



# Taylor Creek Algal Turf Scrubber® Nutrient Recovery Facility

Operational Report  
December 2009 and January 2010  
(12/5/09 through 01/18/10)

Prepared for:



**sfwmd.gov**

South Florida Water Management District  
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Prepared by:



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WATER TREATMENT TECHNOLOGIES

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February 1, 2010

**PHOSPHORUS LOADING SUMMARY**

<b>Ending Date</b>	<b>Influent Flow* (MG)</b>	<b>Influent TP Conc. (µL)</b>	<b>Effluent TP Conc. (µL)</b>	<b>Influent TP Load (lbs)</b>	<b>Effluent TP Load (lbs)</b>	<b>Water Quality/Flow Calculated TP Removal (lbs)</b>
12/7/2009	90.43	284	264	214.36	199.26	15.10
12/14/2009	88.99	313	302	232.33	224.17	8.17
12/28/2009	90.80	364	361	275.44	273.17	2.27
1/11/2010	88.78	295	289	218.25	213.81	4.44
1/18/2009	87.60	217	219	158.58	160.04	-1.46
<b>Period Total</b>	<b>446.61</b>			<b>1098.96</b>	<b>1070.45</b>	<b>28.51</b>
<b>Period Mean</b>		<b>295</b>	<b>287</b>			
<b>Percent Reduction</b>			<b>2.6</b>		<b>2.6</b>	

\* Flow is shown as readings at the influent Parshall flume. Effluent flow is calculated as influent flow minus historical pan evaporation plus rainfall.

**NITROGEN LOADING SUMMARY**

<b>Ending Date</b>	<b>Influent Flow* (MG)</b>	<b>Influent TN Conc. (mg/L)</b>	<b>Effluent TN Conc. (mg/L)</b>	<b>Influent TN Load (lbs)</b>	<b>Effluent TN Load (lbs)</b>	<b>Water Quality/Flow Calculated TN Removal (lbs)</b>
12/7/2009	90.43	1.17	1.16	882.28	875.94	6.34
12/14/2009	88.99	1.52	1.58	1130.48	1169.82	-39.34
12/28/2009	90.80	2.52	1.90	1903.14	1437.00	466.14
1/11/2010	88.78	1.76	1.65	1301.35	1217.75	83.60
1/18/2010	87.60	1.69	1.67	1234.26	1220.38	13.88
<b>Period Total</b>	<b>446.61</b>			<b>6,451.50</b>	<b>5,920.89</b>	<b>530.62</b>
<b>Period Mean</b>		<b>1.73</b>	<b>1.59</b>			
<b>Percent Reduction</b>			<b>8.14</b>		<b>8.22</b>	

\* Flow is shown as readings at the influent Parshall flume. Effluent flow is calculated as influent flow minus historical pan evaporation plus rainfall.

**OPERATIONAL NOTES**

Date	Comment
1/20/2009	Final water quality sample, and harvest, and system shutdown

**HARVEST AND COMPOST SUMMARY**

There were two (2) harvest events in December, totaling 15,800 wet pounds of solids removed. Harvested material, was about 70% *Lemna* and *Hydrilla* sp. and 30% algae for the first harvest; and 95-100% algae for the second harvest. Mean solids content was 9.5%, which translates to a dry harvest of 1,501 lbs. Estimated solids diverted to the settling ponds during December totaled 23,878 dry lbs based on a total suspended solids concentration of 1,235 mg/L associated with the harvest water collected at the beginning of the month.

Date	Recovered Solids (wet-lbs)	Recovered Solids Settling Pond (dry-lbs)
12/2/2009	1,000	9,397
1/20/2010	14,800	14,502
<b>Total Recovered Biomass</b>	15,800	23,878

**VISITORS**

N/A

**AVERAGE DAILY INFLUENT FLOW**

<b>Date</b>	<b>Influent Flow (mgd)</b>
12/1/2009	13.07
12/2/2009	13.05
12/3/2009	12.76
12/4/2009	12.79
12/5/2009	12.94
12/6/2009	12.94
12/7/2009	12.89
12/8/2009	12.80
12/9/2009	12.86
12/10/2009	12.80
12/11/2009	12.62
12/12/2009	12.63
12/13/2009	12.62
12/14/2009	12.66
12/15/2009	12.81
12/16/2009	12.78
12/17/2009	12.72
12/18/2009	12.62
12/19/2009	12.83
12/20/2009	12.99
12/21/2009	13.22
12/22/2009	13.22
12/23/2009	13.14
12/24/2009	12.98
12/25/2009	12.92
12/26/2009	12.90
12/27/2009	12.84
12/28/2009	12.80
12/29/2009	12.74
12/30/2009	12.69
12/31/2009	12.60
1/1/2010	12.55
1/2/2010	12.49
1/3/2010	12.51
1/4/2010	12.51
1/5/2010	12.48
1/6/2010	12.53
1/7/2010	12.53
1/8/2010	12.48
1/9/2010	12.75

<b>Date</b>	<b>Influent Flow (mgd)</b>
1/10/2010	13.00
1/11/2010	13.01
1/12/2010	13.08
1/13/2010	13.02
1/14/2010	12.92
1/15/2010	12.82
1/16/2010	12.71
1/17/2010	10.12
1/18/2010	12.93
12/1/2009	13.07
12/2/2009	13.05
12/3/2009	12.76
12/4/2009	12.79
12/5/2009	12.94
12/6/2009	12.94
12/7/2009	12.89
12/8/2009	12.80
12/9/2009	12.86
12/10/2009	12.80
12/11/2009	12.62
12/12/2009	12.63
12/13/2009	12.62
12/14/2009	12.66
12/15/2009	12.81
12/16/2009	12.78
12/17/2009	12.72
12/18/2009	12.62
<b>Mean Daily Flow</b>	<b>12.75</b>

**OPERATIONAL SUMMARY AND PRE-TREATMENT INVESTIGATIONS**

Estimated rainfall at the Taylor Creek site for December 2009 and January 2010 was 3.2 inches which matches the historical mean rainfall during these two months. The average stage of Taylor Creek was 20.3 ft NGVD. Flow to the system averaged 12.75 MGD, with a total flow of 624.7 million gallons.

A shift from submerged vascular plant species to periphytic algae was observed during the final weeks of operation at the Taylor Creek ATS™. Throughout the project, a continued presence of toxicity within Taylor Creek surface water negatively impacted system function. Water quality improvement was documented on the main system with a 2.6 percent reduction in total phosphorus concentrations (28.51 lbs TP removed); and 8.2 percent reduction in total nitrogen concentrations (530.62 lbs TN removed). Mean total phosphorus influent and effluent concentrations were 295 µg/L and 287 µg/L, respectively; while mean influent total nitrogen influent and effluent concentrations were 1.73 mg/L and 1.59 mg/L, respectively.

As described in previous reports, various pre-treatment methods are being evaluated to reduce toxicity of Taylor Creek water prior to introduction to the ATS™ to restore treatment function of the TC-ATS™ to original design projections.

At the end of November, a lined pond was dosed with aluminum sulfate (alum) in an effort to precipitate out the toxicant, recognizing that some nutrient reduction would also occur. The control ATS™ Pilot Unit was also operational at this time. The study was designed to allow a 24 hour detention time in which the alum would be mixed with Taylor Creek water, and the flocculent allowed to settle out. The dosed water was then introduced to a 100 ft long MPU. The test was conducted over two weeks, with a resulting turf that was comprised of *Oscillatoria sp*, *Spirogyra sp*, *Melosira sp*, *Scenedesmus sp*, *Cosmarium sp*, while the control showed only diatom species. Water quality samples have been collected at the influent and effluent of the Mobile Pilot Units, however due to their short length and the duration of the study, these results are presented to provide comparative analysis, and should not be used to evaluate maximum expectations for a full-scale system.

For the two week study, a 63.2% reduction in TP was observed using alum treatment followed by ATS™. This was a 6.1% improvement over alum treatment alone and a 57.4% improvement over ATS™ alone. A 28.7% reduction in TN concentration was observed using alum followed by ATS™, compared with 22.1% reduction using Alum or - 4.24% reduction using ATS™ as stand-alone treatments.

	Total Phosphorus (µg/L)			
	Influent	Effluent		
		Control	Alum Effluent	Alum-ATS™
Date				
12/7/2009	284	221	45	45
12/14/2009	313	346	219	181
% Reduction		5.82	57.1	63.2

	Total Nitrogen (mg/L)			
	Influent	Effluent		
		Control	Alum Effluent	Alum-ATS™
Date				
12/7/2009	1.17	1.04	0.8	0.79
12/14/2009	1.52	1.82	1.33	1.15
% Reduction		-4.24	22.1	28.7

**TAYLOR CREEK STA ATS™ PILOT UNIT**

A Micro-ATS™ Unit was installed at the inlet of the Taylor Creek Stormwater Treatment Area beginning 11/20/2009. The unit is 1 inch wide and 36 inches long. The purpose of this study is to determine whether an algal turf can be established using water treated by the STA, therefore, water quality data is not being collected. The unit showed considerable algal growth for the duration of the study, and was harvested three times over six weeks of operation during November and December.

	Harvested Wet Weight (pounds)	Productivity (dry g/m <sup>2</sup> -d)
11/6/2009	0.34	14.3
11/13/2009	0.28	16.7
11/27/09	0.23	9.47