THE TAMPA BAY NITROGEN MANAGEMENT CONSORTIUM
PARTNERSHIP FOR PROGRESS

TO: Drew Bartlett, FDEP
Jim Giattina, US EPA Region 4

FROM: Holly Greening, TBEP Executive Director (NMC Facilitator)

DATE: April 18, 2012

SUBJECT: 2011 Tampa Bay Nutrient Management Compliance Assessment Results & Addendum
Old Tampa Bay Anomalous Event Report

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On behalf of the Tampa Bay Nitrogen Management Consortium, please find attached the 2011 update on water quality and seagrass resources in the Tampa Bay estuary. This update has been developed in accordance with the compliance assessment adopted through FDEP's Tampa Bay Reasonable Assurance determination on December 22nd, 2010 (Link to FDEP Final Order) and the federally-recognized TMDL for Tampa Bay (Link to EPA TMDL). The formal annual compliance assessment utilized by the Consortium is detailed in Section VIII.B. of the Final 2009 Reasonable Assurance Addendum: Allocation and Assessment Report (Link to Final Document).

In summary, chlorophyll-a concentrations in three of the four major bay segments of the Tampa Bay estuary were below FDEP-approved thresholds. Old Tampa Bay chl-a concentrations exceeded FDEP-approved annual average thresholds in 2011; however, this is considered a short duration exceedence as chl-a levels were below thresholds in 2010. Original thresholds were adopted as part of FDEP's 2002 Reasonable Assurance determination for Tampa Bay and, at that time, it was determined that Tampa Bay's seagrass restoration goals could be achieved if annual chl-a concentrations remained below these thresholds. Additional RA compliance assessment steps are only necessary when thresholds are exceeded for two concurrent years in any particular bay segment. This nutrient management strategy has been utilized by the TBEP and Consortium and incorporated into an Annual Decision Matrix report for Tampa Bay (Link to 2011 Update Report), as well as, this report to regulators. Additionally, the most recent seagrass estimates from the SWFWMD indicate that baywide seagrass coverage increased by 3,250 acres from 2008 to 2010 (Link to SWFWMD Estimates). The SWFWMD will be providing an updated acreage estimate for Tampa Bay by the end of 2012.

Thank you again for your continued participation in the Consortium's process. Please contact Holly Greening (hgreening@tbep.org) with any questions about the Consortium's Annual Compliance Assessment.

2011 Tampa Bay Estuary Nutrient Management Compliance Assessment & Addendum
Old Tampa Bay Anomalous Event Report

On December 22nd, 2010, FDEP Secretary Drew signed a Final Order (FDEP 2010) accepting and approving the 2009 Reasonable Assurance (RA; TBNMC 2010) Addendum for the Tampa Bay estuary. The final order found that the Nitrogen Management Consortium (NMC) provided FDEP reasonable assurance that: 1) completed and proposed management actions in the 2009 RA Addendum will result in the continued attainment of the narrative nutrient criteria within Tampa Bay, and 2) compliance with the allocations in the 2009 RA Addendum ensures reasonable progress towards continued attainment of the narrative nutrient criteria and associated Class III designated uses. Furthermore, the FDEP finalized a WQBEL for the Tampa Bay estuary in accordance with the allocations developed under the 2009 RA Addendum in November 2010.

As part of the compliance assessment stipulated under the 2009 RA Addendum, the NMC committed to assess the water quality and seagrass conditions within Tampa Bay and report these to FDEP and EPA annually. The Consortium's assessment responsibilities are shown in green in Figure 1. It should be noted that the Consortium's reasonable assurance assessment strategy begins with the observation of water quality conditions in the bay for a particular year. As is recommended in numerous EPA guidance documents for the development of numeric nutrient criteria, the Consortium's assessment strategy attempts to apply a stressor-response rationale for the determination of nitrogen load allocation reasonable assurance in Tampa Bay.

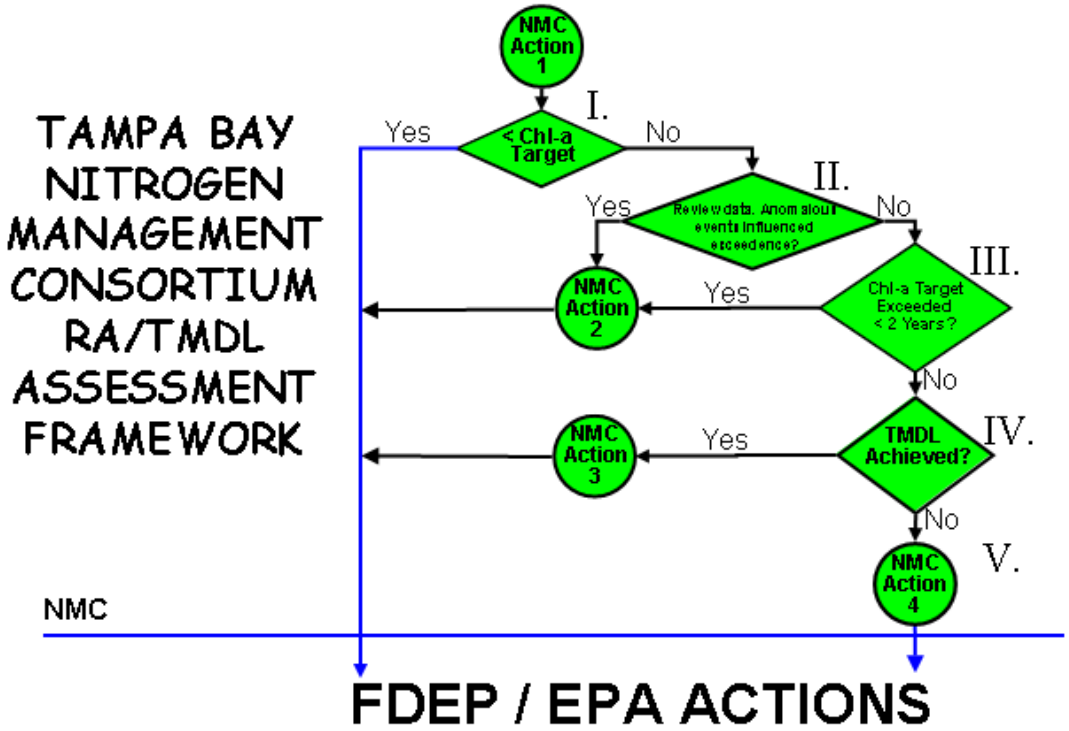

Figure 1: Nitrogen Management Consortium decision framework to assess future reasonable assurance of adopted allocations. Actions and steps to be conducted by the NMC are shown in green. Steps, decision points, and actions are outlined in Table 1 according to the Roman numerals listed on the figure.

The framework is applied on a bay-segment basis, and is predicated on assessing annual attainment of the bay segment chlorophyll-a concentration threshold as the initial step. If the bay segment-specific chlorophyll-a threshold is met, the Consortium annually reports the results to FDEP and EPA and additional assessment steps are not required by the Consortium (by June of the following year). If annual average chlorophyll-a thresholds are not met in one or more bay segments, additional assessment steps are required by the Consortium as noted in the framework and assessment process (Figure 1; Table 1).

Regardless of the assessment results, the Consortium will annually report (by June of the following year) whether the bay segment specific chlorophyll-a thresholds are met using the Environmental Protection Commission of Hillsborough County (EPCHC) dataset, as traditionally assessed using the "Decision Matrix" management strategy developed by the TBEP (Janicki, Wade and Pribble 2000) and will deliver this to FDEP and EPA (Figure 1; NMC Action 1 in the Framework). If an annual, individual exceedence of a bay segment chlorophyll-a threshold is observed, an addendum report outlining the anomalous event(s) or data which influenced the bay segment chlorophyll-a exceedence will be delivered to FDEP and EPA upon review by NMC participants by September of the following year (Figure 1; NMC Action 2 in the Framework). An evaluation of the bay segment assimilative capacity (i.e. revision to the federally-recognized TMDL) is formally considered (if not already considered by the NMC) when bay segment chlorophyll-a thresholds are not met in 2 concurrent years, and hydrologically normalized loads for those years meet the federally-recognized TMDL (Figure 1; NMC Action 3 in the Framework). Alternatively, when bay segment chlorophyll-a thresholds are not met in 2 concurrent years and hydrologically normalized loads for those years also do not meet the federally-recognized TMDL, the Consortium will deliver a full loading report to FDEP and EPA comparing the observed, combined entity/source annual or multiple year loadings to the sources' 2008-2012 annual average allocations by September of the following year. This report will identify any exceedences among combined entity/source load categories after taking into consideration "set allocation" sources and hydrologically-normalized sources, and if necessary, whether exceedences were observed for individual MS4 or unpermitted (LA) sources (Figure 1; NMC Action 4 in the Framework). It is noted that FDEP will independently assess individual entities for compliance with their allocations.

Table 1: Assessment steps linked to the Nitrogen Management Consortium's decision framework, as depicted in Figure 1.

Assessment Step	Result	Action
I. Determine annual bay segment specific chlorophyll-a FDEP threshold attainment as traditionally assessed using the Decision Matrix management strategy developed by the TBEP (TBEP Technical Publication 04-00).	**Yes**	**NMC Action 1**
	No	**NMC Action 1**
II. Review data and determine if an anomalous event(s) influenced non-attainment of the bay segment specific chlorophyll-a threshold.	**Yes**	**NMC Action 2**
	No	**Go to III.**
III. Determine if the chlorophyll-a thresholds have been exceeded for <2 consecutive years.	**Yes**	**NMC Action 2**
	No	**Go to IV.**
IV. Determine if the bay segment specific federally-recognized TMDL	**Yes**	**NMC**

has been achieved using the hydrologically-adjusted compliance assessment outlined in NMC Decision Memo #11 (Appendix 2-11).		**Action 3**
	No	**Go to V.**
V. For a given year or for multiple years, compile and report entity-specific combined source loads in comparison to 5-yr annual average reasonable assurance allocation.	**Compile & Report**	**NMC Action 4**

NMC actions outlined in Figure 1 and Table 1 performed during RA Implementation (2008-2012) are as follows:

NMC Action 1 – A report assessing attainment of bay segment specific chlorophyll-a thresholds using the EPCHC dataset, as traditionally assessed using the Decision Matrix management strategy developed by the TBEP (TBEP Technical Publication 04-00) will be delivered to FDEP and EPA.

NMC Action 2 – A report of the anomalous event(s) or data which influenced the bay segment chlorophyll-a exceedence will be delivered to FDEP and EPA, upon review by NMC participants.

NMC Action 3 – Consider re-evaluation of the bay segment assimilative capacity based on nonattainment of bay segment chlorophyll-a threshold while meeting federally-recognized TMDL.

NMC Action 4 – If federally-recognized TMDL not achieved, compile results of hydrologic evaluation for FDEP's review and identify potential further actions needed to achieve reasonable assurance for bay segment allocations.

2011 Results Summary & Addendum Old Tampa Bay Anomalous Event Report

Results from 2011 indicate that all bay segments except Old Tampa Bay met chlorophyll-a thresholds accepted by the Florida Department of Environmental Protection to maintain FDEP Reasonable Assurance for Tampa Bay and to comply with the EPA TMDL (Figure 2). The Old Tampa Bay segment continues to pose challenges to bay managers as another *Pyrodinium bahamense* bloom was observed during the summer months in this bay segment. Average 2011 chlorophyll-a concentrations in all segments rose from 2010 levels (Figure 2) and more individual stations exceeded their respective bay segment targets in 2011 relative to previous years (Figure 3; Note that individual station exceedences are not considered in this RA compliance assessment). The summer *Pyrodinium bahamense* bloom in Old Tampa Bay transitioned into a harmless diatom bloom in Middle and Lower Tampa Bay during the late summer months and led to higher overall chlorophyll-a levels in those segments during those months (Figure 4). The results from 2011 highlight the proactive efforts of bay managers to fully develop and implement an Old Tampa Bay Water Quality and Habitat Assessment Project. This project will identify the best management action(s) to remediate the water quality conditions observed in this bay segment through the application of an integrated ecological model. The TBEP and SWFWMD have commenced the project in the Fall of 2011 and anticipate completion by the end of 2013.

Despite the water quality set-backs in Old Tampa Bay, seagrasses throughout the segment appear to be maintaining their condition and acreages (SWFWMD 2010). Aerial photographs taken in January 2010 indicate that baywide seagrass coverage increased by 3,250 acres baywide over the 2008 estimate, with a total of 32,897 acres (Figure 5). All bay segments showed an increase in seagrass acreage with the greatest increase seen in Middle Tampa Bay (1,549 acres). The SWFWMD will be providing updated estimates of seagrass acreages in Tampa Bay by the end of 2012.

Detailed results for the RA implementation period from 2007-2011 are also provided in Tables 2-6 for each bay segment. As of the 2011 reporting period, NMC Actions 2-5 are not necessary based upon observed water quality and seagrass conditions within Tampa Bay. Individual annual reports of the bay's conditions from 2007 – 2011 can be found on the TBEP Tech website, as specified in the following links (TBEP Tech Pub.01-08; 02-09; 02-10; 01-11; 01-12). A summary of historic attainment of the regulatory chlorophyll-a thresholds for each of the bay segments is depicted in Figure 6.

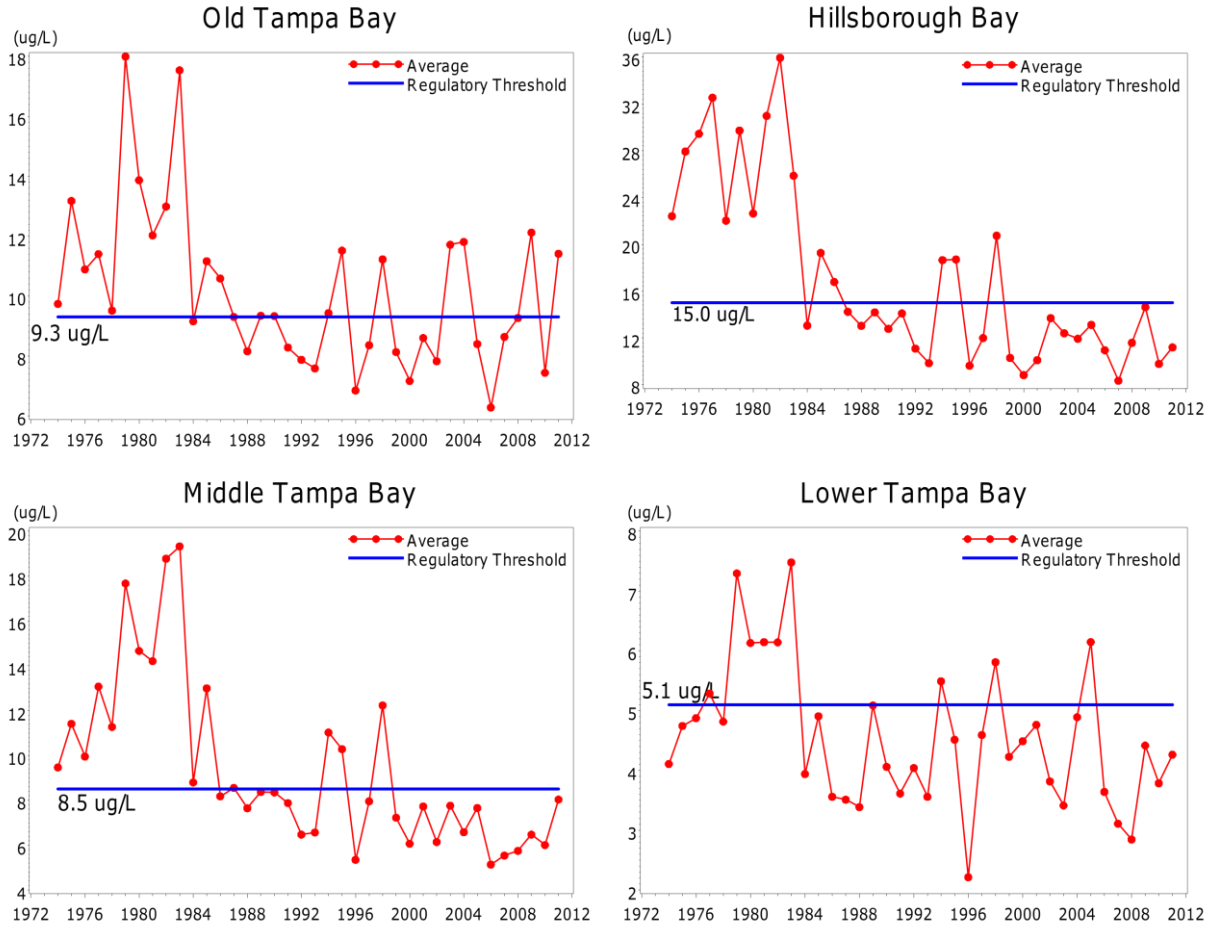

Figure 2: Historic chlorophyll-a annual averages for the four major bay segments of Tampa Bay. Annual averages in 2011 were below the regulatory thresholds developed under the Tampa Nitrogen Management Consortium's nutrient management strategy in all bay segments except Old Tampa Bay. Data source: EPCHC.

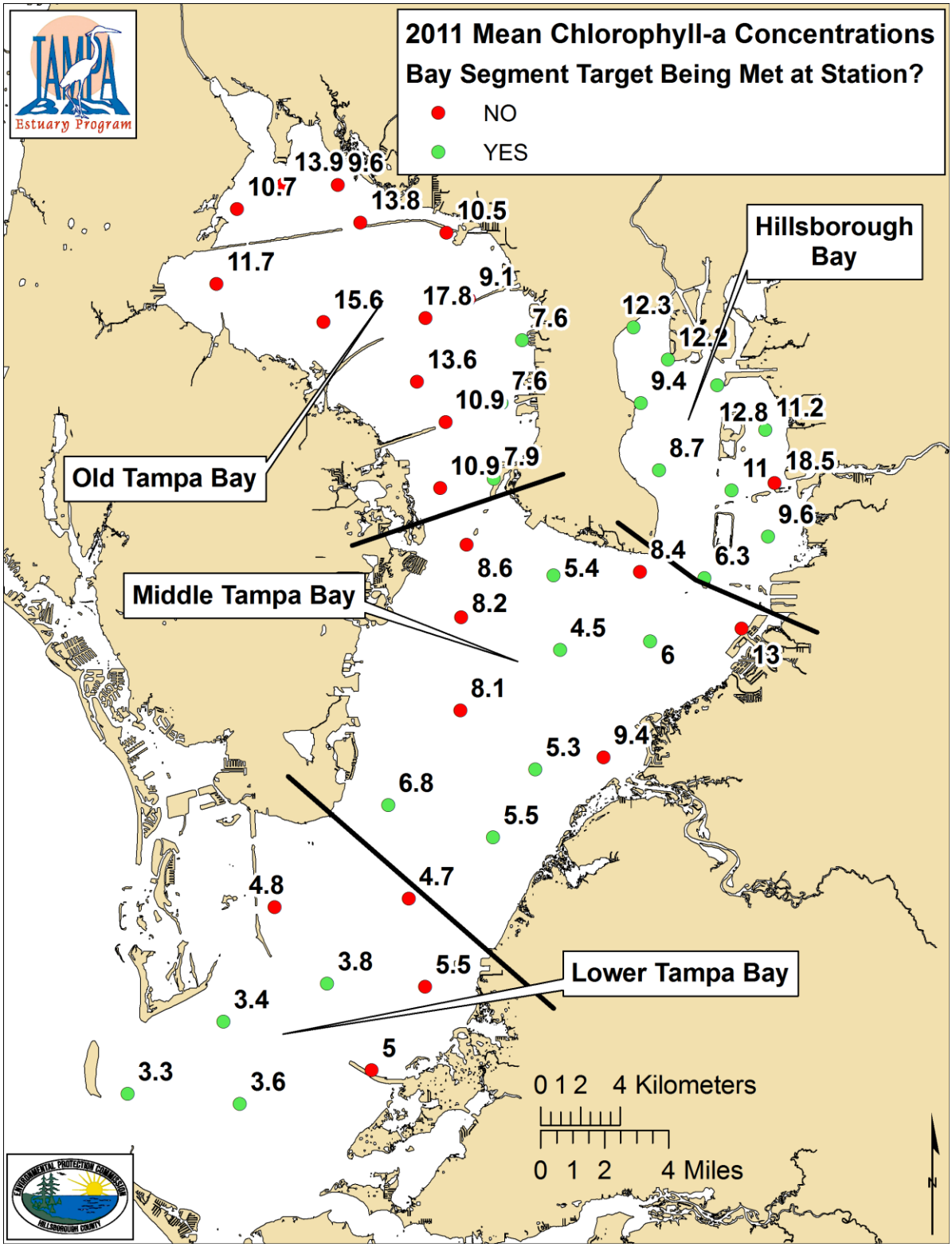

Figure 3: Map depicting individual station chlorophyll-a exceedences in Tampa Bay. **Note individual station exceedences do not indicate failed compliance at the bay segment scale.**

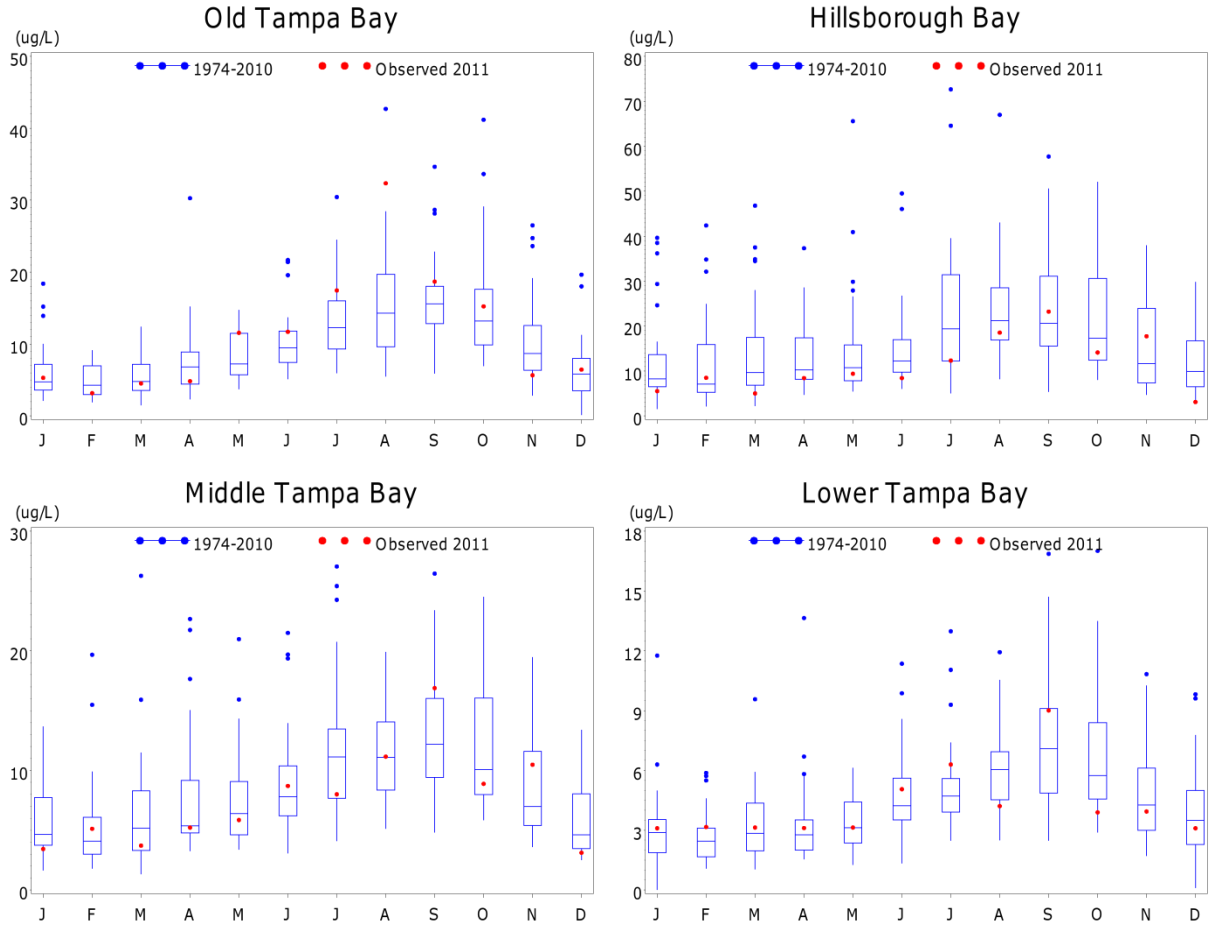

Figure 4: 2011 monthly chlorophyll-a bay segment averages (red dots) compared to monthly distributions from 1974-2010 (blue box plots). Boxes encompass the 25th and 75th percentiles, while whiskers bound the interquartile range. Blue dots represent outliers throughout the 1974-2011 sample period.

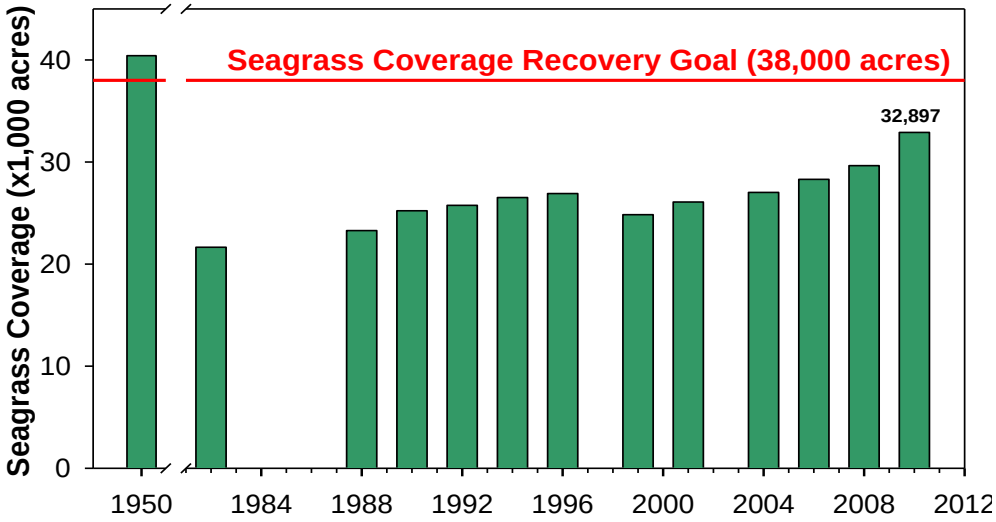

Figure 5: Historic seagrass coverage estimates for Tampa Bay. Data source: SWFWMD.

Table 2: Demonstration of reasonable assurance assessment steps for Old Tampa Bay. Green and yellow squares indicate outcomes of decision points outlined in the Consortium's reasonable assurance assessment framework (Figure 1).

Bay Segment Reasonable Assurance Assessment Steps	**DATA USED TO ASSESS ANNUAL REASONABLE ASSURANCE**					**OUTCOME**
	Year 1 (2007)	**Year 2 (2008)**	**Year 3 (2009)**	**Year 4 (2010)**	**Year 5 (2011)**	
NMC Action 1: Determine if observed chlorophyll-*a* exceeds FDEP threshold of 9.3 μg/L	8.6 μg/L (No)	9.27 μg/L (No)	12.1 μg/L (Yes)	7.4 μg/L (No)	11.4 μg/L (Yes)	Chlorophyll-*a* threshold exceedences occurred during 1 year of assessment period, not necessary for NMC Actions 2-5.
NMC Action 2: Determine if any observed chlorophyll-*a* exceedences occurred for 2 consecutive years	No	No	No	No	No	Chlorophyll-*a* exceedence did not occur in 2 concurrent years, not necessary for NMC Actions 3-5
NMC Action 3: Determine if observed hydrologically-normalized total load exceeds federally-recognized TMDL of 486 tons/year	N/A	N/A	N/A	N/A	N/A	Not necessary due to observed water quality and seagrass conditions in the bay segment.
NMC Actions 4-5: Determine if any entity/source/facility specific exceedences of 5-yr average allocation occurred during implementation period						Not necessary when chlorophyll-*a* thresholds met.

Table 3: Demonstration of reasonable assurance assessment steps for Hillsborough Bay. Green squares indicate outcomes of decision points outlined in the Consortium's reasonable assurance assessment framework (Figure 1).

Bay Segment Reasonable Assurance Assessment Steps	DATA USED TO ASSESS ANNUAL REASONABLE ASSURANCE					OUTCOME
	Year 1 (2007)	Year 2 (2008)	Year 3 (2009)	Year 4 (2010)	Year 5 (2011)	
NMC Action 1: Determine if observed chlorophyll-*a* exceeds FDEP threshold of 15.0 μg/L	8.3 μg/L (No)	11.6 μg/L (No)	14.6 μg/L (No)	9.8 μg/L (No)	11.2 μg/L (No)	All years below threshold, not necessary for NMC Actions 2-5
NMC Action 2: Determine if any observed chlorophyll-*a* exceedences occurred for 2 consecutive years	No	No	No	No	No	All years met threshold, not necessary for NMC Actions 3-5
NMC Action 3: Determine if observed hydrologically-normalized total load exceeds federally-recognized TMDL of 1451 tons/year	N/A	N/A	N/A	N/A	N/A	Not necessary due to observed water quality and seagrass conditions in the bay segment.
NMC Actions 4-5: Determine if any entity/source/facility specific exceedences of 5-yr average allocation occurred during implementation period						Not necessary when chlorophyll-*a* thresholds met.

Table 4: Demonstration of reasonable assurance assessment steps for Middle Tampa Bay. Green squares indicate outcomes of decision points outlined in the Consortium's reasonable assurance assessment framework (Figure 1).

Bay Segment Reasonable Assurance Assessment Steps	**DATA USED TO ASSESS ANNUAL REASONABLE ASSURANCE**					**Comment**
	Year 1 (2007)	**Year 2 (2008)**	**Year 3 (2009)**	**Year 4 (2010)**	**Year 5 (2011)**	
NMC Action 1: Determine if observed chlorophyll-*a* exceeds FDEP threshold of 8.5 μg/L	5.5 μg/L (No)	5.7 μg/L (No)	6.5 μg/L (No)	6.0 μg/L (No)	8.0 μg/L (No)	All years below threshold, not necessary for NMC Actions 2-5
NMC Action 2: Determine if any observed chlorophyll-*a* exceedences occurred for 2 consecutive years	No	No	No	No	No	All years met threshold, not necessary for NMC Actions 3-5
NMC Action 3: Determine if observed hydrologically-normalized total load exceeds federally-recognized TMDL of 799 tons/year	N/A	N/A	N/A	N/A	N/A	Not necessary due to observed water quality and seagrass conditions in the bay segment.
NMC Actions 4-5: Determine if any entity/source/facility specific exceedences of 5-yr average allocation occurred during implementation period						Not necessary when chlorophyll-*a* threshold and TMDL target met

Table 5: Demonstration of reasonable assurance assessment steps for Lower Tampa Bay. Green squares indicate outcomes of decision points outlined in the Consortium's reasonable assurance assessment framework (Figure 1).

Bay Segment Reasonable Assurance Assessment Steps	**DATA USED TO ASSESS ANNUAL REASONABLE ASSURANCE**					**OUTCOME**
	Year 1 (2007)	**Year 2 (2008)**	**Year 3 (2009)**	**Year 4 (2010)**	**Year 5 (2011)**	
NMC Action 1: Determine if observed chlorophyll-*a* exceeds FDEP threshold of 5.1 μg/L	3.1 μg/L (No)	2.8 μg/L (No)	4.4 μg/L (No)	3.8 μg/L (No)	4.3 μg/L (No)	All years below threshold so far, not necessary for NMC Actions 2-5
NMC Action 2: Determine if any observed chlorophyll-*a* exceedences occurred for 2 consecutive years	No	No	No	No	No	All years met threshold, not necessary for NMC Actions 3-5
NMC Action 3: Determine if observed hydrologically-normalized total load exceeds federally-recognized TMDL of 349 tons/year	N/A	N/A	N/A	N/A	N/A	Not necessary due to observed water quality and seagrass conditions in the bay segment.
NMC Actions 4-5: Determine if any entity/source/facility specific exceedences of 5-yr average allocation occurred during implementation period						Not necessary when chlorophyll-*a* threshold and TMDL target met

Table 6: Demonstration of reasonable assurance assessment steps for the Remainder of the Lower Tampa Bay watershed. Green squares indicate outcomes of decision points outlined in the Consortium's reasonable assurance assessment framework (Figure 1).

Bay Segment Reasonable Assurance Assessment Steps	**DATA USED TO ASSESS ANNUAL REASONABLE ASSURANCE**					**OUTCOME**
	Year 1 (2007)	**Year 2 (2008)**	**Year 3 (2009)**	**Year 4 (2010)**	**Year 5 (2011)**	
NMC Action 1: Determine if observed chlorophyll-a exceeds FDEP threshold of 5.1 μg/L for Lower Tampa Bay proper	3.1 μg/L (No)	2.8 μg/L (No)	4.4 μg/L (No)	3.8 μg/L (No)	4.3 μg/L (No)	All years below threshold so far, not necessary for NMC Actions 2-5
NMC Action 2: Determine if any observed chlorophyll-*a* exceedences occurred for 2 consecutive years	No	No	No	No	No	All years met threshold, not necessary for NMC Actions 3-5
NMC Action 3: Determine if observed hydrologically-normalized total load exceeds RA target load of 629 tons/year	N/A	N/A	N/A	N/A	N/A	Not necessary due to observed water quality and seagrass conditions in the bay segment.
NMC Actions 4-5: Determine if any entity/source/facility specific exceedences of 5-yr average allocation occurred during implementation period						Not necessary when chlorophyll-*a* threshold and TMDL target met

Year	Old Tampa Bay	Hillsbor-ough Bay	Middle Tampa Bay	Lower Tampa Bay
1974	No	No	No	Yes
1975	No	No	No	Yes
1976	No	No	No	Yes
1977	No	No	No	No
1978	No	No	No	Yes
1979	No	No	No	No
1980	No	No	No	No
1981	No	No	No	No
1982	No	No	No	No
1983	No	No	No	No
1984	Yes	Yes	No	Yes
1985	No	No	No	Yes
1986	No	No	Yes	Yes
1987	No	Yes	No	Yes
1988	Yes	Yes	Yes	Yes
1989	No	Yes	Yes	Yes
1990	No	Yes	Yes	Yes
1991	Yes	Yes	Yes	Yes
1992	Yes	Yes	Yes	Yes
1993	Yes	Yes	Yes	Yes
1994	No	No	No	No
1995	No	No	No	Yes
1996	Yes	Yes	Yes	Yes
1997	Yes	Yes	Yes	Yes
1998	No	No	No	No
1999	Yes	Yes	Yes	Yes
2000	Yes	Yes	Yes	Yes
2001	Yes	Yes	Yes	Yes
2002	Yes	Yes	Yes	Yes
2003	No	Yes	Yes	Yes
2004	No	Yes	Yes	Yes
2005	Yes	Yes	Yes	No
2006	Yes	Yes	Yes	Yes
2007	Yes	Yes	Yes	Yes
2008	Yes	Yes	Yes	Yes
2009	No	Yes	Yes	Yes
2010	Yes	Yes	Yes	Yes
2011	No	Yes	Yes	Yes

2007-2011 RA Compliance Period

Figure 6: Attainment of adopted chlorophyll-a thresholds (1974- 2011) in the four major bay segments. Green (yes) indicates that average annual chlorophyll-a thresholds were met; red (no) indicates that threshold levels were not met. Data source: EPCHC.