

Progress toward water quality improvement: Total Phosphorus. AMP 2013 Annual Report.
(Guidance Value)

AMENDED CONSENT JUDGMENT GOAL

Achieve compliance with the applicable ambient water quality standard in the upper waters considering all watershed sources of phosphorus. Achieve phosphorus reduction sufficient to reduce the frequency and duration of nuisance algal blooms and eliminate turbidity as impairment to desired uses of the lake for water contact recreation, aesthetics, aquatic life protection, and fish reproduction.

Hypotheses to be tested:	Status:																								
Improvements at Metro will enable the County to meet final effluent limits (as set forth in a revised TMDL on or before Dec 31, 2011, or as schedule is modified)	<ul style="list-style-type: none">TMDL for Phosphorus was updated in 2012 and approved by the USEPA on June 29, 2012.																								
Reduced phosphorus load from Metro reduces concentration of phosphorus in Onondaga Lake	<ul style="list-style-type: none">Phosphorus loading from Metro reduced from an annual average 58 metric tons in the 1990s to 7.2 metric tons in 2013 (87% reduction)Phosphorus concentration in the lake’s upper waters (0, 1 and 3 m depths averaged) has been reduced from average > 70 µg/L in the 1990s to approximately 25 µg/l in 2012 (66% reduction)																								
Reduced phosphorus load from Metro and the nonpoint sources brings the lake into compliance with the numerical TP guidance value 20 ug/l summer average, (or alternative, such as a site-specific guidance value or EPA ecoregional criteria, appropriate for this urban lake).	<ul style="list-style-type: none">The lake exceeded the numerical TP guidance value of 20 µg/l summer average in 2012, with an upper waters summer average of 25 µg/l																								
Current Conditions with Historical Comparison																									
Major Sources – Percent Contribution (Annual Average (standard deviation) 1998 – Stage I Limit caps loading; 2005 – HRFS on-line in February)	<table><tr><th>Time Period</th><th>Metro and Bypass Effluent</th><th>Tributaries</th></tr><tr><td>1990-1997:</td><td>64% (13%)</td><td>36% (13%)</td></tr><tr><td>1998-2004:</td><td>59% (5.7%)</td><td>41% (5.7%)</td></tr><tr><td>2005-2009:</td><td>31% (7.6%)</td><td>69% (7.6%)</td></tr><tr><td>2010:</td><td>17%</td><td>83%</td></tr><tr><td>2011:</td><td>20%</td><td>80%</td></tr><tr><td>2012:</td><td>37%</td><td>63%</td></tr><tr><td>2013:</td><td>18%</td><td>82%</td></tr></table>	Time Period	Metro and Bypass Effluent	Tributaries	1990-1997:	64% (13%)	36% (13%)	1998-2004:	59% (5.7%)	41% (5.7%)	2005-2009:	31% (7.6%)	69% (7.6%)	2010:	17%	83%	2011:	20%	80%	2012:	37%	63%	2013:	18%	82%
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Upper Waters Concentration (Annual Average (standard deviation))	<table><tr><th>Time Period</th><th>South Deep, 0-3 meters, Jun 1 – Sept 30 (µg/L)</th></tr><tr><td>1990-1997:</td><td>79 (23)</td></tr><tr><td>1998-2004:</td><td>53 (12)</td></tr><tr><td>2005-2009:</td><td>27 (11)</td></tr><tr><td>2010:</td><td>25 (5)</td></tr><tr><td>2011:</td><td>20 (3.4)</td></tr><tr><td>2012:</td><td>22 (6.2)</td></tr><tr><td>2013:</td><td>25 (6.3)</td></tr></table>	Time Period	South Deep, 0-3 meters, Jun 1 – Sept 30 (µg/L)	1990-1997:	79 (23)	1998-2004:	53 (12)	2005-2009:	27 (11)	2010:	25 (5)	2011:	20 (3.4)	2012:	22 (6.2)	2013:	25 (6.3)								
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Compliance with NYS AWQS in Upper Waters	<ul style="list-style-type: none">Narrative Standard: None in amounts that will result in growths of algae, weeds, and slimes that will impair the waters for their best usagesGuidance Value: 20 µg/l summer average in upper waters																								
	No algal blooms (chlorophyll-α >15 µg/l) measured during 2013 (Summer), consistent compliance with narrative phosphorus standard.																								
	2013 summer average TP exceeded the guidance value.																								
Factors Affecting Compliance	Point and nonpoint sources of phosphorus, food web interactions																								

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(Guidance Value) (continued).

Planned Load Reductions (1998 – 2012)

Metro SPDES Permit Requirement	Stage I Limit: Cap on Loading: effective January 1998
	<ul style="list-style-type: none"> • 400 pounds per day
	Stage II Limit: Cap on Concentration: effective April 2006
	<ul style="list-style-type: none"> • Metro effluent TP 0.12 mg/l (12-month rolling average)
	Revised Interim Stage II: Cap on Concentration: effective Nov, 2010
	<ul style="list-style-type: none"> • Metro effluent TP 0.10 mg/l (12-month rolling average)
	Limit specified in TMDL for phosphorus: effective June 29, 2012
	<ul style="list-style-type: none"> • Metro effluent TP 0.10 mg/l (12-month rolling average)

Monitoring and Assessment Program

Loading Estimates <i>Annual County monitoring program</i>	<ul style="list-style-type: none"> • Biweekly tributary monitoring, supplemented with sampling during high flow conditions • Storm event monitoring • Daily measurements of Metro effluent
Lake Monitoring <i>Annual County monitoring program</i>	<ul style="list-style-type: none"> • Biweekly phosphorus profiles in lake (TP, SRP, TDP), April –Nov, 3-meter depth intervals at South Deep • Chlorophyll-α, Secchi disk transparency and LiCor measurements, • Winter sampling as weather allows
Related Biological Monitoring	<ul style="list-style-type: none"> • Annual phytoplankton and zooplankton monitoring • Macrophyte survey every five years (began in 2000)

Tools for Decision Making

Models	<ul style="list-style-type: none"> • Watershed model (USGS) • Onondaga Lake Water Quality Model (Anchor QEA, LLC) • Mass balance TP framework and linked empirical eutrophication model (William Walker)
TMDL Allocations	Phase II TMDL for phosphorus effective June 29, 2012
NYS AWQS and Guidance Value; Federal Criteria	Narrative standard
	Guidance value of 20 $\mu\text{g/l}$ summer average upper waters
	Possible site-specific guidance value for TP
	EPA ecoregional criteria
