-Structural BMPs & Operations/Maintenance)
		# maintained		
			66 drainage well inspections; 1124 lake & lakeshore inspections (94 acres 12x/year)	
	Litter Collection	# times / frequency	daily downtown; bi-weekly in the rest of the City	(Non-Structural BMPs & Operations/Maintenance)
		miles swept	51700	
		cubic yards of material	26324	
		Frequency	daily (downtown); weekly (primary roads); bi-weekly (secondary roads)	
		Miles ROW maintained	239,875 ac	
		cubic yards of material	5010 CY	

Project Table (jurisdiction-specific)

Entity	Subbasin	Project Name	Project Footprint (Acres)	Treatment Area (Acres)	Land Use in Treatment Area (acres)						Estimated Load Reduction-TP (lbs/yr)
					Comm	Multi-Fam.	Resid.	Ag	Vacant	Open Space	
Orlando	Howell Creek	Lake Rowena Screening Facility & Alum Stormwater Treatment	0.25	538	120	90	300	0	3	25	
Orlando	Howell Creek	Mills Avenue Retrofit	0.1	108	20	10	70	0	5	3	
Orlando	Howell Creek	Overbrook Stormwater Improvements	5.1	236	24	50	150	0	12	0	

MS4 Table (jurisdiction-specific)

Category	MS4 Performance Measure Description	Units	Value (2005-2008 Annual Report)	Estimated TP Load Reductions (lbs)
Operations and Maintenance of Structural	Sediment & debris removal structure maintenance (CDS units, baffle boxes, pollution control boxes, catch basins, vials, etc.)	# inspected	24314	
		# maintained	7355	
	Outfalls, control structures, spillways, & weirs	# inspected		
		# maintained		
	Open drainage system maintenance (swales, ditches, canals)	linear feet inspected	3113 ac (linear feet?)	
		linear feet maintained		
	MS4 pipes	linear feet inspected	29450	
		linear feet maintained	1706 repaired/replaced	
	Ponds / sediment basins (wet & dry)	# inspections	3756	
		# cleaned/maintained	3756	
Roadways	Pump stations	# inspections	384	
		# maintained		
	Other		66 drainage well inspections; 1134 lake & lakeshore inspections (94 acres 120/year)	
	Street sweeping	# times / frequency	daily downtown; bi-weekly in the rest of the city	
		miles swept	51700	
		cubic yards of material	26324	
Roadways	Litter Collection	Frequency	daily (downtown); weekly (primary roads); bi-weekly (secondary roads)	
		Miles ROW maintained	239,615 ac	
		cubic yards of material	5010 CY	

Allocation Table

Jursdiction / Source Category		TP Load (lbs)			Documented TP Reductions Achieved		Interim Load Reduction Remaining (lbs)	TP Load Reductions from New Projects			Non-quantifiable Reductions Achieved (e.g. public ed?)	Final Load Reduction Remaining (lbs)
		Revised TMDL Load	Allocation (34% reduction)	Reduction Required	Structural Projects	Non-Structural Activities		Structural Projects	Non-Structural Activities	Regional Project Participation		
Water, Wetland, & Conservation Areas		8,705.77	0.00	0.00								
Local Governments	Altamonte Springs	89.19	58.87	30.33								
	Casselberry	1,381.67	911.90	469.77								
	Eatonville	205.53	135.65	69.88								
	Lake Mary	832.05	549.16	282.90								
	Longwood	823.11	543.25	279.86								
	Maitland	666.37	439.80	226.56								
	Orange Co (unincorporated)	1,292.48	853.04	439.44								
	Orlando	932.92	615.73	317.19								
	Oviedo	770.40	508.47	261.94								
	Sanford	1,836.64	1,212.18	624.46								
	Seminole Co (unincorporated)	6,747.36	4,453.26	2,294.10								
	Winter Park	1,620.01	1,069.20	550.80								
	Winter Springs	1,552.49	1,024.64	527.85								
Site 10 Wastewater		1,011.87	667.83	344.03								
DOT		1,018.53	672.23	346.30								
Agriculture		1,979.72	1,306.62	673.11								
Interagency Plan Projects		-	-	-	-	-	-	-	-		-	-
TOTAL		31,466.12	15,021.83	7,738.52	0.00	0.00	0.00			0.00		0.00

EPA BMP Load Reduction Calculation Tool

- Recommended for calculating reductions from **structural BMPs**
- Note: May require recalculation of new load reduction numbers for existing projects
- Next step: Evaluate load reduction coefficients against Jesup-specific data and revise

Select BMP Type

	Vegetated Filter Strips		Sand Filters		Retention (1.00")
	Grass Swales		WQ Inlets		WQ Inlet w/ Sand Filter
	Retention (0.25")		Weekly Street Sweeping		Oil/Grit Separator
	Wet Pond (1", 14day)		Retention (0.75")		Wet Pond(.5", 7 day)
	Wetland Detention		Infiltration Trench		
	Dry Detention		Porous Pavement		
	Retention (0.50")		Concrete Grid Pavement		

BMP Pollutant Removal Efficiencies (Percent)									
		BOD		TP		TSS		TN	
Vegetated Filter Strips	A&B	0.505	0	0.5	0	0.85	0.2	0.5	0
Grass Swales	A,B&C	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Retention (0.25")	A,B	0.4	0	0.4	0	0.4	0	0.4	0
Wet Pond	B,C,D	0.55	0	0.65	0	0.8	0	0.25	0
Wetland Detention	C,D	0.18	0	0	0	0.25	0	0.2	0
Dry Detention	A&B	0.2	0	0.25	0	0.5	0	0.15	0
Dry Retention (0.50")	A,B	0.6	0	0.6	0	0.6	0	0.6	0
Sand Filters	B,C	0.7	0	0.43	0	0.6	0	0.01	0
WQ Inlets	A&B	0.13	0	0.09	0	0.63	0	0.2	0
Weekly Street Sweeping	A	0.06	0	0.06	0	0.84	0		0
Retention (0.75")	A,B	0.8	0	0.8	0	0.8	0	0.8	0
Infiltration Trench	B&D	0.6	0	0.6	0	0.6	0	0.6	0
Porous Pavement	A,B	0.8	0	0.65	0	0.2	0	0.8	0
Concrete Grid Pavement	A,B		0	0.9	0	0.25	0	0.9	0
Retention (1.00)	A,B	0.9	0	0.9	0	0.9	0	0.9	0
WQ Inlet w/ Sand Filter	B		0		0	0.2	0	0.35	0
Oil/Grit Separator	B		0	0.05	0	0.85	0	0.3	0
Wet Pond	C,D	0.3	0	0.3	0	0.4	0	0.1	0
Agricultue Filter Strip	C		0	0.6125	0		0	0.5325	0

Define Treatment Area

	Stw Treated	Stw Untreated
Commercial	0	1
Industrial	0	2
Institutional	0	3
Transportation	0	4
Multi-Family	0	5
Residential	0	9
Agriculture	0	7
Vacant	0	8
Open Space	0	9

AVERAGE POLLUTANT LOADS BY LAND USE (Lbs./Ac./Yr.) 1

Land Use	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space
BOD (Sewered)	127	87	52	48	89	32		2	1
BOD (Unsewered)	112	77	31	43	75	28	11	0.9	0.4
COD (Sewered)	589	260	320	881	320	140		64	46
COD (Unsewered)	520	230	190	518	260	71	28	26	15
TSS (Sewered)	858	844	1320	401	564	124		100	61
TSS (Unsewered)	757	746	790	355	499	109	144	40	20
LEAD (Sewered)	1.80	1.92	0.40	1.60	0.70	0.18		0.03	0.02
LEAD (Unsewered)	1.60	1.70	0.22	1.42	0.60	0.16	0.00	0.01	0.01
COPPER (Sewered)	0.2	0.21	0.1	0.56	0.1	0.1		0.01	0.01
COPPER (Unsewered)	0.18	0.18	0.061	0.33	0.1	0	0.0044	0.004	0.002
ZINC (Sewered)	1.43	1.2	0.6	1.12	0.41	0.9		0.1	0.08
ZINC (Unsewered)	1.3	1.1	0.34	1	0.4	0.5	0.069	0.06	0.03
TDS (Sewered)	2830	1290	623	6060	623	436		1210	724
TDS (Unsewered)	2500	1130	374	3565	498	218	89.2	483	241
TN (Sewered)	20	16	11	15	19	10		1	1
TN (Unsewered)	18	14	6.5	13	17	9	7	0.5	0.2
TKN (Sewered)	6.9	4	6.4	18	6.4	3.2		2.2	1.3
TKN (unsewered)	6.1	4	3.8	11	5.1	1.6	0.91	0.88	0.44
DP (Sewered)	0.69	0.86	0.61	0.2	0.61	0.3		0.1	0.08
DP (Unsewered)	0.61	0.75	0.36	0.1	0.48	0.1	0.08	0.05	0.03
TP (Sewered)	2.9	2.7	1.4	2.9	3.8	1.3		0.22	0.39
TP (Unsewered)	2.54	2.4	0.8	2.6	3.4	1.2	0.18	0.088	0.13
CADMIUM (sewered)	0.008	0.03	0.0037	0.021	0	0		0.0003	0.0002
CADMIUM (Unsewered)	0.0071	0.02	0.0022	0.012	0	0	0.0002	0.0001	0.0001

1. Unit Area Pollutant Load Estimates are from US EPA, Harper et.al., Eric Livingston et.al., etc.

Output: Pounds / Year / BMP

	Load before BMP (lbs/yr)		Load after BMP (lbs/yr)		Load Reduction (lbs/yr)
BOD	1,246		498		747
COD	6,100		2,440		3,660
TSS	11,023		2,205		8,818
LEAD	16		6		10
COPPER	3		Unavailable		Unavailable
ZINC	16		Unavailable		Unavailable
TDS	31,251		Unavailable		Unavailable
TN	338		135		203
TKN	127		Unavailable		Unavailable
DP	8		Unavailable		Unavailable
TP	51		20		31
CADMIUM	0		Unavailable		Unavailable

FSA Non-Structural BMP Load Reduction Calculation Tool

- Recommended for calculating reductions from non-structural BMPs and maintenance of structural BMPs
- May require conversion of existing MS4 data into alternative format (e.g. annual wet pond cleaning = X lbs sediment removed)
- Next step: Evaluate load reduction coefficients against Jesup-specific data and revise
- Note: tool has not yet been released for general use

Mass Load Inputs

Collection System Operation

	Dry Weight Sediment	Dry Weight Vegetative Material	Dry Weight Trash
Inlet, Grate, Catch Basin Cleaning (lbs)	1	6	11
Baffle Box, Sediment Trap Cleaning (lbs)	2	7	12
Ditch/Swale, material removed (lbs)	3	8	13
Pipe/Conduit/Pump Station Cleaning (lbs)	4	9	14
Retention/Detention Pond Cleaning (lbs)	5	10	15

Roadways

Street Sweeping (lbs)	16	17	18
Litter Control Programs (lbs)			19
Adopt-A-Highway litter program (lbs)			20

Wastewater Management

Leaking Septic Tanks Removed (connected to SS) (Annual Volume Gallons)	21
Sanitary Sewer Overflows Removed (Annual Volume Gallons)	22

Pollutant Load Removal Details (in pounds)

Copyright Florida Stormwater Association 2005

Key

###	[mg/kg] pollutant mass fractions determined from literature review
###	lb, mass of material removed during MS4 practice
###	lb, mass of pollutant removed during MS4 practice

Sediments Collected	Dry Weight Sediments/ Sweepings (lbs)	Total Pollutant Load Removed (in pounds)					
		TP			TN		
		(min)	(median)	(max)	(min)	(median)	(max)
Catch Basin - Pollutant Mass Fraction [mg/kg]		708.0	70000.0	440000.0			
Inlet, Grate, Catch Basin Cleaning Pollutants Removed (lbs)	1	0.0007086	0.070063	0.4403958	0	0	0
Baffle Box, Sediment Trap Cleaning Pollutants Removed (lbs)	2	0.0014173	0.1401259	0.8807915	0	0	0
Ditch/Swale, Pollutants Removed (lbs)	3	0.0021259	0.2101889	1.3211873	0	0	0
Pipe/Conduit/Pump Station Cleaning Pollutants Removed (lbs)	4	0.0028345	0.2802519	1.7615831	0	0	0
Retention Pond Pollutant Mass Fraction [mg/kg]		292	922.4	1438			
Retention/Detention Pond Cleaning Pollutants Removed (lbs)	5	0.0014613	0.0046161	0.0071965	0	0	0
Street Sweeping Pollutant Mass Fraction [mg/kg]		1.1	230	647	29.1	534.3	794.2
Street Sweeping Pollutants Removed (lbs)	16	1.762E-05	0.0036833	0.0103613	0.000466	0.0085565	0.0127186
TOTAL POLLUTANTS REMOVED (lbs)		0.0085653	0.7089291	4.4215155	0.000466	0.0085565	0.0127186

Vegetative Material Collected (Includes Brush & Aquatic Vegetation)	Dry Weight Vegetative Material (lbs)	Pollutants Removed					
		TP			TN		
		(min)	(median)	(max)	(min)	(median)	(max)
Vegetative Pollutant Mass Fraction [mg/kg]		380	1678.7	3400	3700	10650	28100
Inlet, Grate, Catch Basin Cleaning Pollutants Removed (lbs)	6	0.0022821	0.0100813	0.0204183	0.02222	0.0639575	0.1687517
Baffle Box, Sediment Trap Cleaning Pollutants Removed (lbs)	7	0.0026624	0.0117615	0.0238214	0.0259233	0.0746171	0.1968769
Ditch/Swale, material removed Pollutants Removed (lbs)	8	0.0030427	0.0134417	0.0272245	0.0296266	0.0852766	0.2250022
Pipe/Conduit/Pump Station Cleaning Pollutants Removed (lbs)	9	0.0034231	0.0151219	0.0306275	0.03333	0.0959362	0.2531275
Retention/Detention Pond Cleaning Pollutants Removed (lbs)	10	0.0038034	0.0168021	0.0340306	0.0370333	0.1065958	0.2812528
Street Sweeping vegetative Pollutants Removed (lbs)	17	0.0064658	0.0285636	0.057852	0.0629566	0.1812129	0.4781297
TOTAL POLLUTANTS REMOVED (lbs)		0.0216795	0.095772	0.1939743	0.2110897	0.607596	1.6031407

Trash Collected	Dry Weight Trash (lbs)	Pollutants Removed					
		TP			TN		
Trash Pollutant Mass Fraction [mg/kg]							
Inlet, Grate, Catch Basin Cleaning Pollutants Removed (lbs)	11	0	0	0	0	0	0
Baffle Box, Sediment Trap Cleaning Pollutants Removed (lbs)	12	0	0	0	0	0	0
Ditch/Swale, material removed Pollutants Removed (lbs)	13	0	0	0	0	0	0
Pipe/Conduit/Pump Station Cleaning Pollutants Removed (lbs)	14	0	0	0	0	0	0
Retention/Detention Pond Cleaning Pollutants Removed (lbs)	15	0	0	0	0	0	0
Litter Control Programs Pollutants Removed (lbs)	19	0	0	0	0	0	0
Adopt-A-Highway litter program Pollutants Removed (lbs)	20	0	0	0	0	0	0
Street Sweeping Trash Pollutants Removed (lbs)	18	0	0	0	0	0	0
TOTAL POLLUTANTS REMOVED (lbs)		0	0	0	0	0	0

Pollutant Load Removal Summary (in pounds)

Operation & Maintenance of Structural BMPs
and Roadways

Street Sweeping: Total Mass Pollutant Removed (lbs)
Vegetative Material: Total Mass Pollutant Removed (lbs)
TrashTotal: Mass Pollutant Removed (lbs)

TP			TN		
(Min)	(Median)	(Max)	(Min)	(Median)	(Max)
1.76E-05	0.003683	0.010361	0.000466	0.008556	0.01272
0.21109	0.607596	1.603141	0	0	0
0	0	0	0	0	0

Wastewater Management

Sanitary Sewage:Total Mass Pollutant Removed (lbs)
Septic Tank Removal: Total Mass Pollutant Removed (lbs)

TP			TN		
(Min)	(Median)	(Max)	(Min)	(Median)	(Max)
0	0	0	0	0	0
0.000123	0.001667	0.016143	0.000895	0.009072	0.0169

Total Pollutant Load Removed (lbs)

TP			TN		
(Min)	(Median)	(Max)	(Min)	(Median)	(Max)
0.21123	0.612946	1.629645	0.001361	0.017628	0.02958

Project Table (jurisdiction-specific)

Entity	Subbasin	Project Name	Project Footprint (Acres)	Treatment Area (Acres)	Land Use in Treatment Area (acres)						Estimated Load Reduction-TP (lbs/yr)
					Comm.	Multi-Fam.	Resid.	Ag	Vacant	Open Space	
Orlando	Howell Creek	Lake Rowena Screening Facility & Alum Stormwater Treatment	0.25	538	120	90	300	0	3	25	Values from EPA Tool
Orlando	Howell Creek	Mills Avenue Retrofit	0.1	108	20	10	70	0	5	3	
Orlando	Howell Creek	Overbrook Stormwater Improvements	5.1	236	24	50	150	0	12	0	

MS4 Table (jurisdiction-specific)

Category	MS4 Performance Measure Description	Units	Value (2005-2006 Annual Report)	Estimated TP Load Reductions (lbs)
Operations and Maintenance of Structural	Sediment & debris removal structure maintenance (CDS units, baffle boxes, pollution control boxes, catch basins, vials, etc.)	# inspected	24314	Values from FSA Tool
		# maintained	7355	
	Outfalls, control structures, spillways, & weirs	# inspected		
		# maintained		
	Open drainage system maintenance (swales, ditches, canals)	linear feet inspected	3113 ac (linear feet?)	
		linear feet maintained		
	MS4 pipes	linear feet inspected	29450	
		linear feet maintained	1706 repaired/replaced	
	Ponds / sediment basins (wet & dry)	# inspections	3756	
		# cleaned/maintained	3756	
Roadways	Pump stations	# inspections	384	
		# maintained		
	Other		66 drainage well inspections; 1134 lake & lakeshore inspections (94 acres 12x/year)	
	Street sweeping	# times / frequency	daily downtown; bi-weekly in the rest of the city	
		miles swept	51700	
Litter Collection		cubic yards of material	26324	
		Frequency	daily (downtown); weekly (primary roads); bi-weekly (secondary roads)	
		Miles ROW maintained	239,615 ac	
		cubic yards of material	5010 CV	

Allocation Table

Jurisdiction / Source Category		TP Load (lbs)			Documented TP Reductions Achieved		Interim Load Reduction Remaining (lbs)	TP Load Reductions from New Projects			Non-quantifiable Reductions Achieved (e.g. public ed?)	Final Load Reduction Remaining (lbs)
		Revised TMDL Load	Allocation (34% reduction)	Reduction Required	Structural Projects	Non-Structural Activities		Structural Projects	Non-Structural Activities	Regional Project Participation		
Water, Wetland, & Conservation Areas		8,705.77	0.00	0.00								
Local Governments	Altamonte Springs	89.19	58.87	30.33								
	Casselberry	1,381.67	911.90	469.77								
	Eatonville	205.53	135.65	69.88								
	Lake Mary	832.05	549.16	282.90								
	Longwood	823.11	543.25	279.86								
	Maitland	666.37	439.80	226.56								
	Orange Co (unincorporated)	1,292.48	853.04	439.44								
	Orlando	932.92	615.73	317.19								
	Oviedo	770.40	508.47	261.94								
	Sanford	1,836.64	1,212.18	624.46								
	Seminole Co (unincorporated)	6,747.36	4,453.26	2,294.10								
	Winter Park	1,620.01	1,069.20	550.80								
	Winter Springs	1,552.49	1,024.64	527.85								
Site 10 Wastewater		1,011.87	667.83	344.03								
DOT		1,018.53	672.23	346.30								
Agriculture		1,979.72	1,306.62	673.11								
Interagency Plan Projects		-	-	-	-	-	-	-	-		-	-
TOTAL		31,466.12	15,021.83	7,738.52	0.00	0.00	0.00			0.00		0.00

Considerations

Inputs

- Inputs would need to be modified to meet requirements for each tool. This may require additional assumptions (e.g. frequency of street sweeping = X pounds of sediment and Y pounds of trash removed per year)
- Both tools allow use of local BMP efficiency values
- Both tools assume basin-wide consistency in efficiency ratings

Outputs

- May result in different BMP efficiency numbers used in the BMAP vs. those used in your project design documents

Next Steps

- Gather local load reduction efficiency values (WG members)
- Compare load reduction efficiency values between EPA tool, FSA tool, TMDL, local studies, and other sources (DEP)
- Work together one-on-one to compile project lists and complete these calculations
- Public education – to quantify or not quantify...