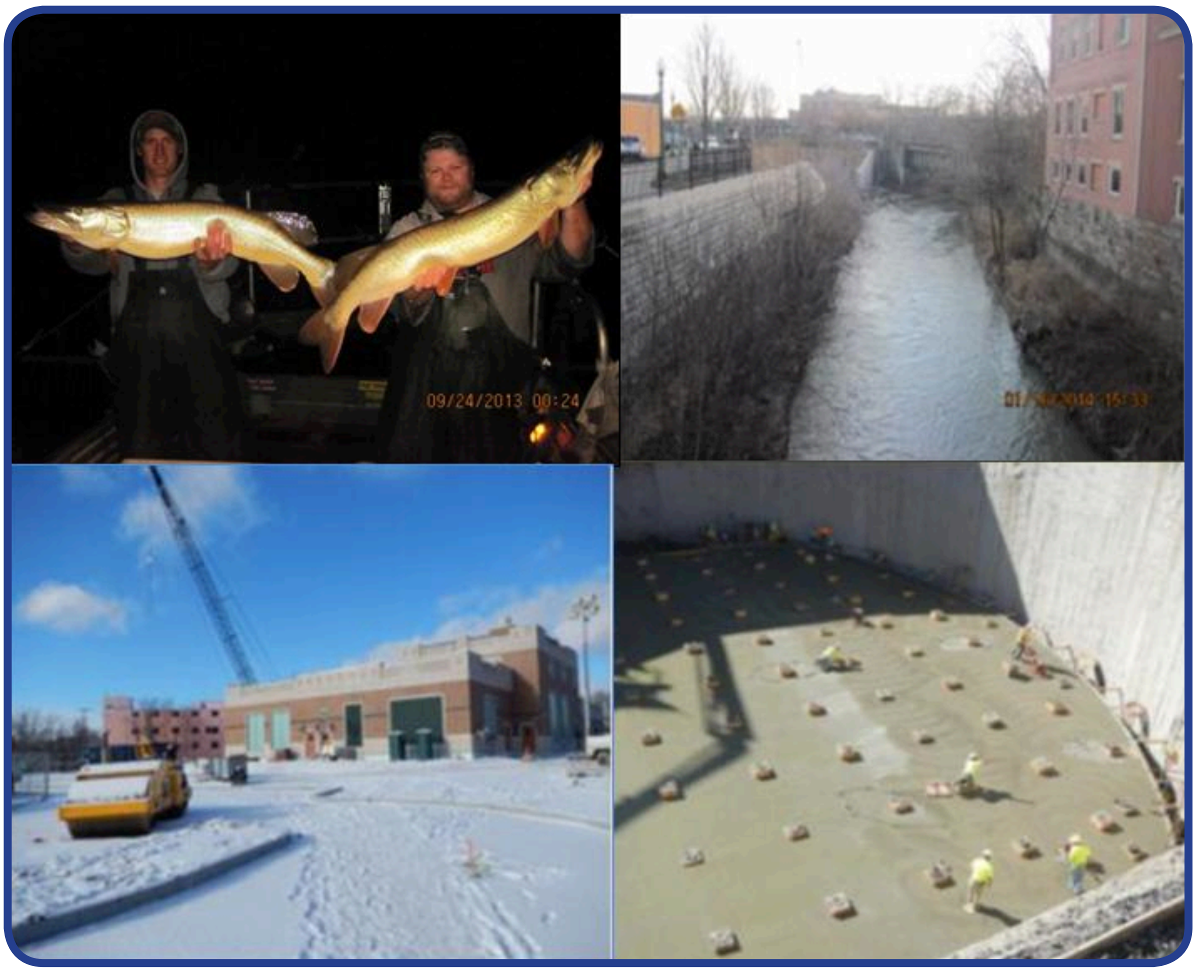
ONONDAGA COUNTY

AMBIENT MONITORING PROGRAM

Five Year Work Plan
(2014-2018)

Final dated, October 2014

Submitted to NYSDEC and ASLF



Save the Rain

Onondaga County Department of
WATER
ENVIRONMENT
PROTECTION

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

VISION

To be a respected leader in wastewater treatment, stormwater management, and the protection of our environment using state of-the-art, innovative technologies and sound scientific principles as our guide.

MISSION

To protect and improve the water environment of Onondaga County in a cost-effective manner ensuring the health and sustainability of our community and economy.

CORE VALUES

Excellence
Teamwork
Honesty
Innovation
Cost-Effectiveness
Safety

Save the Rain

http://www.savetherain.us

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SECTION 1: List of Acronyms

ACJ	Amended Consent Judgment
AMP	Ambient Monitoring Program
ASLF	Atlantic States Legal Foundation
AWQS	Ambient Water Quality Standards
BAF	Biological Aerated Filter
BMP	Best Management Practices
CPUE	Catch Per Unit Effort
CSO	Combined Sewer Overflow
CSF	Clinton Storage Facility
CSS	Combined Sewer System
DEC	Department of Environmental Conservation
EBSS	Erie Boulevard Storage System
ELAP	Environmental Laboratory Approval Program
FCF	Floatables Control Facility
GC	Gate Chamber
GI	Green Infrastructure
HB	Harbor Brook
HBIS	Harbor Brook Interceptor Sewer
HRFS	High Rate Flocculating Settling
Metro	Metropolitan Syracuse Wastewater Treatment Plant
LC	Ley Creek
LHB	Lower Harbor Brook
LIMS	Laboratory Information Management System
LTCP	Long Term Control Plan
MIS	Main Interceptor Sewer
MS4	Municipal Separate Storm Sewer System
NMC	Nine Minimum Controls
NRCS	Natural Resources Conservation Services
NYCRR	New York Code, Rules, and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
OC	Onondaga County
OCDWEP	Onondaga County Department of Water Environment Protection
OEI	Onondaga Environmental Institute
OLTAC	Onondaga Lake Technical Advisory Committee
OLWQM	Onondaga Lake Water Quality Model
PCCM	Post Construction Compliance Monitoring
PLC	Programmable Logic Controller
QPR	Quarterly Performance Report
RTF	Regional Treatment Facility
RIBS	Rotating Intensive Basin Studies
SCADA	Supervisory Control and Data Acquisition System
SOCPA	Syracuse Onondaga County Planning Agency
SPDES	State Pollution Discharge Elimination System
STR	Save the Rain

SUNY ESF	State University of New York Environmental Science and Forestry
SVAP	Stream Visual Assessment Protocol
SWMM	Storm Water Management Model
TBD	To be determined
TMDL	Total Maximum Daily Load
TOGS	Technical & Operational Guidance Series
TRWQM	Three Rivers Water Quality Model
UFI	Upstate Freshwater Institute
USEPA	United States Environmental Protection Agency
WEP	Water Environment Protection

SECTION 2: Executive Summary

From 1999 through 2013, Onondaga County submitted an annual Ambient Monitoring Program (AMP) work plan to NYSDEC and ASLF describing the sampling programs proposed for Onondaga Lake, its tributaries, and the Three Rivers System. The sampling work plans contained specific sites, monitoring frequencies, and the targeted chemical, physical, and biological parameters proposed for the year. In light of the notable water quality improvements in Onondaga Lake, recently constructed major gray infrastructure project milestones to remediate combine sewer overflows (CSOs), and on-going green infrastructure projects, Onondaga County has conducted a thorough review of the AMP and developed a five-year work plan to guide monitoring and assessment of Onondaga Lake and its tributaries planned from 2014 to 2018.

Onondaga County's proposed five-year AMP work plan, covering 2014 to 2018, is presented here for review by New York State Department of Environmental Conservation (NYSDEC) and Atlantic States Legal Foundation (ASLF). This work plan, which serves as a roadmap for monitoring and assessment of Onondaga Lake and its tributaries during this five year period, was developed in consultation with members of the County's Onondaga Lake Technical Advisory Committee (OLTAC), representatives of NYSDEC (Region 7), ASLF, Onondaga Environmental Institute (OEI), and Parsons (Honeywell's project consultant).

This work plan, which is intended to comply with the requirements of the Fourth Stipulation to the Amended Consent Judgment (ACJ) and the State Pollution Discharge Elimination System (SPDES) permit for the Metropolitan Syracuse Wastewater Treatment Plant (Metro), incorporates:

- AMP sampling program changes for Onondaga Lake and its tributaries, as accepted by the NYSDEC in 2013 as part of the review of the 2013 AMP Work Plan.
- Proposed sampling program changes, with supporting justifications, based on recommendations of the AMP Technical Workgroups convened in November and December of 2013.
- Modifications to the Tributary sampling program to support assessment of the effectiveness of green and gray infrastructure projects, consistent with the Final Work Plan, dated December 2011, with changes as approved by NYSDEC in 2013. A tentative sampling program schedule over the five-year period and sampling plans related to Post Construction Compliance Monitoring (PCCM). The PCCM includes a monitoring plan for demonstrating compliance with AWQS associated with specific CSO controls.
- Coordination efforts with Honeywell and their sediment remediation program, to increase synergies and reduce data redundancy.

It is the County's goal to supplement this Five-Year AMP Work Plan annually, with updates submitted to NYSDEC and ASLF by January 31 of each year. These updates will reflect findings from the previous year's sampling efforts and any changes in the NYS AWQS or guidance values. The sampling program will continue to incorporate the flexibility necessary to respond to new data and information. It is the County's goal to ensure all elements of the AMP provide meaningful data in a scientifically defensible and cost-effective manner. The final distribution of the Five-Year AMP Work Plan will follow review and approval by NYSDEC and ASLF.

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SECTION 3: Introduction

3.1 Regulatory Framework

3.1.1 ACJ

On August 1, 1998, Onondaga County implemented an approved AMP to comply with a judicial requirement set forth as part of the ACJ (ACJ) entered into on January 20, 1998, between Onondaga County (OC), New York State (NYS), and ASLF. A comprehensive effort was proposed to impartially assess and document water quality prior to, during, and after implementing improvements to Metro and the CSOs over a 15-year period. Improvements to the Metropolitan Syracuse Wastewater Treatment Plant (Metro) and the Combined Sewer Overflows (CSOs) were implemented in a phased program, with final completion dates in 2012. Evaluation of the effectiveness of the planned actions in improving water quality were designed and conducted as a long-term program. Onondaga County Department of Water Environment Protection (OCDWEP) is responsible for implementing the AMP and reporting its findings.

3.1.2 ACJ Fourth Stipulation

The ACJ has been amended periodically, most recently by stipulation in November of 2009 (referred to as the Fourth Stipulation). The ACJ amendments have added other requirements to the AMP, particularly related to the tributary monitoring program. The Fourth Stipulation specifically identified Green Infrastructure (GI) as an acceptable technology to significantly reduce or eliminate the discharge of untreated combined sewage into Onondaga Lake and its tributaries, and bring the County's effluent discharges into compliance with the applicable ambient water quality standards (AWQS) for the receiving waters.

The Fourth Stipulation includes a phased schedule for CSO compliance that uses an incremental approach to meeting the new goal of capture for treatment or elimination of no less than 95 percent by volume of CSO by 2018, within the meaning of the Environmental Protection Agency's (EPA) National CSO Policy. To meet this goal, the County initiated the "Save the Rain" (STR) program using a combination of green and gray infrastructure that focuses on the removal of stormwater from the combined sewer system through GI, CSO storage with conveyance to Metro, and elimination of CSO discharge points. Green practices help maintain and restore natural hydrology by enhancing stormwater capture, infiltration, and evapotranspiration. The objective is to reduce the peak flow of stormwater reaching the collection system and ultimately reducing the magnitude, duration, and water quality impacts of overflow events. The Fourth Stipulation further required modifications to the County's established monitoring program to document the effectiveness of improvements to the CSO system through the construction of gray and green infrastructure projects and initiatives.

3.1.3 Metro SPDES Permit

Two important regulatory milestones were reached in 2012. First, New York State Department of Environmental Conservation (NYSDEC) issued a new State Pollution Discharge Elimination System (SPDES) Permit for Metro on March 21, 2012. Second, a total maximum daily load (TMDL) allocation for phosphorus inputs to Onondaga Lake was approved by USEPA on June 29, 2012. A total phosphorus concentration limit of 0.10 mg/L on a 12-month rolling average basis was established for Metro outfall 001 and became effective upon TMDL approval.

In addition to the requirements set forth in the ACJ Fourth Stipulation, the Metro SPDES Permit outlines a Compliance Action for CSOs, that requires the permittee to submit to the NYSDEC an annual report addressing compliance with the USEPA CSO strategy requirements, the SPDES permit, the ACJ, and AWQS. The new permit requires the County to issue an annual report for CSO Best Management Practices (BMP) (Section VI.15) and CSO compliance (Sec X.C.1). The ninth element of the Long Term Control Plan (LTCP) listed in the CSO Control Policy, as required by the Metro SPDES Permit, is the development of a post construction compliance monitoring (PCCM) adequate to verify compliance with water quality-based requirements and ascertain the effectiveness of CSO controls. Section II.B of the USEPA National Combined Sewer Overflow policy describes the ninth element of the Nine Minimum Control (NMC) as "monitoring to effectively characterize CSO impacts and the efficacy of CSO controls". Evaluation of CSO control measures, CSO volume, loadings of conventional and toxic pollutants, and receiving water quality environmental indicators are to be used to measure compliance.

This Work Plan is intended to also comply with the requirements of the SPDES permit, which specifically requires water quality monitoring:

a. To include sampling of each water body that receives a CSO. Sampling shall be consistent with the revised AMP; and
b. List measures to be taken to address water quality violations if detected. This shall include follow up sampling and source trackdown as appropriate and discuss measures taken to comply with the Pretreatment requirements.

The Metro SPDES Permit also specifies monitoring requirements for the following CSO treatment facilities to monitor effluent overflow and to report the sample results on the quarterly performance reports (QPRs):

Retention Facilities

1. Erie Boulevard Storage System
2. Hiawatha Regional CSO Treatment Facility
3. Midland Regional CSO Treatment Facility
4. Harbor Brook CSO 018 Pilot Constructed Wetlands Treatment Facility (as per draft Permit)

Floatables Control Facilities

1. Teall Floatables Control Facility
2. Butternut Floatables Control Facility
3. Burnet Floatables Control Facility
4. Maltbie Floatables Control Facility
5. Harbor Brook Floatables Control Facility

3.2 AMP Objectives

The primary objective of the AMP dated July 1998 was to evaluate the impact of alterations and improvements to Metro and the CSOs on water quality. The program was designed to assess progress towards compliance with the AWQS and progress towards use attainment and includes an assessment of the physical, chemical, and biological attributes of the aquatic resource.

The AMP objectives, as stated in Appendix D of the ACJ, include measures to:

- Assess compliance with ambient water quality standards in the lake and tributary streams
- Estimate loading of materials to the lake, including the volume and loading of materials from the combined sewer overflows
- Evaluate physical habitat conditions in the lake and tributaries
- Evaluate the lake's trophic state (level of productivity)
- Model the assimilative capacity of the Seneca River in the region of the Onondaga Lake outlet to support a decision regarding diversion of Metro effluent
- Characterize the lake's biological community

In NYS, most of the promulgated AWQS and criteria reference maximum concentrations of chemical parameters. Chemical monitoring is consequently a significant component of the work plan. The lake and tributary monitoring programs include sample collection and analysis for a large suite of chemical parameters to support assessments of compliance with NYS AWQS and guidance values. The chemical monitoring of Onondaga Lake and its tributaries will continue annually over the five year period and is supplemented with assessment of indicators of the ecological integrity of the surface water system. Improvements to the habitat for aquatic organisms are an important element of use attainability in this system. Both the chemical and ecological assessments will be used to continue tracking progress towards achieving "swimmable and fishable" conditions.

3.3 AMP Work Plan

From 1999 through 2013, Onondaga County submitted an annual AMP work plan to NYSDEC and ASLF outlining the sampling programs proposed for Onondaga Lake, its tributaries, and the Seneca

River. The sampling work plans contained specific sites, monitoring frequencies and the targeted chemical, physical, and biological parameters proposed for the year.

In 2013, efforts were initiated for the evaluation of overlap of monitoring conducted as part of Honeywell's sediment remediation program. Subsequently, a detailed evaluation of the AMP sampling program was undertaken in 2013 that considered data collection needs to reduce data redundancy. It was agreed that there are areas for monitoring program cooperation and integration that have potential benefits to both Honeywell and OC. Both the Honeywell program and the AMP collect data at the South Deep monitoring station. To eliminate redundancy, OC did not deploy the monitoring buoy at South Deep during 2013; data from the Upstate Freshwater Institute (UFI) buoy (funded by Honeywell), was accessed and utilized. In addition, the open line of communication precedent set in 2012 continued, with Honeywell providing OC periodic updates on dredging and capping operations that could affect OC sampling. Honeywell and OC also agreed to mutual data sharing as part of this cooperative effort.

Onondaga County proposes a five-year AMP work plan, covering 2014 to 2018, for NYSDEC and ASLF review. The work plan outlines Onondaga County's program for monitoring and assessment of Onondaga Lake and its tributaries during this five year period. This work plan was developed in consultation with members of the County's Onondaga Lake Technical Advisory Committee (OLTAC) with expertise in limnology, engineering, statistics, and fisheries. In addition to members of OLTAC, these workgroups consisted of NYSDEC representatives (Region 7 and Region 7 Fisheries Office), ASLF, Onondaga Environmental Institute (OEI), and Parsons (Honeywell's project consultant), reflecting a coordinated effort. The recommendations from these workgroup discussions are incorporated into this proposed five-year AMP sampling program.

The goals of the five-year AMP work plan are to support a focused sampling program that will:

- produce the data needed to continue assessment of compliance with the NYS AWQS and guidance values;
- track progress towards use attainment; and
- allocate resources to support additional monitoring and analysis as needed

In addition to this five-year work plan, annual updates will be submitted to the NYSDEC and ASLF for review, by January 31 of each year. These updates will reflect findings from the previous year's sampling efforts and any changes in the NYS AWQS or guidance values. Any changes will be implemented following NYSDEC review and approval, prior to implementation. The sampling program will continue to incorporate flexibility necessary to respond to new data and information. It is the County's goal to ensure all elements of the AMP provide meaningful data in a scientifically defensible and cost-effective manner.

For NYSDEC and ASLF review convenience, the 2014 AMP sampling program work plan for water quality and biological monitoring is included as Appendix 1 of this document.

3.4 ACJ Milestones

Several project and program-related ACJ milestones have been met to date. These include the completion of the advanced wastewater treatment projects at Metro, specifically the Biological Aerated Filter system (BAF) for ammonia removal and the High Rate Flocculated Settling system (HRFS) for phosphorus removal, which became operational in 2005. With the reductions in total phosphorus, ammonia and chlorophyll-*a*, several notable water quality improvements have been documented in the lake. Recently achieved project milestones, include the successful completion of the Onondaga Lake Water Quality Model Project (OLWQM) in 2012 and the NYSDEC's issuance of the Final Onondaga Lake TMDL for Phosphorus, dated May 2012, as approved by the USEPA in June 2012. In 2013, several ACJ Fourth Stipulation required project milestones were achieved (Table 3.4.1).

Table 3.4.1 ACJ Gray Infrastructure Milestone Schedule and Compliance Status

Project	Milestone Schedule	Milestone Date	Compliance Status
CSO 044 Conveyances Project	Complete construction and commence operation	12/31/13	Achieved
Harbor Brook Interceptor Sewer (HBIS) Replacement	Complete construction and commence operation	12/31/13	Achieved
Erie Boulevard Storage System (EBSS) GC (Gate Chamber) Modifications	Complete required modifications	12/31/11	Achieved
Clinton Storage Facility (CSF)	Complete construction and commence operation	12/31/13	Achieved
Lower Harbor Brook (LHB) Storage Facility	Complete construction and commence operation	12/31/13	Achieved

In addition to the constructed gray infrastructure projects, several additional gray projects are also planned by the County (Table 3.4.2).

Table 3.4.2 Additional Gray Infrastructure Projects and Implementation Schedule

Project	Task Description	Date
CSO 022/045 Sewer Separation Project	Complete construction and commence operation	12/31/12
CSO 063 Conveyances	Complete construction and commence operation	9/1/15
CSO 061	Complete construction and commence operation	TBD
CSO Facilities Plan (CSOs 027, 029, 052, 060, 067, 077)	Complete construction and commence operation	TBD

TBD – To be determined

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SECTION 4: Overview of the Five-Year AMP Work Plan (2014-2018)

4.1 Purpose

The purpose for developing the five-year AMP work plan is to:

- Provide an overview of the AMP sampling programs planned in the context of the recently constructed major CSO gray project milestones and on-going GI projects, consistent with the Fourth Stipulation of the ACJ.
- Consider potential synergy opportunities with Honeywell related to their sediment remediation program.
- Submit a five-year AMP sampling work plan with annual updates, to facilitate an expeditious annual review by the NYSDEC and ASLF, and allowing for the annual implementation of a NYSDEC approved program by April 1 of the same year, as required by the ACJ.

4.2 Elements of the Five-Year AMP Sampling Program

In addition to complying with the judicial requirements set forth in the 1998 ACJ, this work plan is also intended to comply with the Fourth Stipulation of the ACJ. The five-year AMP work plan describes the water quality and biological monitoring programs planned for Onondaga Lake and it's tributaries for 2014-2018. The improvements to the CSOs are implemented in a phased program, with final completion dates in 2018.

OC's proposed five-year monitoring program includes annual elements designed to recur each year from 2014 through 2018 (refer to Table 4.2.1 for program elements). Additional sampling and monitoring are proposed in this work plan to complement the annual monitoring program; these are more intense monitoring and assessment programs designed to support specific project milestones. Section 6 (Tributary Monitoring) and Section 7 (Onondaga Lake Monitoring) outline program-specific details. The sampling program will continue to incorporate flexibility, with annual updates submitted to NYSDEC and ASLF as new data and information become available. Any changes will be implemented following NYSDEC review and approval, prior to implementation.

Table 4.2.1 Overview of Components and Sub-components of the Five-Year AMP Sampling Program

Monitoring Program	Program Components	Program Sub-components	Description
Tributary Monitoring	Water Quality Monitoring	Annual Sampling	Includes monitoring of 7 tributaries to the lake, Metro effluent, and Onondaga Lake outlet to support compliance assessment, loading estimates, and trend analysis.
		Post Construction Compliance Monitoring	Monitoring of representative CSO outfalls and receiving streams (Onondaga Creek and Harbor Brook) to support assessment of the effectiveness of green and gray infrastructure and CSO controls to demonstrate compliance w/specific projects.
	Biological Monitoring	Macroinvertebrate Monitoring	Macroinvertebrates are collected and identified at two to four sites in each of the CSO affected streams (Onondaga Creek, Ley Creek, and Harbor Brook).
		Stream Mapping	Survey to assess the physical and biological conditions within the stream using the Stream Visual Assessment Protocol (SVAP). Includes the collection and identification of macroinvertebrates at one location per stream mile in each of the three CSO-affected streams.
Onondaga Lake Monitoring	Water Quality Monitoring	Annual Sampling	Monitoring is conducted at two main lake stations, South Deep and North Deep, to support compliance assessment, trend analysis, and evaluation of trophic state.
		Near-shore Sampling	Weekly monitoring of a network of ten near-shore locations during summer to evaluate suitability for water contact recreation.
	Biological Monitoring	Plankton	Phytoplankton and zooplankton samples are collected each year and analyzed for numbers, biomass, biovolume, and species composition. Long-term trends and seasonal variations are tracked.
		Fish Community	Annual monitoring of the fish community supports assessment of the densities and species composition of fish and evaluation of the success of walleye, bass, and sunfish propagation in the lake.
		Macrophyte Assessment	Provides information on the areal coverage and community composition of macrophytes in the lake.
		Benthic Macroinvertebrate Assessment	Community composition of benthic macroinvertebrates is assessed at multiple littoral zone locations.

4.3 2014 AMP Sampling Program

The 2014 AMP sampling program work plan for water quality and biological monitoring is included as Appendix 1 of this document. The work plan details specific sites, monitoring frequencies, and targeted chemical, physical, and biological parameters proposed for the year.

4.4 Five-Year AMP Sampling Program Schedule (2014-2018)

The proposed schedule for the Onondaga Lake AMP and related Honeywell monitoring planned for 2014 through 2018 is presented in Table 4.4.1.

Table 4.4.1 Proposed 2014-2018 Schedule for the Onondaga Lake Ambient Monitoring Program and Related Honeywell monitoring

Monitoring Component	Sub-component	Year				
		2014	2015	2016	2017	2018
Tributary Monitoring						
Water Quality Monitoring	Annual Sampling	✓	✓	✓	✓	✓
	Post Construction Compliance Monitoring	✓	✓	✓	✓	✓
Biological Monitoring	Macroinvertebrate Monitoring		✓		✓	
	Stream Mapping				✓	
Onondaga Lake Monitoring						
Water Quality Monitoring	Main Lake Sampling	✓	✓	✓	✓	✓
	Near-shore Sampling	✓	✓	✓	✓	✓
Biological Monitoring	Plankton Sampling	✓	✓	✓	✓	✓
	Fish Community Sampling	✓	✓	✓	✓	✓
	Macrophyte Assessment				✓	
	Macroinvertebrate Assessment		✓			
Honeywell Monitoring						
	Surface Water (mercury in mid-lake)	✓	✓	✓	✓	✓
	Aquatic Vegetation Monitoring	✓	✓	✓	✓	✓
	Fish Community Sampling	✓	✓	✓	✓	✓
	Macroinvertebrate Assessment		✓			

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SECTION 5: Summary of AMP Sampling Program Changes

5.1 2013 AMP Sampling Program Changes

With the completion of several milestone projects and the achievement of significant water quality improvements in Onondaga Lake, a detailed review of the 2012 Sampling Program was conducted in January 2013. An AMP Technical Workgroup meeting was convened on February 5, 2013, with the participation of several members of the Department's OLTAC committee who have extensive knowledge of the County's AMP. AMP data collected as part of the sampling programs conducted from 1998 through 2012 were reviewed to evaluate future program objectives and discuss recommendations for the proposed 2013 AMP sampling work plan. The sampling program objectives were reviewed in the context of AMP data needs to support loading estimates, evaluate trends, and assess compliance with AWQS.

Based on the recommendations of the Workgroup, several changes were proposed to NYSDEC and ASLF and incorporated as part of the 2013 Annual AMP Sampling Work Plan. These included proposed changes to Onondaga Lake and tributary programs relating to sampling protocol, parameters, sites, and frequency. Although NYSDEC did not concur with a few of the proposed sampling program changes, several of the proposed changes were approved. Subsequently, this five-year AMP work plan incorporates the NYSDEC 2013 accepted changes.

5.2 2014-2018 AMP Sampling Program Changes

A similar review of the AMP was conducted later in 2013 for the development of the proposed five-year AMP for implementation from 2014 through 2018. A detailed evaluation of the water quality and biological sampling programs (including sampling sites, parameters, and frequency) was undertaken, with a greater focus on the overall sampling schedule. As part of this effort, two (2) separate workgroups were convened to discuss recommendations for the water quality and biological monitoring programs. An AMP Technical Workgroup meeting was convened on November 7, 2013, and a Biological Workgroup meeting was convened on December 2, 2013. In addition to several members of the OLTAC, these workgroups consisted of representatives of NYSDEC (Region 7 and the Region 7 Fisheries Office), ASLF, OEI, and Parsons (Honeywell's project consultant), reflecting a coordinated effort. The workgroup recommendations are incorporated into this proposed five-year AMP sampling program. Tables 5.2.1 and 5.2.2 include a summary of these proposed changes and associated justifications supporting the changes for the water quality and biological monitoring programs planned through 2018. The overall goals of the County's long-term monitoring program are maintained with these proposed changes.

The potential for continued integration and coordination with the Honeywell sampling program was also evaluated for the efforts planned from 2014 through 2018. Discussions with Honeywell included reducing the duplication of efforts among the biological sampling programs related to the fish community surveys, macrophyte assessment, and benthic invertebrate sampling. For the fish sampling program, with the reduced reduction in scope proposed for the County's program, any prior overlap has essentially been eliminated. The spring sampling efforts (mainly electrofishing) typically overlapped, with SUNY ESF conducting population estimates and the

County doing the community Catch Per Unit Effort (CPUE). Because there will not be WEP's fish sampling in the spring, there will not be a need for coordinating field efforts. Any formal data sharing is coordinated through Parsons for Honeywell.

In summary, the proposed five-year AMP sampling program incorporates:

- AMP water quality sampling program changes as approved by the NYSDEC in 2013, as part of the 2013 AMP sampling program review.
- Additional changes in water quality monitoring proposed for the Annual Tributary and Lake sampling programs, with supporting justifications, based on recommendations from the November 2013 AMP Technical Workgroup meeting.
- Proposed changes in the biological monitoring program and schedule, relating to the Annual Fisheries sampling program (reflecting a reduced annual sampling effort), Macroinvertebrate program (Lake and Tributary), and Macrophyte assessment program, based on the recommendations of the December 2013 Biological Workgroup meeting.
- A proposal to discontinue the annual Three Rivers monitoring program as part of the AMP, as the issue of the Metro effluent diversion to the river system is no longer a management option under consideration and the Three Rivers Water Quality Model (TRWQM) efforts are complete.
- Coordination of efforts with Honeywell during the five-year period related to on-going and planned Onondaga Lake monitoring programs relating to:
    - The utilization of the UFI's monitoring buoy data, funded by Honeywell, at Onondaga Lake South Deep station, as available during this five-year period.
    - Coordination with Honeywell for the sample collection and analysis of the Onondaga Lake benthic macroinvertebrate assessment program (planned in 2015).
    - Coordination efforts planned during the five-year period with Honeywell for the Littoral Zone Macrophyte Survey, potentially eliminating the need for an additional survey by the County.
- Changes to the Tributary Sampling Program, as outlined in the December 2011, NYSDEC approved work plan. These changes, as approved by the NYSDEC in 2013, reflect the findings of the two (2) sampling events conducted in May 2012 (CSO 080 Event 1 and 2), following the completion of GC Modifications for the EBSS, as required by the ACJ Fourth Stipulation.
- A tentative sampling program schedule over the five-year period, in the context of the recently constructed major CSO gray project milestones in 2013, and sampling plan related to Post Construction Compliance Monitoring (PCCM).

Based on this coordination effort, the following AMP changes are proposed as part of the proposed five-year AMP sampling program:

- Discontinue deploying the County's buoy at the lake South Deep station and utilize UFI's monitoring buoy data, funded by Honeywell, as available during the five-year period.
- Delete the County's 2018 Macrophyte planned survey - subject to Honeywell conducting a survey prior to 2018.
- Delete the County's spring electrofishing event, and supplement with SUNY ESF's spring electrofishing sampling event data.
- Coordinate with Honeywell sample collection and analysis for the 2015 Onondaga Lake Benthic Macroinvertebrate Assessment Program.

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Table 5.2.1 Summary of Proposed Modifications to the (2013) AMP Water Quality Sampling Programs

Program Element	Locations	Parameters	Frequency	Timing	Proposed Modification	Justification
Routine Tributary Sampling	All AMP tributary sampling locations	Total alkalinity	Biweekly	January - December	Discontinue total alkalinity measurements.	Total alkalinity measurements have been used solely to calculate bicarbonate concentrations, which were then used to compute charge balances. Charge balance calculations have routinely closed within the goal of 20%, establishing that all the major ions were measured. These calculations don't contribute to meeting the objectives of the AMP.
		Bacteria (fecal coliform)	Five measurements per month	January - December	Limit fecal coliform sampling at all AMP tributary sampling locations to 5 samples per month during the April to October disinfection period, as specified in the Metro SPDES permit requirements.	Section §703.4 of the NYSDEC Water Quality Regulations provides the total and fecal coliform standards for classes B, C, D, SB, SC and I to be met during all periods: (1) when disinfection is required for SPDES permitted discharges directly into, or affecting the best usage of, the water; or (2) when the department determines it necessary to protect human health. Fecal coliform concentrations in the tributaries are consistently higher during the warmer months (see 2012 AMP Report, Appendix D-5), supporting April to October as the critical time period.
		BOD-5	Biweekly	January - December	Discontinue BOD-5 measurements.	BOD-5 concentrations have been routinely low in the Onondaga Lake tributaries, with a large fraction of measurements below the limit of detection. For example, in 2012, the average BOD-5 concentration was below 3 mg/L in all of the natural tributaries (Attachment 5.2.1A). In addition, dissolved oxygen measurements indicate compliance with the AWQS in all the natural tributaries (Attachment 5.2.1A).
		TOC-F, TIC	Biweekly	January - December	Discontinue TOC-F and TIC measurements.	These parameters do not have any specific utility to the AMP and have no applicable AWQS.

Table 5.2.1 Summary of Proposed Modifications to the (2013) AMP Water Quality Sampling Programs

Program Element	Locations	Parameters	Frequency	Timing	Proposed Modification	Justification
		Sodium, Potassium, Manganese, Iron, Sulfate, Silica-Dissolved	Biweekly	January - December	Discontinue sodium, potassium, manganese, iron, sulfate, and silica-dissolved measurements.	The parameters sodium, potassium, manganese, iron, sulfate, and silica-dissolved will be discontinued. The parameters calcium and magnesium used for computing hardness will be retained to allow for assessment of compliance with the AWQS for the limited AMP Quarterly Tributary metals parameters (cadmium-dissolved, copper-dissolved, and lead-dissolved). Overall a reduced sampling program for the metals parameters with the AWQS (refer to Appendix 1 for the 2014 AMP Sampling Work Plan).
	Onondaga Creek at Spencer Street	Cl, Ca, Na, Mg, K, SO_4, Fe, Mn, Alk-T, pH, Temperature, Dissolved Oxygen, Redox, Salinity and Conductivity	Semi-annual	January - December	Discontinue sampling at Spencer Street.	Spencer Street sampling was retained for a limited set of parameters in 1998 when the primary downstream site for Onondaga Creek was moved to Kirkpatrick Street as part of the AMP. Spencer Street sampling was sampled in recent years on a semi-annual at the same frequency as the Spence-Patrick Spring well point sampling. Spence-Patrick Spring well point is no longer sampled as part of the AMP and the impacts of Spence-Patrick Spring as data will be available downstream (at Kirkpatrick Street).
	Ley Creek at Park Street	Free Cyanide	Quarterly	January - December	Measurements of Free Cyanide will be made quarterly for Ley Creek at Park Street in 2014.	We propose quarterly measurements of free cyanide for Ley creek at Park Street in order to evaluate compliance with the AWQS expressed in the free cyanide form. The sole lab certified in NYS for free cyanide analysis - Alloway Analytical Services, a laboratory in Marion, Ohio, using EPA Method OIA-1677-09, as approved in 40 CFR Part 136 with a Method Reporting Limit (MRL) of 0.003mg/L will be used.

Table 5.2.1 Summary of Proposed Modifications to the (2013) AMP Water Quality Sampling Programs

Program Element	Locations	Parameters	Frequency	Timing	Proposed Modification	Justification
	Bloody Brook at Onondaga Lake Parkway	All parameters	Biweekly	January - December	Reduce sampling frequency at Bloody Brook to quarterly for all parameters and 5 samples per month for bacteria.	Bloody Brook is a minor, ungauged tributary that is not target for management as part of the ACJ. The contribution of this tributary to total lake inflow and constituent loading is minimal.
	Sawmill Creek at Onondaga Lake Recreational Trail	Mercury-Dissolved, Mercury-Total Recoverable and Fecal Coliform	Quarterly	January - December	Add TDS sampling.	Sawmill Creek is a minor, ungauged tributary that is not a target for management as part of the ACJ. The contribution of this tributary to total lake inflow and constituent loading is minimal. Additional TDS sampling as requested by NYSDEC in 2013, as the AWQS were exceeded in 2012.
	Tributary 5A @ State Fair Boulevard	All parameters	Biweekly	January - December	Reduce sampling frequency of Tributary 5A to quarterly.	Tributary 5A is a minor, ungauged tributary that is not a target for management as part of the ACJ. The contribution of this tributary to total lake inflow and constituent loading is minimal. Although, ACJ requirements related to flow measurements have been met, flow monitoring will be conducted in conjunction with the quarterly sampling events.
	Harbor Brook at Bellevue Avenue	Bacteria (Fecal Coliform)	Biweekly	January - December	Discontinue sampling of bacteria and drop the sampling site for future AMP sampling events.	Harbor Brook at Bellevue Avenue was added to the AMP in 2011 as a "reference site" for biweekly sampling based on a recommendation from the "Draft Final Phase I: Microbial Trackdown Study Report" dated November 15, 2010. The resulting data are analyzed to specifically evaluate dry weather versus wet weather impacts. Based on a compilation of the Fecal Coliform data collected at this sampling site (refer to Attachment 5.2.1B), we recommend that additional sampling be deferred to the Microbial Trackdown Project to determine potential source(s) of contribution.

Table 5.2.1 Summary of Proposed Modifications to the (2013) AMP Water Quality Sampling Programs

Program Element	Locations	Parameters	Frequency	Timing	Proposed Modification	Justification
	Onondaga Creek, Harbor Brook, Ley Creek	Floatables[1]	Biweekly	January - December	Add visual observations of floatables in Onondaga Creek, Harbor Brook, and Ley Creek during each tributary sampling event.	To comply with the ACJ requirements to assess floatables and evaluate the effectiveness of the proposed floatable controls.
Onondaga Lake Sampling Program (Biweekly and Quarterly)	South Deep	calcium, sodium, potassium, magnesium, manganese, iron, sulfate	Biweekly	April-December	Discontinue in-lake measurements of calcium, sodium, potassium, magnesium, manganese, iron, and sulfate.	There are no applicable NYS AWQS for these parameters, they are not targeted as part of remediation, and there are no reasons to expect systematic changes in concentrations.
		TKN, NH_3-N, Org-N, F-TKN, TN	Biweekly	April-December	Discontinue sampling for TKN, NH_3-N, Org-N, F-TKN, and TN at 0, 6, 9, 12, and 18 meter depths. Retain biweekly sampling for these parameters at 3 and 15 meter depths.	Ammonia compliance is no longer an issue in the lake, and samples at 3 and 15 meters are sufficient to track seasonal and long-term dynamics in the upper and lower waters.
Seneca, Oneida, and Oswego River Sampling Program	6 Buoy locations (412, 316, 269, 240, 222, 212)	All parameters	One annual synoptic survey during low flow conditions	Once during the July-September interval	Discontinue the River Sampling Program as part of the AMP.	Diversion of the Metro effluent to the Seneca River is no longer being considered as a management alternative.

[1] Floatable debris will be assessed as part of the AMP, in accordance with methods described in the USEPA guidance document "Assessing and Monitoring Floatable Debris", dated August 2002, as follows:

Method: Visual observations of floatables will be documented using the floatables description form for the Onondaga Creek, Harbor Brook and Ley Creek in-stream and CSO outfalls during the sampling events.
Frequency: Observations will be documented during each of the AMP Tributary (Annual and Post Construction Compliance Monitoring (PCCM) sampling events).
Documentation: The attached Floatables Description Form will be completed during each sampling event and is intended to characterize type(s) of floatables observed (predominant and secondary observed by type), with a record of any obvious indication of origin.

The following information will be documented and entered into the "sample remarks" field of the Laboratory Informational Management System (LIMS):

- Physical Indicators observed relating to sample odor, color, turbidity and floatables. Flow observed at the CSO outfall during the sampling event (with description) is included.
- Floatables observed at the time of sample collection, at both the in-stream and CSO outfall sampling sites, will be characterized. Floatables observed over a period of time (from 3 to 5 minutes) will be referenced in this documentation. Reference to photo documentation will be recorded.
- Relative Severity Index provides detail regarding the magnitude of the physical indicators and floatables. Sampling crews will attempt to document additional metrics for quantification of floatables, including approximate counts and size ranges of observations.

LAB SAMPLE ID#: ____________________

FLOATABLES DESCRIPTION FORM

ONONDAGA COUNTY

DEPARTMENT OF WATER ENVIRONMENT PROTECTION

DATE: ______________ TIME: ______________

LOCATION / IC Code: _________________

SNOW MELT (Y/N):__________________

RAIN (Y/N): _________________________

Flow at CSO Outfall: Yes/No Flow Description: Trickle/Moderate/Substantial

PHYSICAL INDICATOR

Odor Present: ☐

DESCRIPTION

☐ Sewage ☐ Petroleum/Gas
☐ Sulfide ☐ Laundry
☐ Rancid/Sour ☐ Other ______________

Circle Relative Severity Index
(1) Faint
(2) Easily detected
(3) Noticeable from a distance

Color: ☐

DESCRIPTION

☐ Clear ☐ Gray
☐ Green ☐ Red
☐ Brown ☐ Yellow
☐ Other ______________

Circle Relative Severity Index
(1) Faint color in sample bottle
(2) Clearly visible in sample bottle
(3) Clearly visible in outfall flow

Turbidity: ☐

Circle Relative Severity Index
(1) Slight cloudiness (2) Cloudy (3) Opaque

Floatables[1]: ☐

TYPE	Count[2]	Approx. Size	Circle Relative Severity Index
☐ 1. Suds/Foam	_______	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 2. Visible Oil Film	_______	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 3. Globules of Grease	_______	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 4. Street litter (i.e., Cigarette butts)	_______	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 5. Food Packaging	_______	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 6. Sanitary Items (i.e., sewage toilet paper, condoms, tampon applicators)	_______	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 7. Beverage containers	_______	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 8. Medical Items (i.e., syringes)	_______	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious
☐ 9. Other	_______	<2"/2-8"/>8"	(1) Few/Slight; Origin Not obvious (2) Some; Indications of origin (3) Some; Origin clear/obvious

[1] *Floatables: Record Floatables observations during sampling event over a 3-5 minute time duration.*

[2] *Count: Attempt to record count of floatables during the sampling event.*

Photograph Taken: Yes/No

Revision: 10/14/2014 JS

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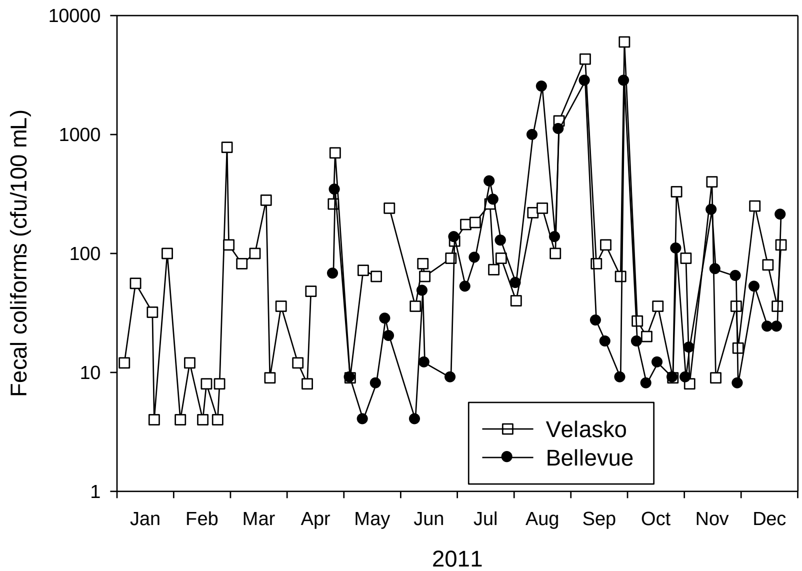
Attachment 5.2.1A Summary of BOD-5 and dissolved oxygen (DO) concentrations in Onondaga Lake tributaries during 2012.

Location	Mean BOD-5 (mg/L)	Standard Error (mg/L)	Mean DO (mg/L)	Standard Error (mg/L)	Minimum DO (mg/L)
Bloody Brook	2.3	0.2	11.6	0.3	5.9
Onondaga @ Dorwin	2.3	0.1	10.5	0.3	6.1
East Flume	6.9	1.4	8.3	0.2	4.7
Harbor @ Hiawatha	2.2	0.2	10.2	0.3	5.2
Onondaga @ Kirkpatrick	2.5	0.2	10.9	0.3	6.3
Metro	3.3	0.1	9.9	0.3	6.5
Ninemile @ RT48	2.9	0.2	10.7	0.3	5.9
Ley @ Park	2.8	0.2	9.2	0.2	5.1
Sawmill	2.1	0.1	9.4	0.3	6.6
Trib 5A	2.1	0.1	9.8	0.3	7.3
Harbor @ Velasko	2.3	0.2	10.7	0.2	6.7

Attachment 5.2.1B Paired time series of fecal coliform concentrations at Harbor Brook-Velasko Road and Harbor Brook-Bellevue Ave. during 2011 and 2012.



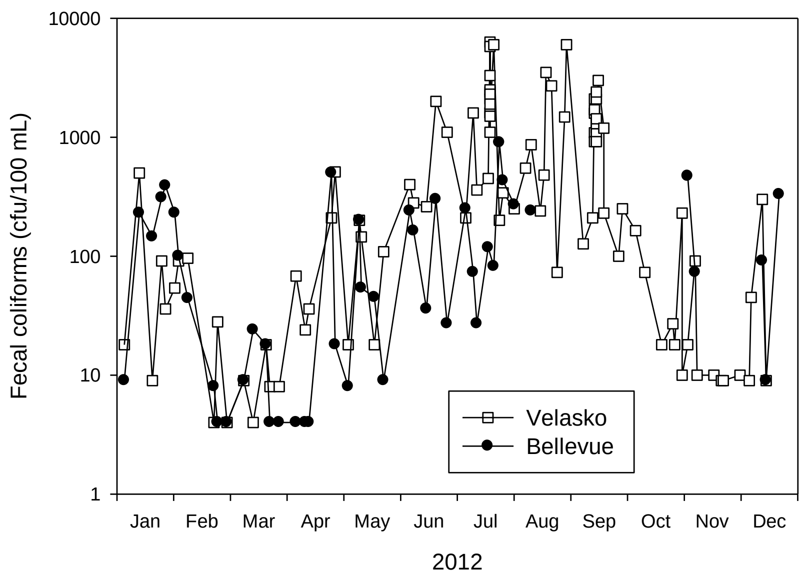


Table 5.2.2 Summary of Proposed Modifications to the Biological Sampling Program

Program Element	Component	Locations	Parameters	Frequency	Timing	Proposed Modification	Justification
Tributary Macro-invertebrate Assessment Program	Macroinvertebrates	Four (4) Sites on Onondaga Creek Three (3) Sites on Ley Creek Three (3) Sites on Harbor Brook	NYSDEC Water Quality Assessment Protocol HBI – Hilsenhoff Biotic Index % Oligochaetes	Once every 2 years	July during low flow conditions.	Propose conducting macroinvertebrate monitoring in 2015, allowing approximately 1 year for the benthic community to reach a new equilibrium to the changed water quality conditions, and then a final monitoring event in 2017. Discontinue the Harbor Brook at 690 sampling location.	Tributary macroinvertebrates were monitored every 2 years from 2000 through 2010, which created a robust baseline dataset to evaluate response to implementation of CSO and non-point source control measures within the watershed. These measures were largely completed in 2013 (LHB and CSF facilities). Sampling should be conducted at the same locations as sampled in the baseline program in Onondaga Creek (four sites) and Ley Creek (three sites). Sampling in Harbor Brook should include two locations, with 690 location removed due to the reconfiguration of the channel in this area.
	Habitat Assessment	Four (4) Sites on Onondaga Creek Three (3) Sites on Ley Creek Three (3) Sites on Harbor Brook	Habitat Characterization	Once every 2 years	July during low flow conditions.	See proposed modification tributary macroinvertebrate assessment program.	See justification for tributary macroinvertebrate assessment program.
	Stream Mapping	Twenty-seven (27) sites on Onondaga Creek. Nine (9) sites on Ley Creek. Seven (7) sites on Harbor Brook.	Physical Assessment of ten (10) elements. FBI – Family Level Biotic Index.	Completed in 2000, 2002, 2008	August during low flow conditions.	Recommend conducting one tributary mapping/stream visual assessment survey during the next 5 years, coinciding with the tributary macroinvertebrate sampling in 2017.	The last stream mapping survey in the tributaries was conducted in 2008. That survey was conducted to assess the physical and biological conditions within the streams using the Stream Visual Assessment Protocol (SVAP) developed by the Natural Resources Conservation Service (NRCS) and issued December 1998. As mentioned previously, CSO and non-point source control

Table 5.2.2 Summary of Proposed Modifications to the Biological Sampling Program

Program Element	Component	Locations	Parameters	Frequency	Timing	Proposed Modification	Justification
							measures within the watershed were largely completed in 2013. Because habitat conditions may not change as rapidly, we propose conducting one tributary mapping/stream visual assessment survey during the next 5 years, coinciding with the tributary macroinvertebrate sampling in 2017.
Onondaga Lake Fish Community Sampling Program	Adult Electrofishing	Onondaga Lake	• Community Structure • Size/length distribution • Species richness • Evidence of recruitment • Pollution tolerance • Index of Biological Integrity	Annually	Night-time, twice per year once in the spring and once in the fall when water temperature between 15º and 21 ºC.	Littoral adult electrofishing surveys have been conducted twice per year, during the spring and the fall. We propose reducing this survey to once per year, conducted during the fall.	Many other regional lakes are surveyed in the fall when a larger variety of species are vulnerable to capture compared to the spring. Many species including Channel Catfish and White Suckers spawn in the tributaries and the adjoining Seneca River in the spring and are not well represented in the spring sampling events. Additionally the spring sampling usually occurs when many species such as Largemouth Bass, Pumpkinseed, and Bluegill are on their spawning beds and the stresses associated with spring electrofishing can increase predation of eggs and fry on the nest when the guarding adult is removed. Additionally, supplemental biological information including length, weight, and age are best collected in the fall when most growth for the season has ended.
	Pelagic Adult Gillnetting	Onondaga Lake	•Community Structure • Size/length distribution • Species richness • Evidence of	Annually	Day-time, twice per year, within one week of littoral electrofishing.	Delete adult fish pelagic zone sampling 2014-2018	The purpose of this sampling is to assess the pelagic adult community that may not be sampled during the littoral electrofishing. Review

Table 5.2.2 Summary of Proposed Modifications to the Biological Sampling Program

Program Element	Component	Locations	Parameters	Frequency	Timing	Proposed Modification	Justification
			recruitment • Pollution tolerance • Index of Biological Integrity				of the data indicates that species composition is similar between the two methods and that species targeted by gillnets (e.g., Gizzard Shad, White Perch, and Alewife) are more readily collected by electrofishing (refer to Attachment 5.2.1A); therefore, we recommend eliminating this survey for 2014 through 2018.
	Juvenile Seines	Onondaga Lake	• Community Structure • Size/length distribution • Species Richness • Evidence of recruitment • Pollution tolerance	Annually	Day-time Every 3 weeks. Mid July - October. Five total sampling events.	We propose reducing the number of events from five to two, with sampling conducted during August and September.	Delaying juvenile seines until August will allow time for young fish to grow and become vulnerable to the sampling gear. Based on catch rates in 2011 and 2012, largemouth bass young are most readily collected in August when the average total length is 75 millimeters (refer to Attachment 5.2.2B). The two samples in late summer early fall will allow assessment of young-of-year survival and abundance.
	Littoral Larvae	Onondaga Lake	• Community Structure • Growth rate, compared to regional lakes and to historical data • Species Richness • Pollution tolerance	Annually	Three times per year in Mid May, Mid June and early July.	Propose reducing the number of events to two, conducted from mid-June to mid-July, dependent on spawning, timing of centrarchids, to assess larval abundance.	Sampling in June and July will allow for the collection of larval centrarchids during peak time of emergence. Collections at these time periods will allow for the assessment of larval abundance to aid in explaining the low juvenile catch rates of Pumpkinseed and Bluegill observed over the past six years.
Benthic Macroinvertebrate Assessment Program	Macroinvertebrates	Onondaga Lake	NYSDEC Water Quality Assessment Protocol. HBI - Hilsenhoff Biotic Index. % Oligochaetes.	Once every five years, 2000, 2005, 2010, and 2015.	June	Sampling once in 2015, consistent with Honeywell's program.	Much of WEP's program overlaps with a similar program implemented in 2008 by Honeywell as part of their baseline and construction monitoring programs. In 2008, Honeywell collected benthic

Table 5.2.2 Summary of Proposed Modifications to the Biological Sampling Program

Program Element	Component	Locations	Parameters	Frequency	Timing	Proposed Modification	Justification
							macroinvertebrates from eighteen littoral zone locations, with five similar to WEP's locations, and two profundal zone locations, with five replicates per location for community analysis. In 2010, Honeywell repeated the program from 2008, at a reduced number of locations (nine littoral zone locations; two profundal zone locations) and a reduced number of replicates (three per location). We propose coordinating with Honeywell to obtain the benthic community composition samples. WEP field staff would collect, sieve, and sort the samples, and Honeywell could package and ship the samples to the laboratory for species identification, similar to the combined efforts in 2008. These data would be available for both parties.
Macrophyte Assessment Program	Aerial Photography	Onondaga Lake	Determine annual percent of littoral zone with macrophytes	Annually	August when water clarity is approximately 3-meters on the Secchi disk.	Conducting one final aerial survey at the end of the 5 year monitoring period in 2018.	The goals of the Macrophyte Assessment Program, as stated in the 1998 Onondaga Lake AMP, are expansion of the areal coverage of the littoral zone (less than 6 meters in water depth) to optimal levels (40 percent to 60 percent) for Largemouth Bass habitat to achieve desired use of the lake for warm water fish reproduction, and an increase in diversity of the macrophyte community to levels comparable to other regional lakes. The macrophyte community

Table 5.2.2 Summary of Proposed Modifications to the Biological Sampling Program

Program Element	Component	Locations	Parameters	Frequency	Timing	Proposed Modification	Justification
							composition has increased from 10 species in 2000 to 23 species in 2010; areal coverage has increased from 85 acres (11 percent of littoral zone) in 2000 to 505 acres (65 percent of littoral zone) in 2012. The macrophyte community has expanded and diversified in accordance with the goals.
	Field Species Verification of Aerial Photography	Onondaga Lake	Determine species.	Annually	Two (2) sites in each of the five (5) strata for a total of ten (10) sites.	See proposed modification for aerial photography program.	See justification for aerial photography.
	Littoral Zone Survey	Onondaga Lake	Determine species composition, percent cover, frequency of occurrence, biomass, maximum depth, and distribution	Once every five years, 2000, 2005, 2010, and 2015.	August	Consider conducting one final field survey at the end of the 5 year monitoring period in 2018, if Honeywell is not conducting their Macrophyte Assessment Program during the 5-year monitoring period.	See justification for aerial photography.

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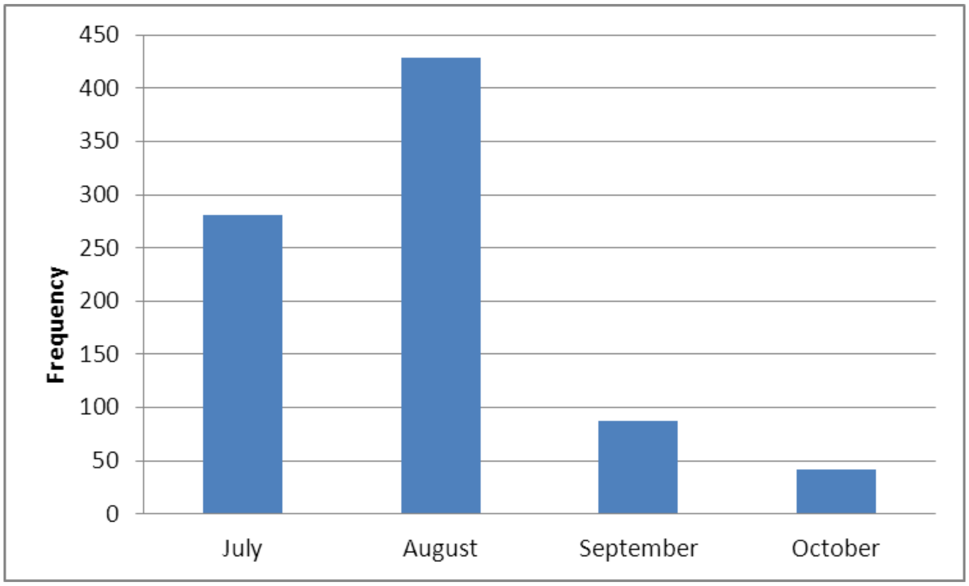
Attachment 5.2.2A Comparison of Gillnetting and Electrofishing Total Fish Netted and Counted in Onondaga Lake from 2000 to 2012

Common Name	Gillnetting Number	Electrofishing Number
Alewife	184	50,408
Bluegill	1	3,045
Brown bullhead	40	3,776
Brown trout	14	6
Carp	31	1,782
Channel catfish	40	211
Freshwater drum	19	196
Gizzard shad	264	21,005
Golden shiner	32	383
Greater red horse	1	3
Lake sturgeon	1	0
Largemouth bass	6	2,197
Longnose gar	50	164
Northern pike	15	113
Pumpkinseed	18	7,589
Rock bass	3	326
Short head red horse	30	133
Smallmouth bass	148	673
Tiger muskellunge	1	8
Walleye	52	193
White bass	1	1
White perch	768	7,199
White sucker	77	1,972
Yellow bullhead	1	25
Yellow perch	313	13,300

Attachment 5.2.2B Catch by Month of Young-of-Year Largemouth Bass Captured in Seine Nets in Onondaga Lake from 2011 to 2012



SECTION 6: Tributary Monitoring Program

6.1 Regulatory Classification

Surface waters in NYS are classified according to their designated uses (e.g., water supply, swimming, fish propagation, aesthetic enjoyment, and fish survival). Classifications of designated best uses for the tributaries to Onondaga Lake are listed in Table 6.1.1. The main stems of Onondaga Lake tributaries are primarily classified as Class C waters (suitable for fish propagation and secondary water contact recreation), though several small segments are Class B (suitable for primary and secondary contact recreation and fishing). In addition, several Class C stream segments within the sub-watersheds are classified as Class C(T), meaning that dissolved oxygen and ammonia levels established for trout waters shall be met.

Table 6.1.1 Summary of Regulatory Classification of Onondaga Lake and Tributary Streams

Water body	Description of Segment	Regulatory Classification	Standards
Onondaga Creek	Enters Onondaga Lake at southeastern end. Mouth to upper end of Barge Canal terminal (0.85 miles)	C	C
	Upper end of Barge Canal terminal to Temple Street (1.7 miles)	C	C
	From Temple Street, Syracuse to Tributary 5B (4.4 miles)	B	B
	From Tributary 5B to Commissary Creek (1.9 miles)	C	C
	From Commissary Creek to source	C	C(T)
Ninemile Creek	Enters Onondaga Lake from south. From mouth to Allied Chemical Corp. water intake located on creek to point mid-way between Airport Rd and Rt. 173 bridge at Amboy (3.4 miles).	C	C
	From point mid-way between Airport Rd and Rt. 173 to outlet of Otisco Lake.	C	C(T)
Harbor Brook	Enters Onondaga Lake at the southernmost point of the lake and within the City of Syracuse. From mouth to upper end of underground section, at Gifford Street (approx. 1.9 miles)	C	C
	From upper end of underground section to City of Syracuse line (1.3 miles)	B	B
	From City of Syracuse City line to source	C	C(T)
Ley Creek	Enters Onondaga Lake 0.2 mile southeast of point where City of Syracuse line intersects east shore of lake. From mouth to Ley Creek sewage treatment plant outfall sewer.	C	C
	From Ley Creek sewage treatment plant outfall sewer to South Branch. Tributaries 3-1A and 3-IB enter from north approximately 3.0 and 3.1 miles above mouth respectively.	B	B
Bloody Brook	Enters Onondaga Lake 2.25 miles southeast of outlet. From mouth to trib. 1 of Bloody Brook (approximately 0.37 miles from mouth)	B	B
	From trib. 1 of Bloody Brook to source.	C	C

Source: NYSDEC (classifications as of February 2012); on-line linkage http://www.dec.ny.gov/regs/4539.html#17588

6.2 Regulatory Goals

The regulatory goal of the ACJ is to bring segments of the Onondaga Lake tributaries affected by Onondaga County's municipal discharges into compliance with designated best uses pursuant to 6 NYCRR (New York Code, Rules and Regulations) Parts 701 and 703.

As outlined in the ACJ, specific NYS water quality standards and guidance that will be used to assess the extent to which these actions are successful, include the following:

- Dissolved Oxygen: 6NYCRR Sec. 703.3
- Ammonia: 6 NYCRR Sec. 703.5
- Turbidity: 6 NYCRR Sec. 703.2
- Floatable Solids in CSO Discharges: 6 NYCRR Sec. 703.2
- Phosphorus: 6 NYCRR Sec. 703.2
- Water Quality Standards & Guidelines (NYSDEC TOGS 1.1.1)
- Nitrogen: 6 NYCRR Sec. 703.2
- Bacteria: 6 NYCRR Sec. 703.4

6.3 Required Elements of the Tributary Monitoring Program

Abstracted from the Amended Consent Judgment, January 1998 (Appendix D) – with added reference to the ACJ Fourth Stipulation

1. Quantify external loadings of phosphorus, nitrogen, suspended solids, indicator bacteria, heavy metals, and salts. Utilize FLUX, or the most recent version of comparable software, to estimate loading and the standard error of the estimate.
2. Conduct monitoring during high flow events to partition point and nonpoint sources of phosphorus (minimum of 5 events annually).
3. Sample upstream and downstream of CSO discharges to Onondaga Creek, Harbor Brook and Ley Creek, during storms of sufficient size to trigger overflows (per Fourth Stipulation: sample receiving water during overflow events for priority pollutants in addition to parameters associated with wastewater and stormwater).
4. Assess compliance with water quality standards in Onondaga Creek, Harbor Brook, and Ley Creek.
5. Measure attributes of the physical environment in tributaries: (a) velocity; (b) cross-sectional area to map erosional and depositional sections; (c) survey for presence and character of sludge deposits in depositional areas and map; (d) map physical characteristics of the stream bed that could affect spawning habitat from mouth to first barrier; (e) sample macroinvertebrate communities and calculate NYSDEC rapid field biotic index throughout tributaries' length.
6. Continue cooperative arrangements with USGS to gauge discharge of the major tributaries.
7. Continue data collection, analysis, and reporting consistent with historical database (1970 to 1997) to enable statistical trend analysis.
8. Install flow metering devices and indicators of overflows on CSOs to estimate annual discharge. Use this information to estimate percent capture of total runoff on an annual basis.

6.4 Water Quality Monitoring

The AMP includes an extensive tributary monitoring program that supports estimates of external material loading to Onondaga Lake and assessments of water quality and habitat conditions in the streams. In order to accomplish the objectives of the ACJ, Fourth Stipulation of the ACJ and the Metro SPDES Permit requirements, the two elements of the Tributary Monitoring Program, which will be implemented as part of the five-year AMP, include:

- Annual Tributary Monitoring; and
- Post Construction Compliance Monitoring (PCCM)

6.4.1 Annual Tributary Monitoring (2014-2018)

Components of the annual tributary monitoring program include (refer to Appendix 1.B for a detailed representation of the annual tributary monitoring program components, frequency, locations, and parameters):

1. **Biweekly** sampling at all AMP tributary sampling locations from January through December to gather data on an adequate temporal and spatial scale to assess compliance, as per Technical & Operational Guidance Series (TOGS 1.1.1), and to quantify external loadings to the lake.
2. **Quarterly** sampling at all AMP sampling locations with additional metals parameters at select tributary sampling sites, as per TOGS 1.1.1, to assess compliance and to quantify external loadings to the lake.
3. **High Flow** sampling at all AMP Tributary sampling locations, targeted during high flow conditions (defined for the AMP as the stream flow at Onondaga Creek - Spencer Street of at least one standard deviation above the long-term monthly averages). CSOs may or may not be discharging during these sampling events. The objective of this sampling program is to improve the annual loading estimates.
4. **Bacteria** sampling at all AMP Tributary sampling locations, at a minimum frequency of five samples per month (from April through October during the disinfection period) to report compliance with NYS AWQS.

Locations

The long-term sites of the County's tributary sampling program have been retained and include locations upstream and downstream of CSOs and urban segments of the sub-watersheds. The annual program includes monitoring of seven (7) tributaries to the lake, the Metro effluent, and the Onondaga Lake Outlet (Figure 6.1):

- Harbor Brook (Hiawatha Boulevard and Velasko Road)
- Ley Creek (Park Street)
- Ninemile Creek (Lakeland)
- Onondaga Creek (Kirkpatrick Street and Dorwin Avenue)
- Tributary 5a (State Fair Boulevard)
- Sawmill Creek (Onondaga Lake Recreational Trail)
- Bloody Brook (Onondaga Lake Park)

Parameters:

The 2014 AMP Tributary Sampling Program (included as Appendix 1) outlines the specific sites, monitoring frequencies, and targeted parameters proposed for the annual Tributary sampling program. The 2014 sampling program incorporates changes as approved by the NYSDEC in 2013. The work plan will be updated annually and will reflect findings from the previous year's sampling efforts and any changes in the AWQS or guidance values. The sampling program will continue to incorporate flexibility to respond to new data and information.

Sampling Protocol:

The sampling procedures for this monitoring program will continue to follow the protocol outlined in the NYSDEC Division of Water Bureau of Watershed Assessment & Research Program Plan for Rotating Intensive Basin Studies (RIBS) Water Quality Section (1997-1998). All tributaries will be sampled using the depth-integrated sampling technique. Depending on the depth of the water at each station, a suspended (deep water) or hand held sampler (wadeable) may be used. Due to the stream regime depth (less than 2 feet on average) at the Bloody Brook and Sawmill Creek sampling sites, the depth-integrated sampling procedure cannot be employed. As referenced in the USGS guidance document: **FIELD GUIDE FOR COLLECTING AND PROCESSING STREAM-WATER SAMPLES FOR THE NATIONAL WATER-QUALITY ASSESSMENT PROGRAM (http://water.usgs.gov/nawqa/pnsp/pubs/ofr94-455/sw-t.html#OO),** a representative sample can be obtained by immersing a hand-held open bottle (dip sample) in the centroid of flow, where a depth-integrating sampler cannot be submerged.

For streams with low velocity and depositional conditions, the vertical Kemmerer water sampler is used (Ley Creek at Park Street and Harbor Brook at Hiawatha Boulevard sampling sites). The Onondaga Lake Outlet is sampled at a depth of 12 feet (3.7m) using the Kemmerer tube-sampling device from mid-channel. The Quality Assurance Program Plan (QAPP) (Appendix 2) for the water quality sampling program describes the sampling protocol and analytical program. The QA/QC program for the field and analytical procedures are those mandated by the New York State Department of Health Environmental Laboratory Approval Program (ELAP). The QAPP will be updated annually to reflect the modifications of the annual sampling and analytical programs for submittal to NYSDEC and ASLF, in conjunction with the annual AMP sampling work plan.

Figure 6.1 AMP Tributary Annual Monitoring Locations

6.4.2 Post Construction Compliance Monitoring (PCCM)

The ACJ Fourth Stipulation requires the County to submit a plan, with a schedule for implementation, for proposed modifications to the tributary component of the County's established AMP. The NYSDEC approved AMP Modifications Work Plan Final dated December 2011, outlines proposed modifications designed to enhance monitoring of tributary water quality in those tributaries impacted by CSOs to determine the effectiveness of the gray and green infrastructure projects. These modifications include additional wet weather monitoring within the CSO-affected stream reaches to evaluate whether completion of the planned improvements to the wastewater (and stormwater) collection infrastructure results in compliance with the AWQS for bacteria and floatables in the CSO-affected tributaries. The five-year AMP work plan incorporates a proposed schedule for sampling in the context of the recently constructed gray project milestones and post construction compliance monitoring program to ensure that the captured (up to the 1-year, 2-hour storm) and separated CSOs are not causing or contributing to violations of water quality standards in the receiving water.

The PCCM is intended to provide data that can be used to:

- Verify the effectiveness of CSO controls; and
- Demonstrate compliance with WQS, protection of designated uses and sensitive areas

An important step in this process, is determining data quality objectives and criteria that describe quality specifications regarding the question and the level of the measurements to support the question. The PCCM plan addresses the following questions:

- Do the numbers of overflows per year or volume of overflow captured during a typical precipitation year meet the goals of the basic approach to verify the effectiveness of CSO control?
- What pollutants and pollutant concentrations are detected at end-of-pipe locations or in-stream?
- Does receiving water quality measured immediately downstream of the CSO (or mixing zone, if applicable) during wet weather meet applicable WQS or criteria?
- Does receiving water quality measured upstream of the CSO during wet or dry weather meet WQS or criteria for pollutants for which the receiving water is listed as impaired?
- Are concentrations of pollutants detected in the receiving water downstream of the CSO greater than those detected upstream?

Evaluation of CSO control measures, CSO volume, loadings of conventional and toxic pollutants, and receiving water quality environmental indicators are to be used to measure compliance and are all elements of the proposed PCCM plan. The goal of the PCCM sampling plan is to time sample collection (to capture first flush) during storms which have sufficient magnitude and intensity to trigger CSO/storage facility overflows to the receiving water. The objective of this sampling program is to assess the extent to which the CSO discharges are causing or contributing to violations of the AWQS.

The PCCM includes a monitoring plan for demonstrating compliance with AWQS associated with specific CSO controls and includes the following CSO/Facility outfalls:

- (10) Representative CSOs: Includes the NYSDEC-recommended list of ten (10) representative CSOs to serve as the basis for sampling (previously developed for the AMP Modifications, required by the ACJ Fourth Stipulation) refer to "Proposed Modifications to the AMP", Final Revised Work Plan, dated December 2011 and includes the following CSO service areas:
  - Harbor Brook CSO Service Area - CSO 003, 004, 014, 018
  - Clinton CSO Service Area - CSO 027, 030, 034, 080 (EBSS)
  - Midland CSO Service Area - CSO 052, 060/077

- (2) Storage Facilities - Clinton and Lower Harbor Brook Storage Facilities: Includes the new discharge outfalls and sampling in the creeks immediately adjacent to these outfalls.
- (3) Sewer Separation Projects - CSO 022, 045, and 061: Consistent with the requirements of the Metro SPDES Permit Number NY 002 7081, these outfalls are to be monitored for a three (3) year period.
- (1) CSO Conveyances Project (CSO 063): Consistent with the requirements of the Metro SPDES Permit Number NY 002 7081, and NYSDEC letter dated November 22, 2013.

PCCM plans and findings will be provided promptly to NYSDEC consistent with established deadlines. Data from the sampling events will be summarized and reviewed with NYSDEC staff, prior to conducting additional sampling events. Any changes to the PCCM plan will only be implemented with prior approval by NYSDEC.

6.4.2.1 *PCCM Sampling Events (to-date)*

CSO 080 (EBSS Gate Chamber Modifications):
The enhanced in-stream water quality sampling program was implemented on December 16, 2011. Two sampling events were conducted in May 2012, following the completion of the Gate Chamber (GC) modifications for the EBSS completed in October 2011, as required by the ACJ Fourth Stipulation. The County estimated that the GC modifications would increase system wide CSO capture by at least 0.2 percent or 8MG on an annual basis. The EBSS is a "real-time control" facility which is fully automated through the use of level sensors and Programmable Logic Controller (PLC)-based controls that utilize telemetry communications for integration into the County's SCADA (Supervisory Control and Data Acquisition system) at Metro. If maximum storage capacity, of the EBSS and the Main Interceptor Sewer (MIS) conveyance capacity are reached (based on current set-points), the incoming CSO flows to the EBSS are discharged to Onondaga Creek.

Based on the evaluation of data collected from the two (2) sampling events conducted in May 2012 (referred to as CSO 080 Event 1 and Event 2), several sampling program recommendations were proposed to NYSDEC and ASLF, consistent with the approach outlined in EPA's "*CSO Post Construction Compliance Monitoring Guidance,*" dated May 2012.

In February 2013, NYSDEC transmitted review comments on the County's 2012 sampling summary submittal with recommendations for the sampling program. The five-year AMP incorporates the changes to the sampling protocol for the Tributary monitoring program, as approved by the NYSDEC in 2013.

6.4.2.2 PCCM Proposed Sampling (2014-2018)

The proposed PCCM related sampling program, including in-stream monitoring and CSO outfall monitoring, is designed to provide sufficient data to determine the impacts of CSOs on receiving water compliance for each of the representative CSO outfalls. Monitoring parameters and/or locations can be modified based on evaluation of the data.

Monitoring of Representative CSO Outfalls (Quantity)

The purpose of the CSO discharge monitoring effort is to increase the veracity of the SWMM (Storm Water Management Model) such that the model can be used for planning, design, and determination of compliance with the volume capture requirements. The County will update the SWMM on a yearly basis using the monitoring data to verify, reconcile, and re-calibrate (as necessary) SWMM values and outputs. In 2011, as part of the AMP Modifications work plan, the County proposed to monitor select representative CSOs for quantity of their discharges in the extensive basin-wide network to be completed by 2011 as required by the ACJ Fourth Stipulation. Installation of flow monitoring devices and indicators of overflows from the combined sewers was completed by December 2011, a major compliance date. Demonstration of the PCCM quantity goals will be documented in the ACJ Annual Reports.

Flow meters were deployed at the manhole of each of the NYSDEC recommended list of ten (10) representative CSOs which serve as the basis for the CSO flow monitoring program and includes the sewersheds listed in Table 6.4.2.2.1. The water quantity monitoring locations will be reviewed and may be modified annually in consultation with NYSDEC and ASLF. Table 2-2 in Section 2 (Post Construction Compliance Monitoring) of the ACJ Fourth Stipulation 2013 Annual Report, submitted to NYSDEC on March 31, 2014, includes an updated list of the status of CSOs, proposed or implemented CSO abatement strategy, and flow monitoring devices where applicable.

In accordance with the ACJ Fourth Stipulation and the County's SPDES permit (Section X.C.1), the table is sorted by receiving water and includes the following:

- CSO outfall number
- CSO status (abated, operational, or closed)
- CSO location
- CSO characteristic based on a 1-year, 2-hour design storm
- Basin characteristics
- Proposed or implemented CSO abatement strategy
- Scheduled CSO abatement completion date
- Flow monitoring devices where applicable

Table 6.4.2.2.1 Representative CSOs for Flow Monitoring

Sewershed	CSO Outfall	Area Acreage	Description	CSO Abatement	Land Use	Receiving Water
Harbor Brook	CSO 003	112	Hiawatha Boulevard (North of State Fair Blvd.)	Lower Harbor Brook (LHB) Storage Facility	R/C/I	Harbor Brook
Harbor Brook	CSO 004	350	State Fair Blvd.	LHB Storage Facility	R/C/O	Harbor Brook
Harbor Brook	CSO 014	196	Delaware Street	Harbor Brook Intercepting Sewer (HBIS) Replacement	R/C	Harbor Brook
Harbor Brook	CSO 018	145	Rowland Street	HBIS Replacement	R/O	Harbor Brook
Clinton	CSO 027	134	W. Fayette Street	TBD	C	Onondaga Creek
Clinton	CSO 030	312	W. Jefferson Street (Eastside of Onondaga Creek)	Clinton Storage Facility (CSF)	R/C	Onondaga Creek
Clinton	CSO 034	214	Clinton & West Onondaga Street	Clinton Storage Facility (CSF)	C	Onondaga Creek
Midland	CSO 052	228	Hunt Street & Elmhurst Avenue	TBD	R/C	Onondaga Creek
Midland	CSO 060/077	28/445	West Colvin Street	TBD	R&R/C/I	Onondaga Creek
Erie Blvd.	CSO 080 (a-i)	1250	Erie Blvd Storage System and Onondaga Creek	Gate Chamber (GC) Modifications	C	Onondaga Creek

Monitoring of CSO Outfalls (Quality)

Water quality sampling of the representative CSO discharges is planned, in conjunction with the flow monitoring data, to evaluate the impacts of the CSO outfalls to the receiving water. The majority of the sampling program parameters of interest are to be collected as “grabs”. These samples will be collected at the CSO manholes (regulator structures) during overflows. This sampling program may be subsequently modified based on the nature of the overflow conditions and list of analytes.

In-stream Tributary Sampling Program of CSO Outfalls:

The primary objective of the in-stream component of the PCCM tributary sampling program is to evaluate whether completion of the planned improvements to the wastewater (and stormwater) collection infrastructure results in compliance with the AWQS and Guidance Values. Figure 6.2 provides an overview of the CSO sewersheds, CSO outfalls, and the Gray Projects. As conditions allow, four (4) overflow events are targeted per representative CSO outfall, over a two-year period.

Locations

In-stream sampling will focus on locations upstream and downstream of the same ten (10) representative CSO outfall locations selected for flow monitoring. The in-stream sampling locations are accessible from bridges (except for the proposed upstream sampling location for CSO 003 and 004 - Manhole upstream of auto body shop). Table 6.4.2.3.1 details the ten (10) representative CSO outfalls and the proposed in-stream sampling locations (upstream and downstream of the representative CSO outfalls). The selection of the in-stream sites needs to take into consideration distances from and between outfalls for a mixing zone and estimated time-of-travel analysis.

Figure 6.2 PCCM Program Overview Map

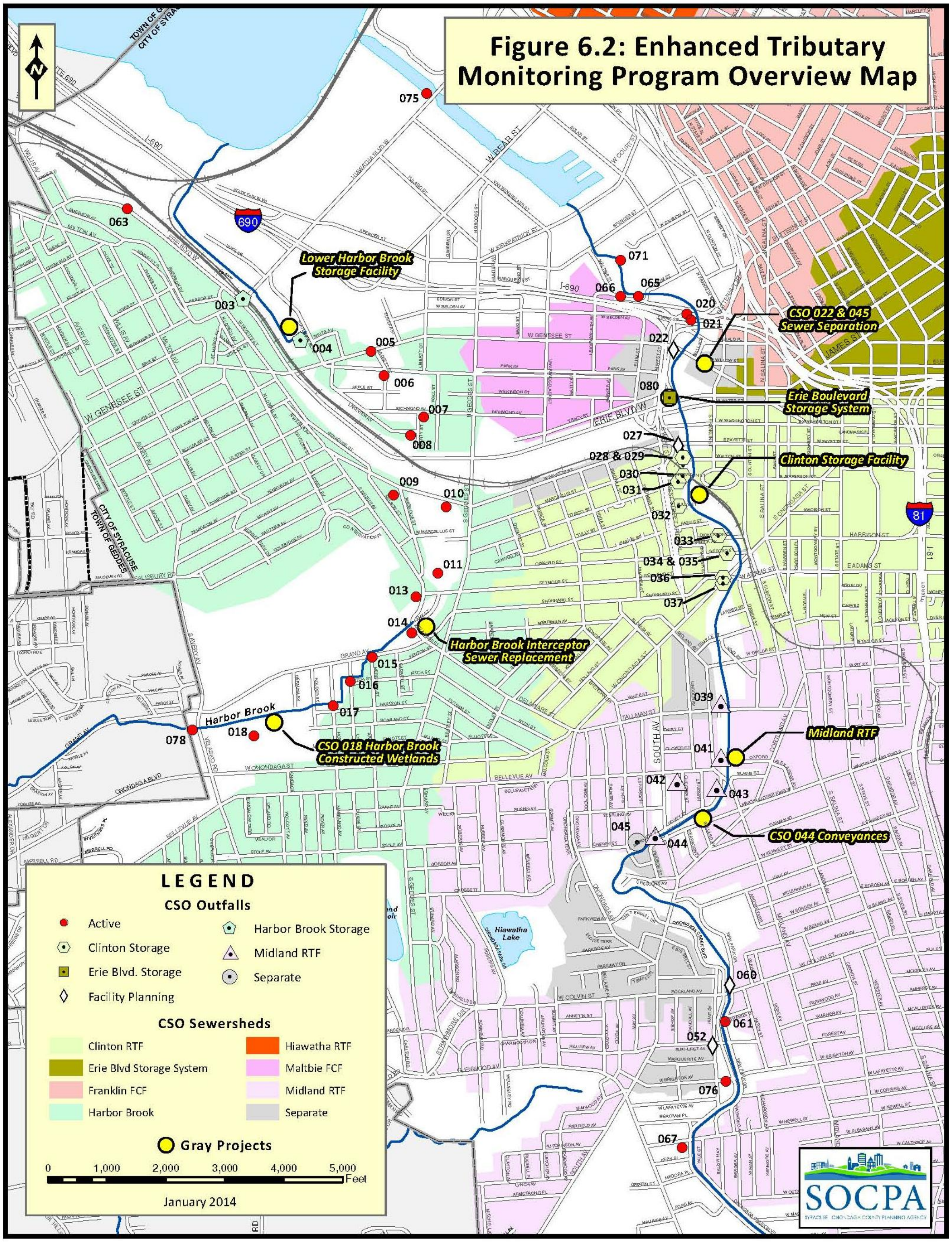


Table 6.4.2.3.1 PCCM - CSO Outfall and in-stream AMP sampling locations

CSO Outfall	*CSO Service Area*	Receiving Water/ Stream Class	In-Stream Sampling Location
REPRESENTATIVE CSO'S			
003	Harbor Brook	Harbor Brook (C)	Upstream - Manhole at the corner of Waite and Dewey Avenue
			Downstream - FCF on Harbor Brook
004	Harbor Brook	Harbor Brook (C)	Upstream - Manhole at the corner of Waite and Dewey Avenue
			Downstream - FCF on Harbor Brook*
014	Harbor Brook	Harbor Brook (C)	Downstream - FCF on Harbor Brook*
			Downstream - Brook access from bridge (downstream) at Fowler High School
018	Harbor Brook	Harbor Brook (B)	Upstream - Velasko Road (downstream side of bridge)
			Downstream - Dam at the end of DePalma Avenue
027	Clinton	Onondaga Creek (C)	Upstream - Fayette Street Bridge (upstream side of bridge)
			Downstream - Water Street (upstream side of bridge)
030	Clinton	Onondaga Creek (C)	Upstream - Dickerson Street (upstream side of bridge)
			Downstream - Walton Street (upstream side of bridge)
034	Clinton	Onondaga Creek (C)	Upstream - W. Onondaga Street (downstream side of bridge)
			Downstream - Dickerson Street (upstream side of bridge)
080 (a-i)	EBSS	Onondaga Creek (C)	Upstream - Water Street (downstream side of bridge)
			Downstream - W. Genesee Street Bridge (downstream side of bridge)*
052	Midland	Onondaga Creek (B)	Upstream - W. Brighton Avenue (upstream side of bridge)
			Downstream - W. Colvin Street (upstream side of bridge)
060/077	Midland	Onondaga Creek (B)	Upstream - Elmhurst Street (upstream side of bridge)
			Downstream - South Avenue (upstream side of Bridge A)

CSO Outfall	*CSO Service Area*	Receiving Water/ Stream Class	In-Stream Sampling Location
STORAGE FACILITIES			
LHBSF (CSO 004A)	Harbor Brook	Harbor Brook (C)	Upstream - Harbor Brook at State Fair Boulevard bridge (downstream side of bridge)
			Downstream - Harbor Brook at Hiawatha Boulevard bridge (upstream side of bridge)
CSF (CSO 033A)	Clinton	Onondaga Creek (C)	Upstream - Onondaga Creek at Dickerson Street bridge (downstream side of bridge)
			Downstream - Onondaga Creek at Walton Street bridge (upstream side of bridge)*
SEWER SEPARATION PROJECTS			
CSO 022		Onondaga Creek (C)	Upstream - Onondaga creek @ Rich St. Bridge
			Downstream - Onondaga creek @ South Avenue
CSO 045		Onondaga Creek (C)	Upstream - Onondaga creek @ Water St. Bridge
			Downstream - Onondaga creek @ W. Genesee St. Bridge (downstream side of bridge)
CSO 061		Onondaga Creek (C)	Upstream - TBD
			Downstream - TBD
OTHER CSO MITIGATION PROJECTS			
CSO 063		Harbor Brook (C)	Upstream - Harbor Brook @ Hiawatha Blvd. Bridge
			Downstream - FCF on Harbor Brook

**Sites are a variation of the in-stream sampling location (downstream) from the AMP Modifications work plan dated December 2011. Refer to Figures 6.2 (A-G) for in-stream sampling locations for representative CSO outfalls and Storage Facilities.*

Figure 6.2A Representative CSO Outfalls 003 & 004

THIS MAP INTENDED FOR GENERAL PLANNING PURPOSES ONLY

DRAFT

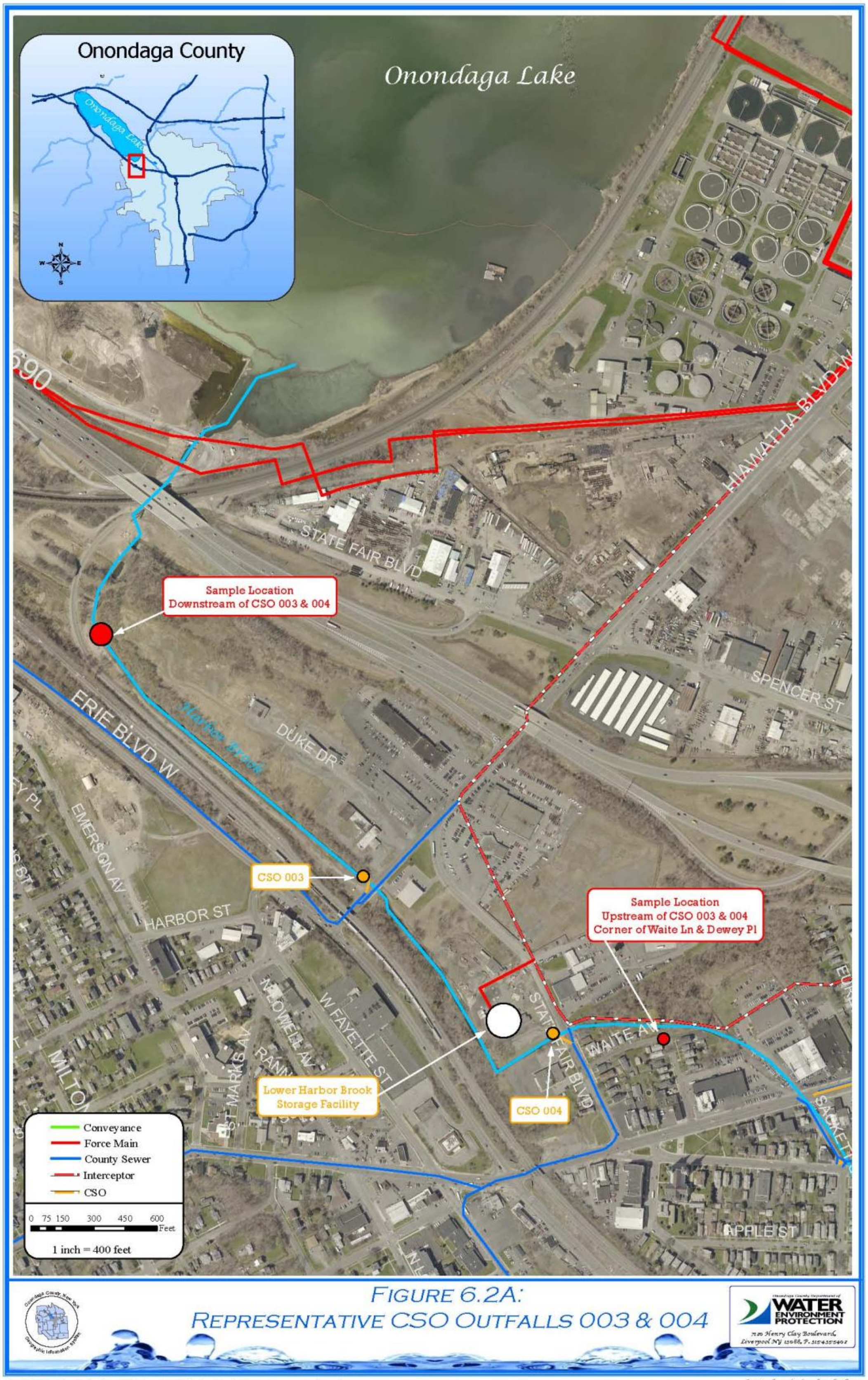


Figure 6.2B Representative CSO Outfall 014

Figure 6.2C Representative CSO Outfall 018

Figure 6.2D Representative CSO Outfalls 027, 030, 034, & 080.

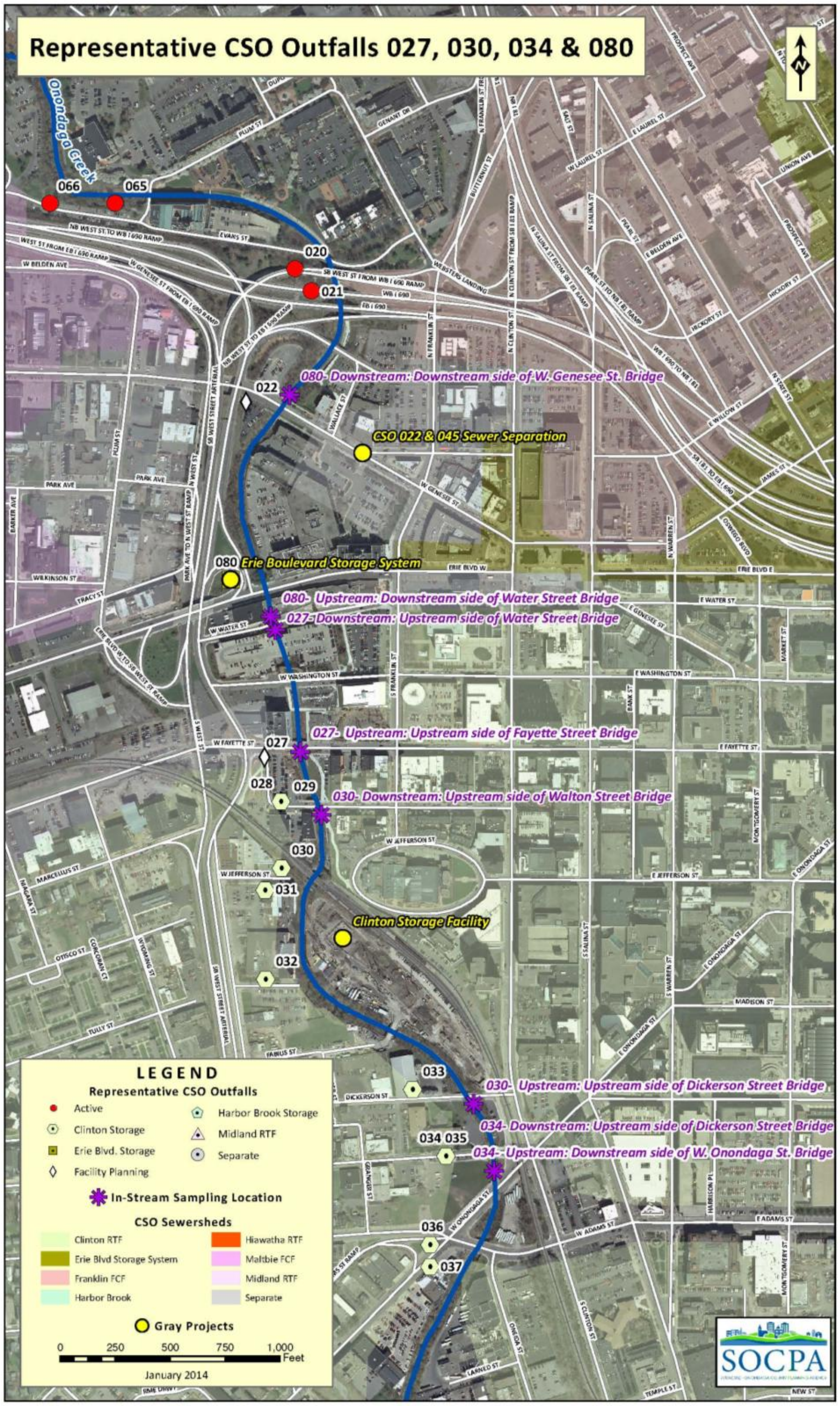


Figure 6.2E Representative CSO Outfalls 052 & 060/077.

Figure 6.2F Lower Harbor Brook Storage Facility (CSO Outfall 004A) & In stream AMP Sampling Locations.

Figure 6.2G Clinton Storage Facility (CSO Outfall 033A) & In Stream AMP Sampling Locations.

THIS MAP INTENDED FOR GENERAL PLANNING PURPOSES ONLY

Parameters

The parameter list includes parameters for which there is a promulgated NYS AWQS or guidance value for Class B or Class C waters. In addition, the NYSDEC is currently developing numeric nutrient criterion for inclusion in its water quality standards. The proposed work plan includes the nutrient parameters total phosphorus (TP) and total nitrogen (TN) in the receiving waters adjacent to the representative CSOs designated for sampling. The 2014 AMP PCCM Tributary Sampling Program (included as Appendix 1.C) outlines the specific sites, monitoring frequencies, and targeted parameters proposed for the PCCM sampling program, which incorporates changes as approved by the NYSDEC in 2013. The work plan will be updated annually and will reflect findings from the previous year's sampling efforts and any changes in the NYS AWQS or guidance values. The sampling program will continue to incorporate flexibility to respond to new data and information. The goal for the program is to collect all samples and assess compliance for all parameters with measurable concentrations.

The high amount of suspended solids in the tributaries, especially in Onondaga Creek during wet weather, create interferences with the priority pollutant parameter analysis. Method 624 and 625 does not allow for sample concentration, typically employed to lower reporting limits and reduce matrix interferences, which makes achieving all results at water quality limits difficult. OCDWEP lab will continue working with the current contract lab to achieve the lowest achievable reporting limits using the GC/MS method and investigate other labs analyzing for priority pollutant parameters to determine compliance with AWQS.

The goal for the program is to collect all samples and assess compliance for all parameters with measurable concentrations. However, the compliance assessment for certain Nutrients and Priority Pollutant parameters may be limited and reported as follows:

- NAS1 - not assessed code 1, compliance could not be assessed because the water quality parameter method reporting limit (MRL) was greater than the AWQS or GV (due to either sample matrix and the associated interferences with that matrix);
- NAS2 - not assessed code 2, compliance could not be assessed because water quality parameter does not have a AWQS or GV

Data from the first two (2) sampling events conducted will be compiled and reviewed with NYSDEC and ASLF staff prior to conducting subsequent sampling events. The following is an outline of the two sampling events planned for 2014 (for representative CSO outfalls 003, 004, 030 and 034) to be designated as CSO 003 Events 1 and 2; CSO 004 Events 1 and 2; CSO 030 Events 1 and 2; CSO 034 Events 1 and 2.

Parameters (Sampling Event 1):

- ***<u>In-Stream</u>***
  Conventionals: Ammonia-N, TP, TDS, Nitrite-N, Nitrate-N, and TN
  In-situ: Dissolved Oxygen, pH, Conductivity and Temperature
  (Conductivity will be used to assess mixing and Temperature will be used to support calculation of ammonia compliance)
  Bacteria: Fecal Coliform (from stream surface) and Total Residual Chlorine
  Note: Over the two-year period when sampling events are conducted at each of the representative CSO outfalls, a minimum of five (5) bacteria samples will be collected each

month (from April through October) to calculate a monthly geometric mean to assess compliance. These samples will be collected at a range of flow conditions that include days of dry as well as wet weather conditions.
Visual observation: Floatables

- ***CSO Outfall/Manhole (Overflow/Regulator Structure):***

  Conventionals: Ammonia-N, TP, TDS, Nitrite-N, Nitrate-N, and TN

  In-situ: Dissolved Oxygen, pH, Conductivity and Temperature

  (Conductivity will be used to assess mixing and Temperature will be used to support calculation of ammonia compliance)

  Bacteria: Fecal Coliform and Total Residual Chlorine

  Visual observation: Floatables

Parameters (Sampling Event 2):

- ***In-Stream***

  Conventionals: Ammonia-N, TP, TDS, Nitrite-N, Nitrate-N, and TN

  In-situ: Dissolved Oxygen, pH, Conductivity and Temperature

  (Conductivity will be used to assess mixing and Temperature will be used to support calculation of ammonia compliance)

  Bacteria: Fecal Coliform (from stream surface) and Total Residual Chlorine
  Note: Over the two-year period when sampling events are conducted at each of the representative CSO outfalls, a minimum of five (5) bacteria samples will be collected each month (from April through October) to calculate a monthly geometric mean to assess compliance. These samples will be collected over a range of flow conditions that include days of dry as well as wet weather conditions.
  Visual observation: Floatables

  Priority Pollutants: Samples will be analyzed using the USEPA Method 608 (pesticides); USEPA Method 624 (volatile organic compounds); USEPA Method 625 (acid/base neutral compounds); and the County's Environmental Laboratory for the USEPA test 13 Priority Pollutant metals. The reporting limits for the Priority Pollutant parameters will be the lowest the contract lab can achieve using the GC/MS method.

- ***CSO Outfall/Manhole (Regulator Structure):***

  Conventionals: Ammonia-N, TDS, TP, Nitrite-N, Nitrate-N, and TN

  In-situ: Dissolved Oxygen, pH, Conductivity and Temperature

  (Conductivity will be used to assess mixing and Temperature will be used to support calculation of ammonia compliance)

  Bacteria: Fecal Coliform and Total Residual Chlorine
  Visual observation: Floatables

  Bacteria: Fecal Coliform

  Priority Pollutants: Samples will be analyzed using the USEPA Method 608 (pesticides); USEPA Method 624 (volatile organic compounds); USEPA Method 625 (acid/base neutral compounds); and the USEPA test 13 Priority Pollutant metals. The reporting limits for the

Priority Pollutant parameters will be the lowest the contract lab can achieve using the GC/MS method.

Timing

CSO outfall and tributary water quality samples will be collected during storms of sufficient magnitude and intensity to trigger the representative CSOs. The sampling approach allows for sample collection prior to and over the entire duration of the CSO(s) discharge to the Creek (including the baseline and first flush samples).

Duration

The duration of each sampling event will be event specific. In addition, there is a need to consider the time-of-travel of the active CSO outfall(s) immediately upstream of each of the representative CSO outfalls. A relatively short travel time during high flows is anticipated from the outfalls.

Frequency

The in-stream samples will also be collected at the same frequency as the CSO outfall samples but will need to account for estimated travel times. The duration and frequency of monitoring for the CSO event will be based on information from the receiving water hydrograph, time travel analyses, and knowledge of when the CSO event begins and ends (from the flowmeter/SCADA data). The total number of "storm" samples collected during the hourly cycles for the sampling event will be dependent on duration of the rain event.

Sampling Protocol

The County will implement the NYSDEC recommended “modified” depth integrated method for the in-stream sampling protocol. At each in-stream tributary bridge sampling site, samples will be collected at three transect locations. These transect locations include a transect perpendicular to the longitudinal axis of the stream (i.e., the center of the stream), half the distance from the centerline and bank on both sides. That is, three (3) samples per bridge sampling location will be collected.

Three (3) individual samples at each of the three (3) transects will be collected at multiple depths as follows: (1) near surface (2) mid-depth and (3) near bottom with a horizontal Kemmerer sampler. These three (3) samples will be composited into a single sample (“vertical composite”), however, each transect will be retained as an individual sample.
NOTE: samples will be collected at two (2) depths (one below the water surface and one at mid-bottom depth), for each of the three (3) transects if the high flows and shallow water column depth does not permit the collection of three (3) separate depths. The Priority Pollutant samples will be collected with a stainless steel “Winkler Bucket” sampling device for the volatile organics from stream. The Priority Pollutant metals (including the USEPA Method 1631 for mercury) will be collected with the Teflon Kemmerer sampler.

The QAPP (Appendix 2) for the water quality sampling program describes the 2014 sampling protocol and analytical program. The QA/QC program for the field and analytical procedures are those mandated by the New York State Department of Health ELAP (ELAP). The QAPP will be updated annually, to reflect the modifications of the annual sampling and analytical programs, for submittal to NYSDEC and ASLF in conjunction with the annual AMP sampling work plan.

PCCM Sampling Schedule (2014-2018):

The sampling schedule proposed from 2014 through 2018 is designed to coincide with the completion of major gray or green Infrastructure projects in a particular CSO basin. As conditions allow, four (4) overflow events are targeted per CSO outfall, over a two-year period. The majority of the sampling is targeted following the completion of the Harbor Brook and Clinton Storage Facilities. Sampling of overflows from the discharge outfalls of the new Clinton and Lower Harbor Brook storage facilities and in-stream locations adjacent to these outfalls has been added to Table 6.4.2.3.2. Sampling is targeted in 2014-2015, when sampling for CSO overflows 003, 004, 030, and 034 is planned, to determine the impact of the overflow relief upon water in Onondaga Creek and in assessing AWQS. The sampling protocol, parameters and targeted frequency of these storage facility discharge overflows will be consistent with the CSO outfall sampling program.

The sampling schedule for CSO discharges from the 014, 027, 052, and 060/077 service areas will be determined based on the approved facility plans. Monitoring and evaluation are required through 2018 and will address all CSO abatement projects; design of future years will be modified based on information obtained from previous efforts. Table 6.4.2.3.2 presents the targeted sampling schedule for the PCCM and the associated gray infrastructure projects.

Table 6.4.2.3.2 Post Construction Compliance Monitoring (Tentative Sampling Schedule 2014-2018)

CSO Service Area	CSO Outfall	CSO Abatement Strategy	Construction Date	Sampling Event Targeted Schedule	NOTES
Harbor Brook	OO3	Lower Harbor Brook Storage Facility (LHBSF) & GI	12/31/2013 & GI by 2018	2014-2015	CSO 003 captured by this storage facility for up to the 1-year, 2-hour design storm.
Harbor Brook	OO4	LHBSF & GI	12/31/2013& GI by 2018	2014-2015	CSO 004 captured by this storage facility for up to the 1-year, 2-hour design storm.
Harbor Brook	LHBSF Outfall[1] (CSO 004A)	Lower Harbor Brook Storage	12/31/2013	2014-2015	CSO 003 and 004 captured by this storage facility for up to the 1-year, 2-hour design storm.
Harbor Brook	O14	Floatables Control Plan (FCF Plan Amendment re-submittal 3/12/13) & GI	TBD	TBD	The sampling schedule of this CSO overflow will be conducted no later than 2018, as required by the ACJ Fourth Stipulation.
Harbor Brook	O18	GI - Wetland Treatment with Floatables Control	12/31/2013	2016-2017	Sampling is targeted when the facility comes on-line and operational; could be conducted during the facility performance testing period.
Clinton	022	Sewer Separation	12/31/2011	2013-2015	Quarterly sampling scheduled during wet weather for a 3-year period.
Clinton	O27	Facility Plan & GI	TBD & GI by 2018	TBD	The sampling schedule of this CSO overflow will be conducted no later than 2018, as required by the ACJ Fourth Stipulation.
Clinton	O30	Clinton Street Storage Facility (CSF) & GI	12/31/2013 & GI by 2018	2014-2015	Sampling is targeted when the facility comes on-line and operational; could be conducted during the facility performance testing period.
Clinton	O34	CSF & GI	12/31/2013 & GI by 2018	2014-2015	
Clinton	CSF Outfall[1] (CSO Outfall 033A)	Clinton Storage Facility (CSOs 028, 030, 031, 032, 033, 034, 035, 036 and 037 captured for up to the 1-year, 2-hour design storm).	12/31/2013	2014-2015	
Clinton	CSO 045	Sewer Separation	12/31/2011	2013-2015	Quarterly sampling scheduled during wet weather for a 3-year period.
Clinton	080 (a-i)	Erie Boulevard Storage System (EBSS) (Gate Chamber Modifications and GI)	GC Modifications completed 2011 & GI by 2018	2016-2017	2 sampling events completed in 2012.

CSO Service Area	CSO Outfall	CSO Abatement Strategy	Construction Date	Sampling Event Targeted Schedule	NOTES
Midland	O52	Facility Plan & GI	TBD & GI by 2018	TBD	The sampling schedule of this CSO overflow will be conducted no later than 2018, as required by the ACJ Fourth Stipulation.
Midland	O60/O77	Facility Plan	TBD	TBD	The sampling schedule of this CSO overflow will be conducted no later than 2018, as required by the ACJ Fourth Stipulation.
Clinton	CSO 061	Sewer Separation	TBD	TBD	Quarterly sampling scheduled during wet weather for a 3-year period.
Clinton	CSO 063	CSO Conveyance Project/LHBS Facility	9/1/2015	2016-2018	Quarterly sampling scheduled during wet weather for a 3-year period.

[1] ***Note: Operation commenced following the construction of the two (2) storage facilities (completed on 12/31/13). Storage Facility performance testing/optimization is currently on-going and has no impact on the operation and PCCM planned for these facilities.***

CSO 022/045 Sewer Separation Projects

The 2012 sewer separation projects include CSO 022, located in the vicinity of Wallace and West Genesee streets, and CSO 045 located in the vicinity of West Castle and Hudson streets. During significant wet weather events, CSOs 022 and 045 would overflow to Onondaga Creek. The regulator sewer within the regulator manholes was sealed in order to eliminate sanitary connection to the outfall for CSO 022 and 045, and these outfalls became the storm sewer outfalls to the creek. Consistent with the requirements of SPDES Permit Number NY 002 7081, a post construction monitoring plan was implemented in 2013 to confirm the effectiveness of sewer separation [formerly CSO 022 and 045 and now Municipal Separate Storm Sewer System (MS4) outfalls]. In-stream sampling results indicating non-compliance with the AWQS could lead to a trackdown program to determine sources. The objective of the sewer separation monitoring program is to verify that overflows from the two outfalls, formerly CSO 022 and CSO 045 (now MS4 outfalls), are not causing or contributing to violations of the AWQS in the receiving waters.

Locations:

The post construction monitoring plan was designed to collect water quality samples from each of the two (2) CSO outfalls (022 and 045) and at Onondaga Creek sites downstream of these two (2) outfalls at Onondaga Creek at West Genesee Street and Onondaga Creek at South Avenue.

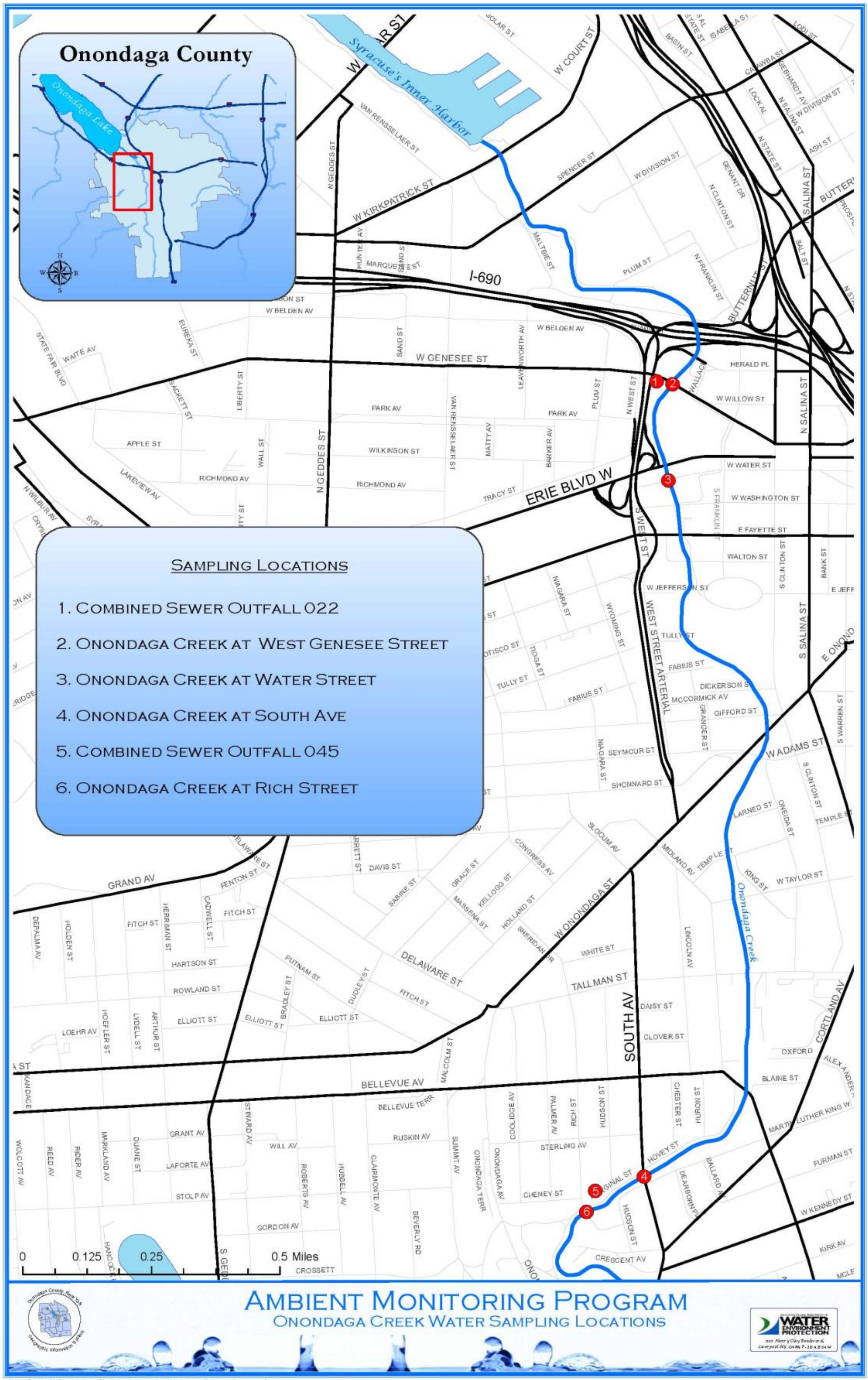
An upstream bridge sampling location is included for each of these two outfalls, in addition to the outfall samples and locations downstream for each of these outfalls, as follows (refer to Figure 6.3 and Appendix I.D for sampling program details):

- Onondaga Creek at Rich Street bridge (Upstream of former CSO 045 outfall)
- Onondaga Creek at Water Street bridge (Upstream of former CSO 022 outfall)

Parameters:

The following water quality parameters, related to combined sewer overflows, will be measured: fecal coliform, total suspended solids, turbidity, dissolved oxygen, and a visual observation of floatables.

Figure 6.3 **Sewer Separation Projects (CSO 022 & 045) – AMP Sampling Locations.**



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Created: 8/25/2014 by: domhenn

Frequency:

These outfalls are required to be monitored for a period of no less than three (3) years, with a minimum of four (4) samples per location per year during storm events to confirm the effectiveness of the sewer separation. Once the monitoring period has ended and inspection of these outfalls by the NYSDEC confirms that these outfalls have been permanently sealed or eliminated, these outfalls will be removed from the County's SPDES Permit. Samples will be collected on a quarterly basis during wet weather. Dry weather observations (no less than 4 per year) will be recorded and documented as well.

CSO 061 Sewer Separation Project

The schedule for the CSO 061 Sewer Separation Project located in the vicinity of Wallace and West Genesee Street, is yet to be determined. The post construction monitoring plan for the project will be consistent with the requirements of SPDES Permit Number NY 002 7081, to confirm the effectiveness of sewer separation. The post construction monitoring plan will be designed to include water quality monitoring at Onondaga Creek sites downstream of this outfall and will include fecal coliform, total suspended solids, turbidity, dissolved oxygen, and a visual observation of floatables.

CSO 063 Conveyances Project

The NYSDEC letter dated November 22, 2013, regarding the Lower Harbor Brook CSO Conveyances Project, requires a PCCM plan to evaluate, for a duration of three years, a water quality assessment of the segment of Harbor Brook adjacent to the new CSO 063 Outfall location. As noted in the letter, the effectiveness of the control is to be demonstrated and a comparison of AMP baseline WQ data with the PCCM data over a three (3) year period is to be conducted. The ultimate goal of the monitoring program is to determine whether Harbor Brook is meeting the AWQS and its designated uses in accordance with the Clean Water Act.

In 2012 Onondaga County initiated the planning and design for the CSO 063 Conveyance Project. This project provides for the transmission of wet weather flow from CSO 063, currently located in Emerson Street, to the Lower Harbor Brook (LHB) Storage Facility constructed on State Fair Boulevard. The schedule for construction will be established based on NYSDEC's approval of the plans and specifications for the project. The post construction monitoring plan will be designed to include water quality monitoring at Onondaga Creek sites downstream of the CSO 063 outfall (Floatables Control Facility on Harbor Brook) and upstream (Hiawatha Boulevard) during storm events to evaluate the effectiveness of the conveyance project for include fecal coliform, total suspended solids, turbidity, dissolved oxygen, and a visual observation of floatables.

6.5 Biological Monitoring

The AMP includes an extensive biological monitoring program that supports assessments of habitat conditions in the streams.

Program elements include:

- Macroinvertebrate Monitoring
- Stream Mapping Visual Assessment

6.5.1 Macroinvertebrate Monitoring

The objective of the tributary macroinvertebrate monitoring program, as described in Exhibit D of the ACJ, is to "measure the physical environment….to map erosional and depositional sections" and "to sample the streams' macroinvertebrate communities and calculate the NYSDEC's rapid field biotic index throughout the tributaries' length" (ACJ 1998). Tributary macroinvertebrate assessments were conducted in 2000, 2002, 2004, 2006, 2008, and 2010; stream visual assessments were conducted in 2000, 2002, and 2008. For the 2014 to 2018 monitoring period, stream biota and tributary mapping will be conducted for comparison to the previous data to assess potential changes as CSO improvements are brought on line.

The tributary macroinvertebrate program includes collection and identification of benthic macroinvertebrates to the lowest possible taxon (ideally, the species level) at two to four sites on each of the CSO-affected streams (Onondaga Creek, Ley Creek, and Harbor Brook). The stream mapping program includes field collection and field identification (to the family level) of macroinvertebrates at one location per stream mile on each of the three CSO-affected streams. Results are used to calculate standard indices that assess whether a stream segment is impaired and what type of pollution is most likely responsible. Table 6.5.1.1 includes the sampling details for each program.

The previously collected AMP tributary macroinvertebrate monitoring program created a robust baseline dataset to evaluate response to remediation of CSOs and non-point source control measures within the watershed. These measures were largely completed in December 2013 with construction of the Lower Harbor Brook and Clinton Storage facilities. As part of this five-year work plan, macroinvertebrate monitoring will be conducted in 2015, allowing approximately 1 year for the benthic community to reach a new equilibrium to the changed water quality conditions, and in 2017 to assess the community three years following improvements. Sampling will be conducted at the same locations as sampled in the baseline program in Onondaga Creek (four sites), Ley Creek (three sites), and Harbor Brook (two sites) (Refer to Table 6.5.1.2 and Figure 6.5.1.1).

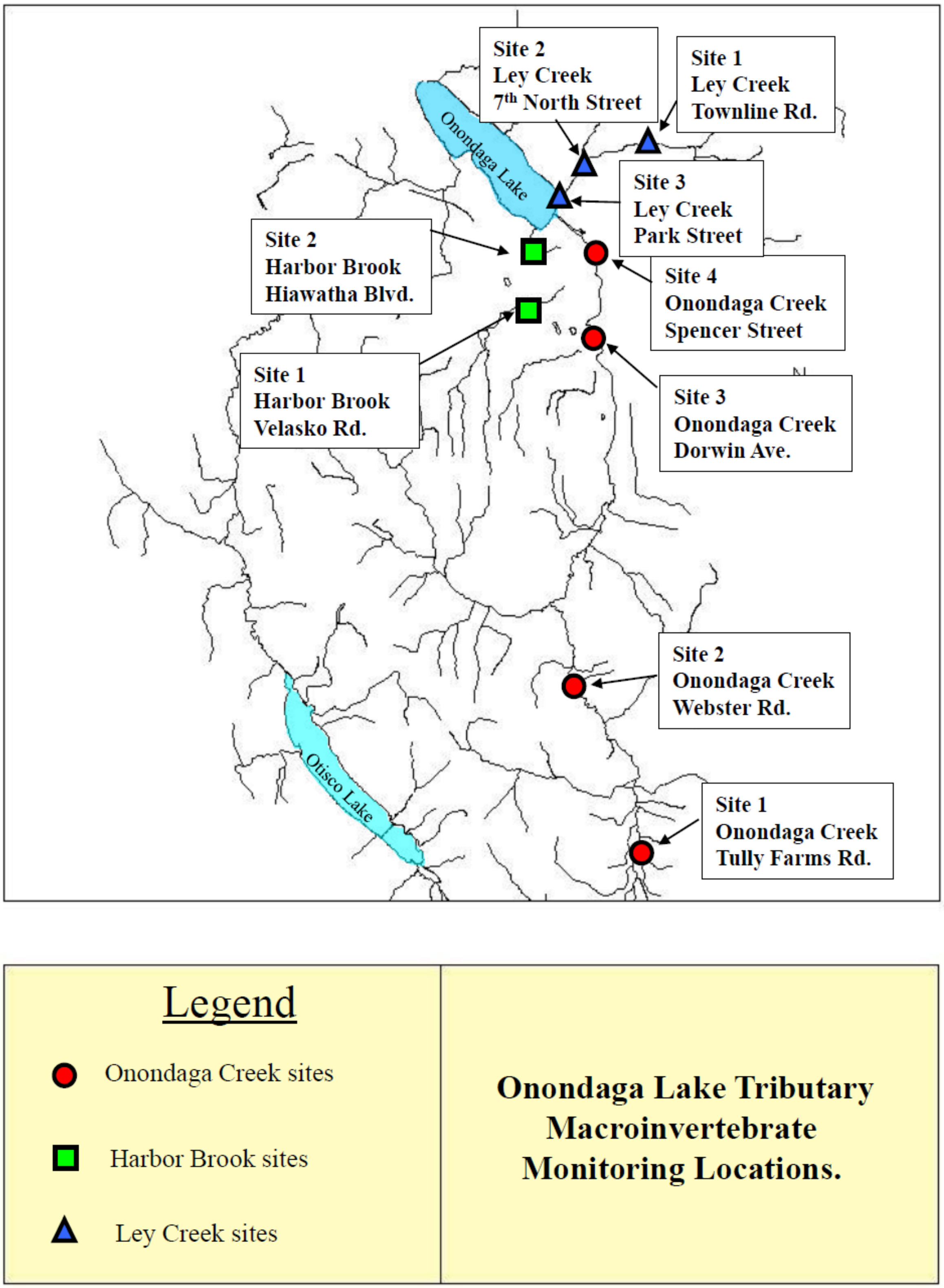
Table 6.5.1.1 Tributary Macroinvertebrate Assessment Program

Component	Methodology/ Gear	Sampling Objectives	Location and Number of Samples	Timing
Tributary Macroinvertebrate Sampling	Kick Screen Sampling Jab Net Sampling	NYSDEC Water Quality Assessment Protocol HBI – Hilsenhoff Biotic Index % Oligochaetes	-Four (4) Sites on Onondaga Creek -Three (3) Sites on Ley Creek -Two (2) Sites on Harbor Brook	July during low flow conditions.
Habitat Assessment	USEPA Rapid Bioassessment Protocol	Habitat Characterization	-Four (4) Sites on Onondaga Creek -Three (3) Sites on Ley Creek -Two (2) Sites on Harbor Brook	July during low flow conditions.

Table 6.5.1.2 Tributary Macroinvertebrate and Habitat Assessment sampling locations

Site Name	Site Location	Site Abbreviation	Sample Type	Reference Coordinates
Onondaga Creek Site 1	Tully Farms Road	OCS1	Kick Screen	N 42° 49.49', W 76° 08.20'
Onondaga Creek Site 2	Webster Road	OCS2	Kick Screen	N 42° 52.95', W 76° 09.24'
Onondaga Creek Site 3	Dorwin Ave. Bridge	OCS3	Kick Screen	N 42° 59.137', W 76° 08.961'
Onondaga Creek Site 4	Spencer Street	OCS4	Kick Screen	N 43° 03.349', W 76° 09.670'
Harbor Brook Site 1	Velasko Road	HBS1	Kick Screen	N 43° 02.156', W 76° 11.467'
Harbor Brook Site 2	Hiawatha Boulevard	HBS2	Kick Screen	N 43° 03.393', W 76° 11.132'
Ley Creek Site 1	Townline Road	LCS1	Kick Screen	N 43° 05.453', W 76° 06.987'
Ley Creek Site 2	7th North Street	LCS2	Jab Net	N 43° 05.242', W 76° 09.706'
Ley Creek Site 3	Park Street	LCS3	Jab Net	N 43° 04.496', W 76° 10.359'

Figure 6.5.1.1 Map of sampling stations for Onondaga Lake Tributary macroinvertebrate sampling



6.5.2 Tributary Mapping/Stream Visual Assessment

During the most recent habitat survey in the tributaries conducted in 2008, physical and biological conditions within the streams were assessed using the Stream Visual Assessment Protocol (SVAP) developed by the Natural Resources Conservation Service (NRCS) and issued December 1998. As mentioned previously, CSO and non-point source control measures within the watershed were largely completed in 2013. Because habitat conditions may not change as rapidly, we propose conducting one tributary mapping/stream visual assessment survey (Table 6.5.2.1) during the next 5 years, coinciding with the tributary macroinvertebrate sampling in 2017. Sampling will be targeted at the same locations as sampled in the baseline program including 27 sites in Onondaga Creek, 9 sites in Ley Creek, and 7 sites in Harbor Brook (refer to Table 6.5.2.2 and Figure 6.5.2.1).

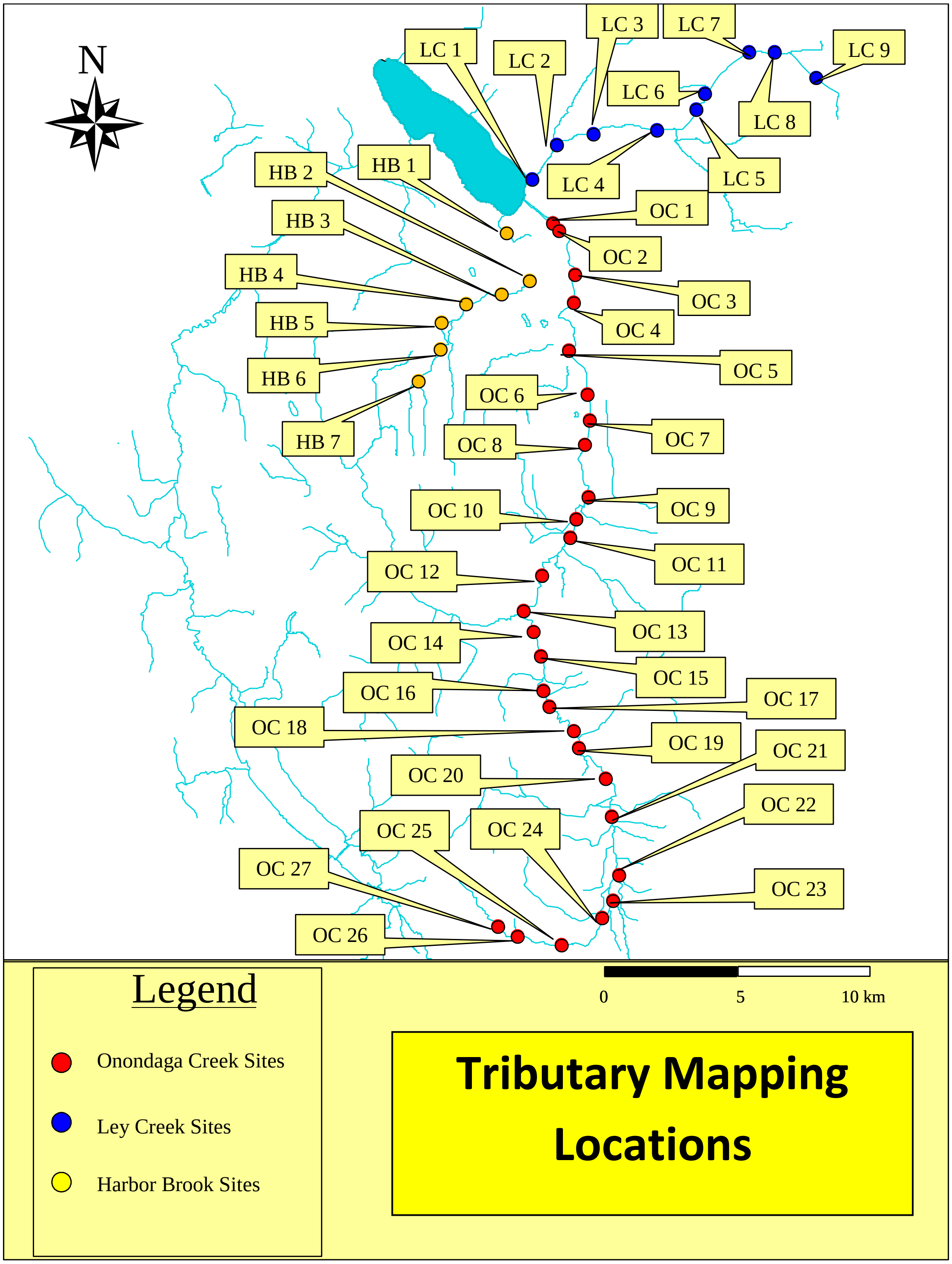
Table 6.5.2.1 Tributary Mapping/Stream Visual Assessment Survey

Component	Methodology/ Gear	Sampling Objectives	Location and Number of Samples	Timing
Tributary Mapping	Stream Visual Assessment Protocol (SVAP) developed by the NRCS	Physical Assessment of ten (10) elements. FBI – Family Level Biotic Index.	-Twenty-seven (27) sites on Onondaga Creek. -Nine (9) sites on Ley Creek. -Seven (7) sites on Harbor Brook.	August during low flow conditions.

Table 6.5.2.2 Tributary Mapping Monitoring Locations and Coordinates

Site Designation	Location	Northing	Easting
Onondaga Creek			
OC1	Between Kirkpatrick and Spencer Streets	43 03 34.1	07 60 95.0
OC2	1st pedestrian walkway above Spencer Street	43 03 25.8	26 09 41.3
OC3	E. Adams Street	42 02 32.5	76 09 15.1
OC4	Midland Ave.	43 01 58.6	76 09 17.3
OC5	Newell St.	43 01 00.2	76 09 26.2
OC6	Rt. 173	43 00 06.5	76 08 55.2
OC7	Rosemont Drive	42 59 35.7	76 08 52.4
OC8	Dorwin Ave.	42 59 04.9	76 09 00.3
OC9	Onondaga Nation	42 57 53.2	76 08 57.9
OC10	Onondaga Nation	42 57 31.1	76 09 12.1
OC11	Onondaga Nation	42 57 14.4	76 09 19.2
OC12	Gibson Rd.	42 56 29.1	76 10 14.3
OC13	Above flood control dam	42 55 48.8	76 10 31.0
OC14	Onondaga Nation	42 55 19.9	76 10 25.0
OC15	Indian Rd.	42 54 50.0	76 10 15.0
OC16	Rt. 20	42 54 06.0	76 10 11.3
OC17	Turner Rd.	42 53 46.4	76 10 01.3
OC18	Bear Mt. Road	42 53 17.9	76 09 21.5
OC19	Webster Rd.	42 52 55.9	76 09 13.3
OC20	Nichols Rd.	42 52 19.2	76 08 27.7
OC21	Otisco Rd.	42 51 32.1	76 08 18.6
OC22	Parking area off Rt. 11A	42 50 21.7	76 08 07.8
OC23	Dirt Rd Crossing off Rt. 11A	42 49 50.3	76 08 18.0
OC24	Tully Farms Rd.	42 49 29.5	76 08 35.0
OC25	Fellows Falls	42 48 56.2	76 09 43.5
OC26	Impoundment at Rt. 80	42 49 07.5	76 10 54.3
OC27	Dirt Rd Crossing off Rt. 80	42 49 19.4	76 11 28.4
Harbor Brook			
HB1	Hiawatha Blvd.	43 03 23.1	76 11 07.4
HB2	Amy St.	43 02 25.1	76 10 29.4
HB3	Velasko Rd.	43 02 08.7	76 11 17.2
HB4	Grand Ave. Pump Station	43 01 56.9	76 12 15.5
HB5	Onondaga Blvd. @ Bellevue Manor	43 01 35.4	76 12 55.2
HB6	Rt. 173 @ St. George Church	43 01 02.2	76 12 57.6
HB7	Harris St.	43 00 23.9	76 13 34.5
Ley Creek			
LC1	Below Rt.81	43 04 28.7	76 10 25.6
LC2	7th North Street	43 05 10.1	76 09 44.5
LC3	LeMoyne Ave.	43 05 23.8	76 08 42.2
LC4	Townline Rd.	43 05 27.1	76 06 58.3
LC5	E. Molloy Rd.	43 05 52.1	76 05 51.9
LC6	Thompson Rd. @ OCM BOCES	43 05 52.1	76 05 51.9
LC7	Schuyler Rd.	43 07 01.6	76 04 24.9
LC8	Fly Rd.	43 07 02.2	76 03 41.1
LC9	Rt. 298	43 06 29.9	76 02 33.6

Figure 6.5.2.1 Map of Sampling Stations for Onondaga Lake Tributary Mapping



SECTION 7: Onondaga Lake Monitoring Program

7.1 Water Quality Classification and Designated Use

Lakes, rivers, streams, embayments, estuaries, and groundwater are classified according to their designated use (for example, water supply, swimming, fish propagation, aesthetic enjoyment, and fish survival). Onondaga Lake is classified as B and C (Figure 7.1.1: Regulatory Classifications and Bathymetry of Onondaga Lake and Table 7.1.1: Summary of Regulatory Classification of Onondaga Lake). The Class B segment encompasses the northern basin; the Class C segments include much of the southern basin and a small area around the mouth of Ninemile Creek. Both B and C waters must exhibit water quality conditions suitable for fish survival and propagation. Class B waters are to be suitable for primary water contact recreation (e.g. swimming) and secondary water contact recreation (e.g. boating). Class C waters shall be suitable for primary and secondary water contact recreation, although other factors may limit the use for these purposes.

Figure 7.1.1 Regulatory Classifications and Bathymetry of Onondaga Lake

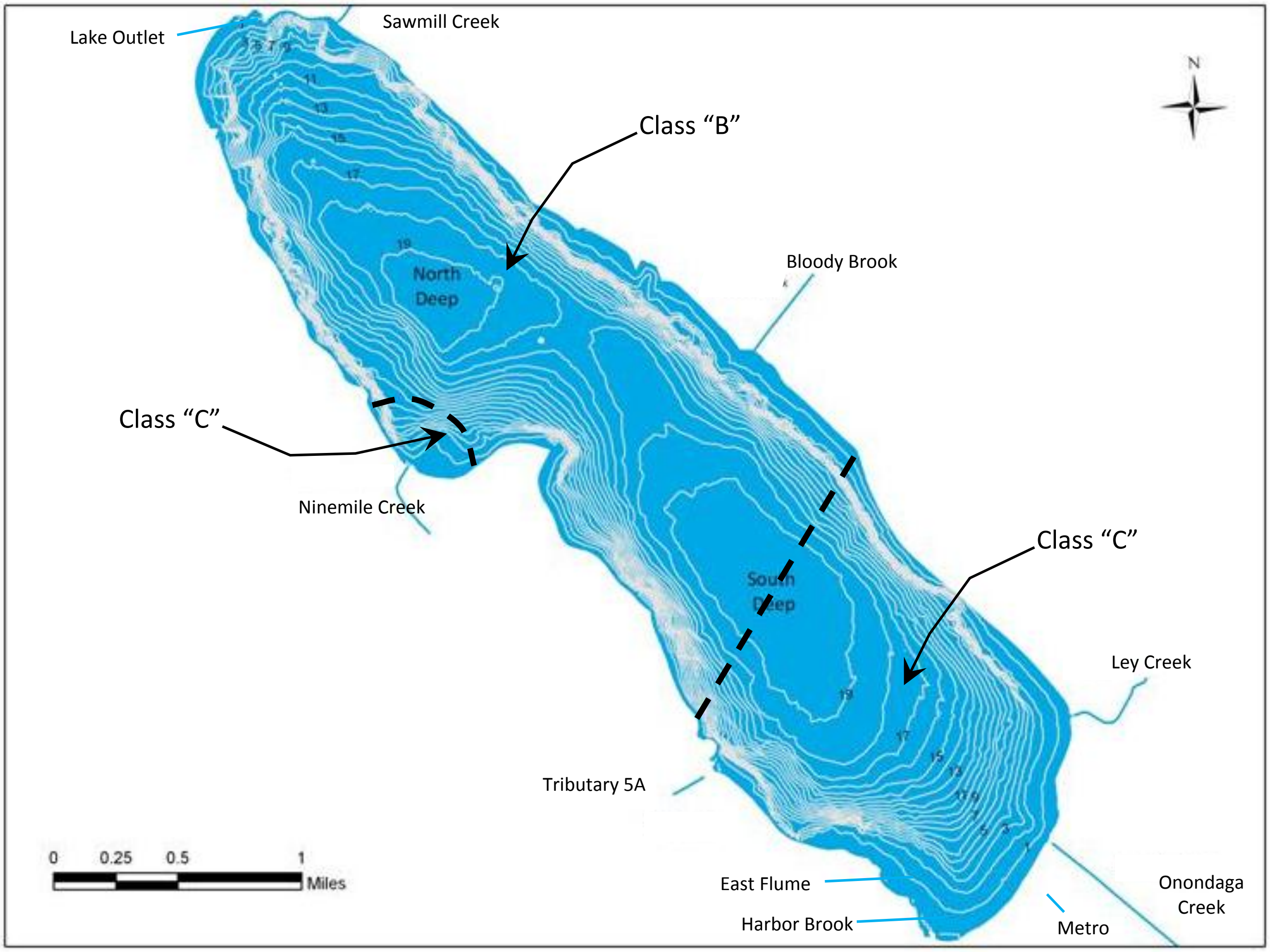


Table 7.1.1 Summary of Regulatory Classification of Onondaga Lake

Water body	Description of Segment	Regulatory Classification	Standards
Onondaga Lake (1)	Northwest of a line extending from a point located on the west shore 0.25 miles northwest of the mouth of trib. 5A to a point on the east shore located at a point 0.6 miles southeast of the mouth of Bloody Brook, except portions of the lake designated as items no. 2 and 3.	B	B
Onondaga Lake (2)	Southeast of a line extending from a point located on the west shore 0.25 miles northwest of the mouth of trib. 5A to a point on the east shore located at a point 0.6 miles southeast of the mouth of Bloody Brook, except portions of the lake designated as items numbered 1 and 3.	C	C
Onondaga Lake (3)	Area within 0.25 mile radius of the mouth of Ninemile Creek, except portions designated as items numbered 1 and 2.	C	C

Source: NYSDEC (classifications as of February 2012); on-line linkage
http://www.dec.ny.gov/regs/4539.html#17588

7.2 Regulatory Goals

The regulatory goal of the ACJ is to bring Onondaga Lake into compliance with designated best uses pursuant to 6 NYCRR (New York Code, Rules, and Regulations) Parts 701 and 703.

As outlined in the ACJ, specific New York State AWQS and Guidance that will be used to assess the extent to which these actions are successful include the following:

- Dissolved Oxygen: 6NYCRR Sec. 703.3
- Ammonia: 6 NYCRR Sec. 703.5
- Turbidity: 6 NYCRR Sec. 703.2
- Floatable Solids in CSO Discharges: 6 NYCRR Sec. 703.2
- Phosphorus: 6 NYCRR Sec. 703.2
- Water Quality Standards & Guidelines (NYSDEC TOGS 1.1.1)
- Nitrogen: 6 NYCRR Sec. 703.2
- Bacteria: 6 NYCRR Sec. 703.4

7.3 Required Elements of the Onondaga Lake Monitoring Program

The required elements abstracted from the Amended Consent Judgment, January 1998 (Appendix D) include:

- Assessing compliance with ambient water quality standards including bacteria in nearshore areas
- Assessing trophic status of the Lake
- Continuing data collection, analysis, and reporting consistent with the long-term lake database (1970 - 1997) to enable statistical trend analysis
- Complementing the chemical program with a biological monitoring effort to assess the densities and species composition of phytoplankton, zooplankton, macrophytes, macroinvertebrate, and fish
- Evaluating the success of walleye, bass, and sunfish propagation (quantitative lake-wide nest surveys, recruitment estimates, and juvenile community structure). Coordinate with NYSDEC fisheries management activities on the lake
- Establishing data sharing protocols with NYSDEC for County to track contaminants in fish flesh
- Acquiring and tracking data by others regarding nature of littoral sediments in Onondaga Lake

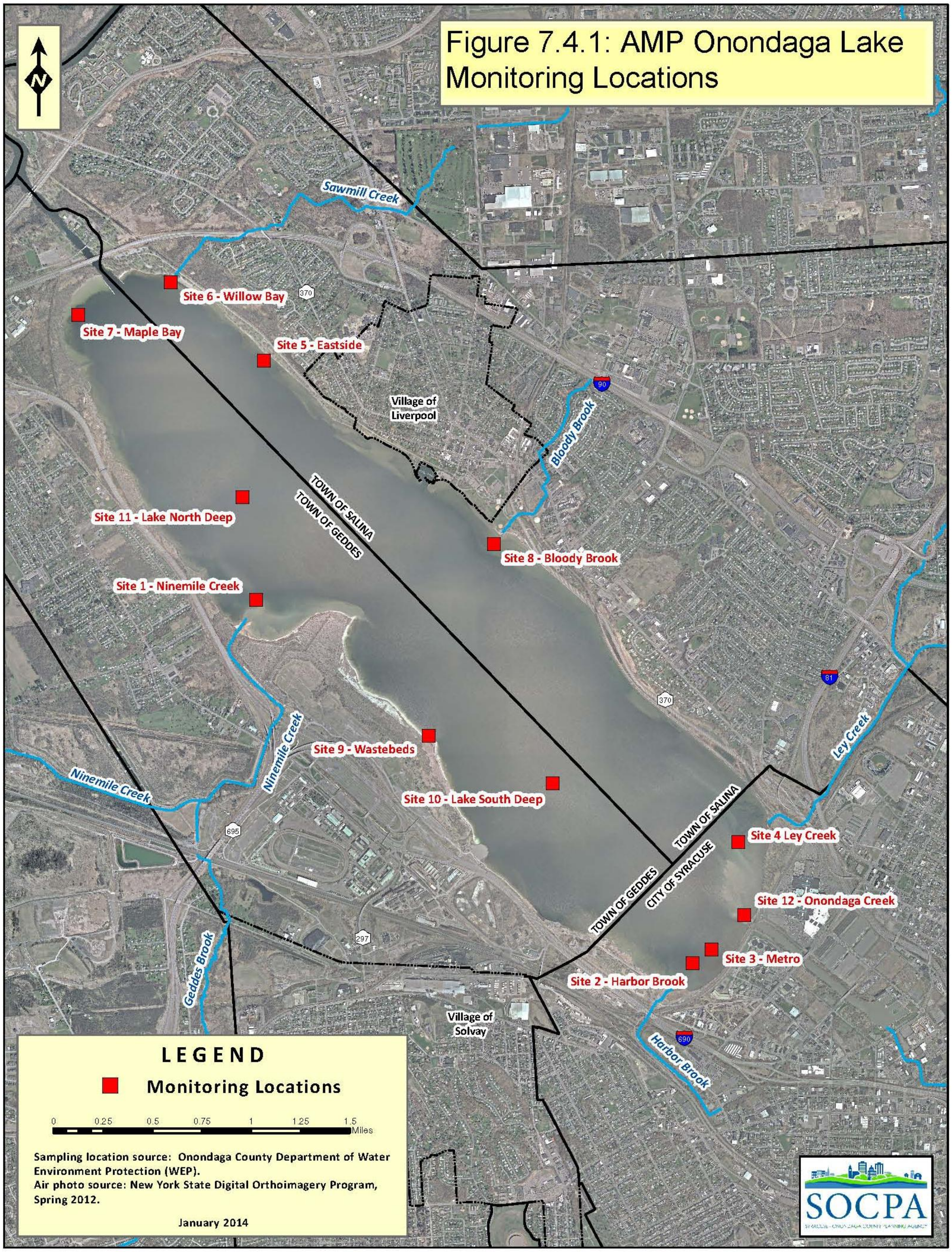
7.4 Annual Onondaga Lake Water Quality Monitoring (2014-2018)

The AMP encompasses multiple parameters with a focus on evaluating compliance with AWQS and assessment of trends toward attainment of designated uses.

Components of the annual lake sampling program include:

1. **Biweekly** sampling at the lake's main sampling station, referred to as South Deep (Figure 7.4.1), the deepest point in the southern basin. South Deep has been the long-term reference monitoring location on Onondaga Lake since the County initiated monitoring in 1970. Trained WEP Technicians collect samples from Onondaga Lake throughout the year to characterize water quality and biological conditions. Most sampling occurs between April and November when the lake is ice free.
2. **Quarterly** sampling from the deepest point of the northern basin (North Deep), is conducted in addition to the routine biweekly sampling program at South Deep. In 2013, the sampling parameters at the North Deep station were reduced to comply with the Phosphorus TMDL follow-up monitoring requirements, as specified by the Onondaga Lake Phosphorus TMDL dated May 2012. Sampling at the North Deep basin is limited to Total Phosphorus, Chlorophyll-*a*, and Secchi depth.
3. **Bacteria** sampling at each of the in-lake sampling stations (South and North Deep) at a minimum frequency of five samples per month (from April through October during the disinfection period) is conducted to report compliance with the NYS AWQS.
4. **Special Weekly** sampling includes sampling of a network of ten (10) near-shore locations for parameters related to suitability for water contact recreation. These include Secchi disk transparency, turbidity, and fecal coliform bacteria.

Figure 7.4.1 AMP Onondaga Lake Monitoring Locations



Parameters

The 2014 AMP Sampling Program (included as Appendix 1) outlines the specific sites, monitoring frequencies and targeted parameters to be monitored for Onondaga Lake. The work plan will be updated annually and will reflect findings from the previous year's sampling efforts and any changes in the NYSAWQS or guidance values. Any changes will be implemented following NYSDEC review and approval. The sampling program will continue to incorporate flexibility to respond to new data and information.

Sampling Protocol

Samples will be collected and analyzed in accordance with the QAPP (Appendix 2) for the 2014 water quality sampling and analytical programs and incorporates changes as approved by the NYSDEC in 2013. The samples will be analyzed in the NYS Certified OCDWEP Environmental Laboratory. The QA/QC program for the field and analytical procedures are those mandated by the New York State Department of Health ELAP (ELAP). The QAPP will be updated annually, to reflect the modifications of the annual sampling and analytical programs, for submittal to NYSDEC and ASLF, in conjunction with the annual AMP sampling work plan.

7.5 Biological Monitoring Programs

The objectives of the biological monitoring program for Onondaga Lake as stated in the ACJ are to "…assess the densities and species composition of phytoplankton, zooplankton, macrophytes, macrobenthos, and fish", and to "evaluate the success of walleye, bass, and sunfish propagation (quantitative lake wide nest surveys, recruitment estimates, and juvenile community structure) in the lake." Based on the more qualitative nature of the objectives, analysis and interpretation of the biological data are primarily focused on changes over time. There also are limited comparisons with reference systems such as Oneida Lake, and comparisons to benchmark conditions considered desirable for various functions and values of the aquatic ecosystem.

7.5.1 Plankton

The annual patterns of phytoplankton and zooplankton will be characterized temporally. The **phytoplankton** community data will be analyzed each year for numbers, biomass, biovolume, and species composition. The percent contribution of the major taxa to the community will be analyzed. These data will also be subject to trend analysis over time. Field collections of phytoplankton will be preserved in Lugol's solution. Samples will be shipped to Phycotech for enumeration and identifications made to species when possible. Phytoplankton densities will be estimated, and biomass will be based on cell volume of species computed from the average cell dimensions and the geometric shape most closely simulating the shape of each species.

Zooplankton community data will be analyzed in terms of numbers of organisms, species composition, size structure, and cladoceran indices. Zooplankton densities, species composition, size structure, and biomass will be based on vertical hauls. Zooplankton will be identified to species when possible and converted to dry weight when used to estimate biomass. Crustacean zooplankton will be assessed in relation to fish community structure. Appendix 1 (2014 AMP Sampling Program) outlines the specific sites and monitoring frequencies, for the Onondaga Lake Plankton sampling program proposed for 2014. The QAPP (Appendix 2) reflects the 2014 Plankton sampling and analytical programs.

7.5.2 *Fish Community Sampling*

The fish community sampling program has been conducted annually since 2000, as required by the ACJ. As part of the five-year work plan, we propose continuing with the fisheries program annually through 2018 (Table 7.5.2.1), with a reduction in overall annual effort from the current sampling.

Table 7.5.2.1 2014-2018 Onondaga Lake Fish Community Sampling Program

Component	Methodology/Gear	Sampling Objectives	Location and Number of Samples	Timing
Littoral Larvae	Larval fish seine swept for 10 m in littoral zone.	Determine community structure and species richness.	-5 strata with 3 sites in each strata and 1 sweep at each site. -No. of Sites = 15 -Total No. of events = 2 -Total No. of samples = 30	-Annually -Daytime Twice per year -Mid-June -Mid-July
Juvenile Fish	50' x 4' x 1/4" bag seine swept into shore in the littoral zone.	Determine community structure and species richness.	-5 strata with 3 sites in each strata and 1 sweep at each site. -No. of Sites = 15 -Total No. of events = 2 -Total No. of samples = 30	-Annually -Daytime -Twice per year -Mid-August -Mid-September.
Nesting Fish	Lake wide nest survey.	Document spatial distribution and species composition.	-Entire perimeter of lake divided into 24 equal length sections. -Total No. of events = 1 -Total No. of samples = 24	-Annually -Once in June when water temperature is between 15° and 20 °C.
Adult Fish-Littoral Zone	Boat mounted electrofisher in the littoral zone at night.	Determine community structure, species richness, CPUE, and relative abundance.	-Entire perimeter of lake shocked in 24 contiguous transects. -Alternating all-fish/gamefish transects. -Total No. of events = 1 -Total No. of samples = 24	- Annually - Night-time - Once in the fall when water temp. between15° and 20 °C.

Figure 7.5.2.1 Location of Electrofishing Transects in Onondaga Lake

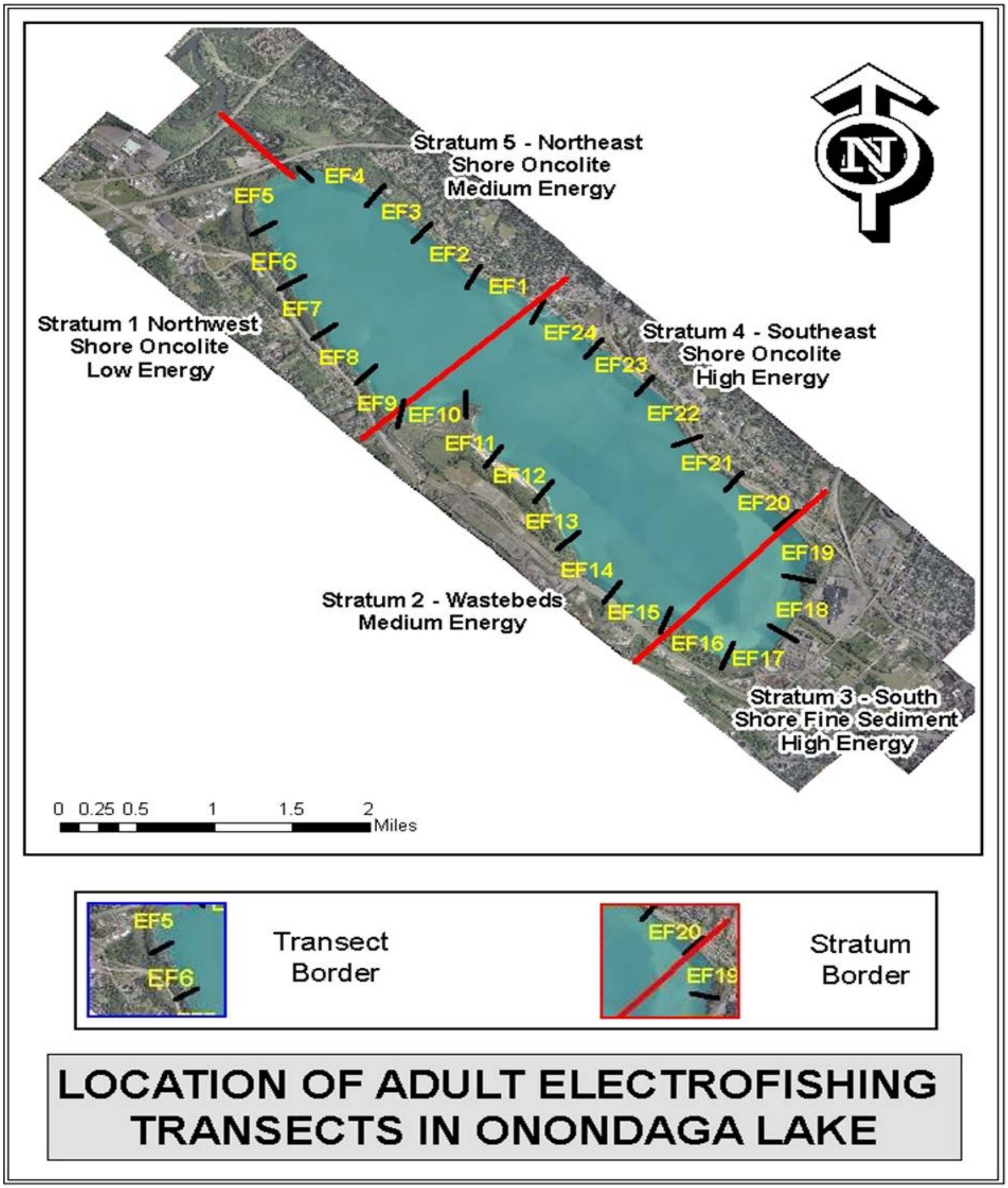


Figure 7.5.2.2 Location of Juvenile Seine Sites in Onondaga Lake

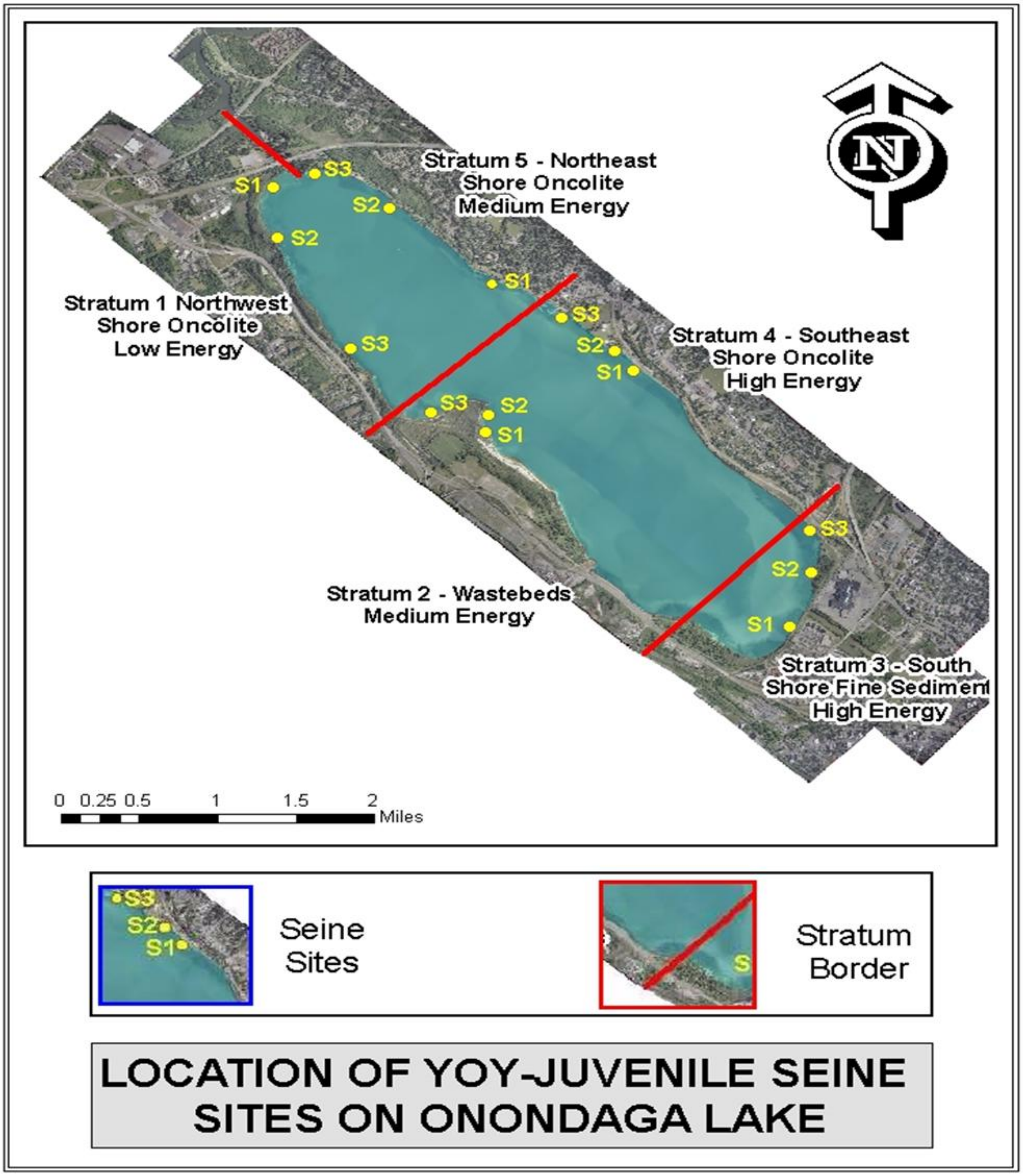


Figure 7.5.2.3 Location of Larval Seine Sites in Onondaga Lake

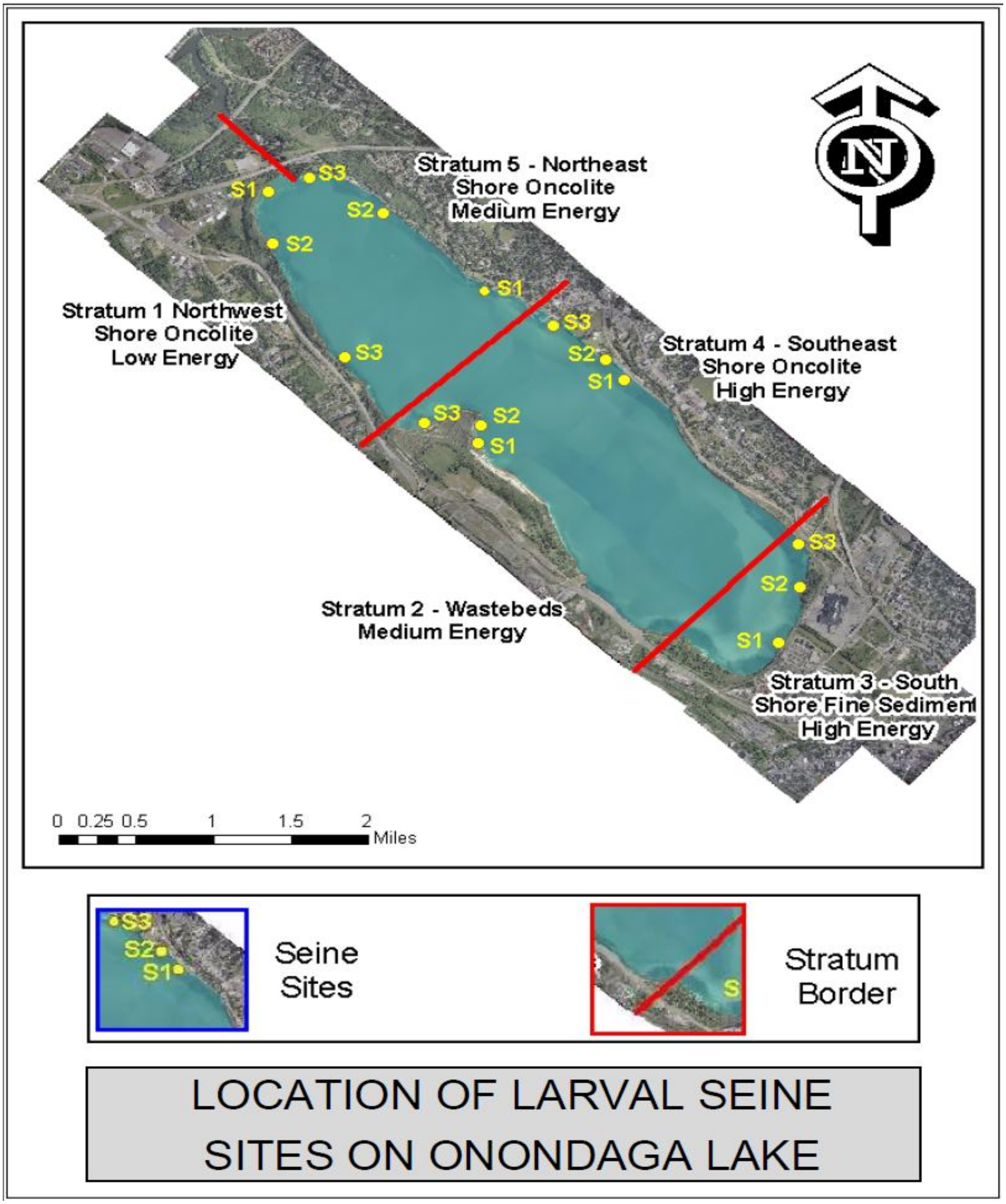
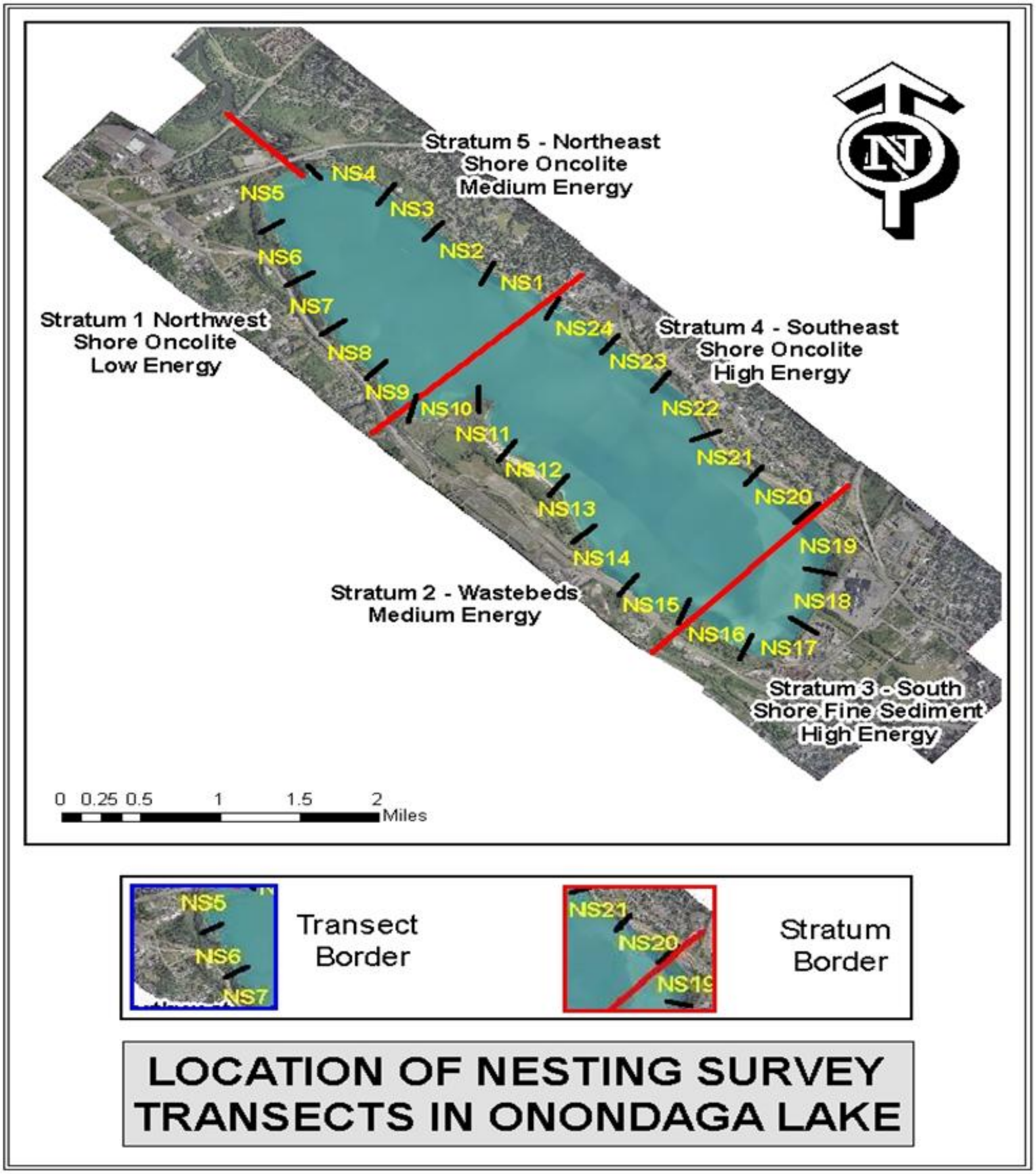


Figure 7.5.2.4 Location of Nesting Survey Transects in Onondaga Lake



7.5.3 Macrophyte Assessment

The Macrophyte Assessment Program (Table 7.5.3.1) included an annual aerial survey and a more intensive field survey every 5 years since 2000, as part of the AMP.

The macrophyte community has expanded and diversified in accordance with these goals; therefore, we recommend discontinuing the intensive field survey and conducting one final aerial survey at the end of the 5-year monitoring period in 2018. If Honeywell is not conducting their Macrophyte Assessment Program during the 5-year monitoring period, one final intensive field survey will be considered in 2018 as well. Sampling will be consistent with the methods used in the previous surveys.

Table 7.5.3.1 Onondaga Lake Macrophyte Assessment Program

Component	Methodology/Gear	Sampling Objectives	Location and Number of Samples	Timing
Onondaga Lake Aerial Photography	Program utilizes plane with belly mounted 9x9 camera. 60% forward overlap, 30% side overlap.	Determine annual percent of littoral zone with macrophytes.	-Three (3) flight lines full lake coverage.	-August when water clarity is approximately 3-meters on the Secchi disk. -Early morning with low sun angle.
Field Species Verification of Aerial Photography	Visual identification.	Determine species.	-Two (2) sites in each of the five (5) strata for a total of ten (10) sites.	-Within 1 week of the aerial photos. (Figure 7.5.3.1)
Onondaga Lake Littoral Zone Survey	Stratified Design. Line transects. Transects sampled from shore to 6m depth. 1 m^2 quadrats sampled for species composition and cover. 0.25 m^2 quadrats sampled for biomass.	Determine species composition, percent cover, frequency of occurrence, biomass, maximum depth, and distribution.	-20 line transects total (4 per stratum). -1 m^2 cover quadrats sampled every other meter along transect to 6m depth. -0.25 m^2 biomass quadrats sampled once per 30m of transect to a depth of 6m.	-August (Figure 7.5.3.2)

Figure 7.5.3.1 Macrophyte field verification sampling locations

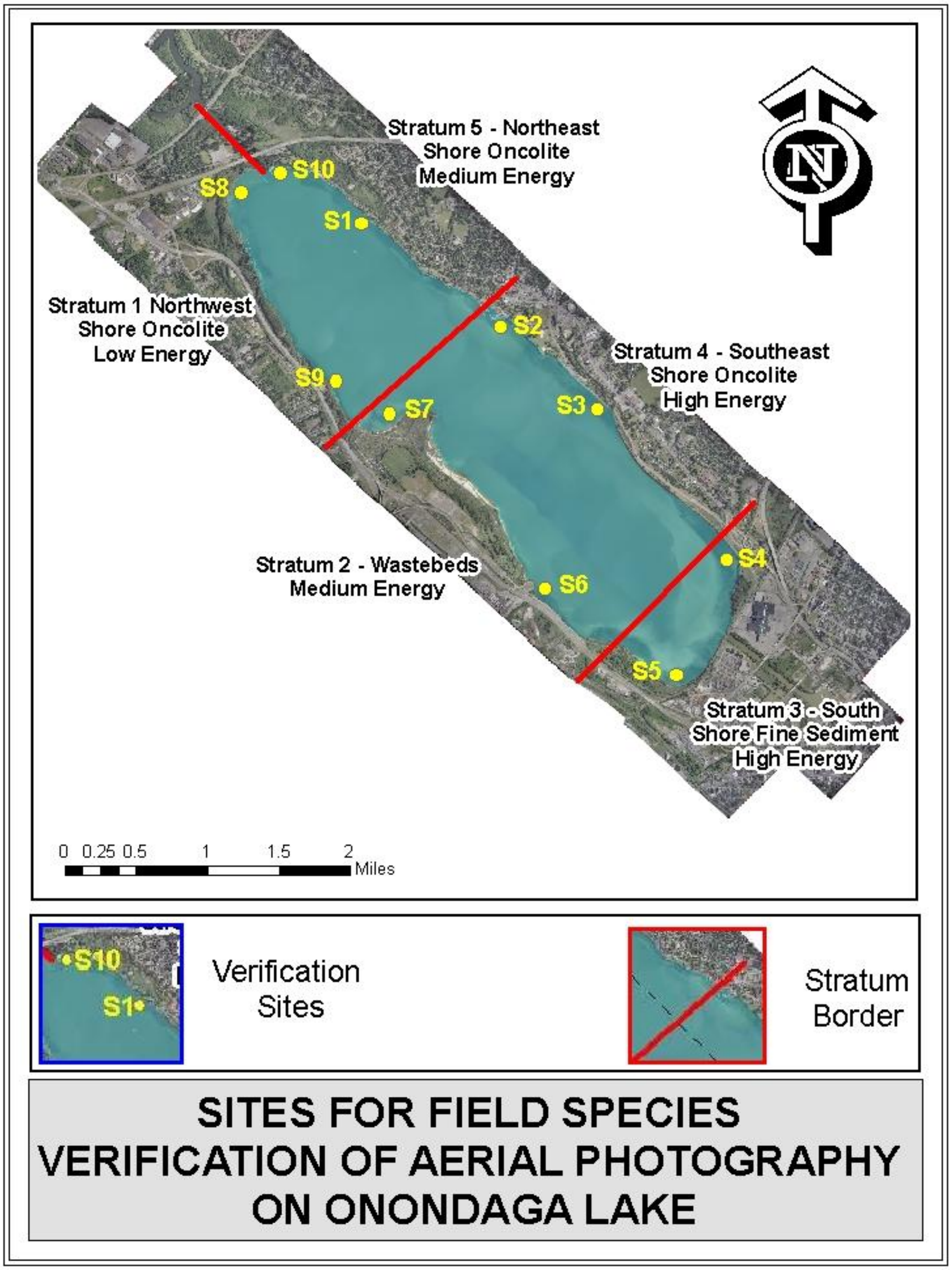
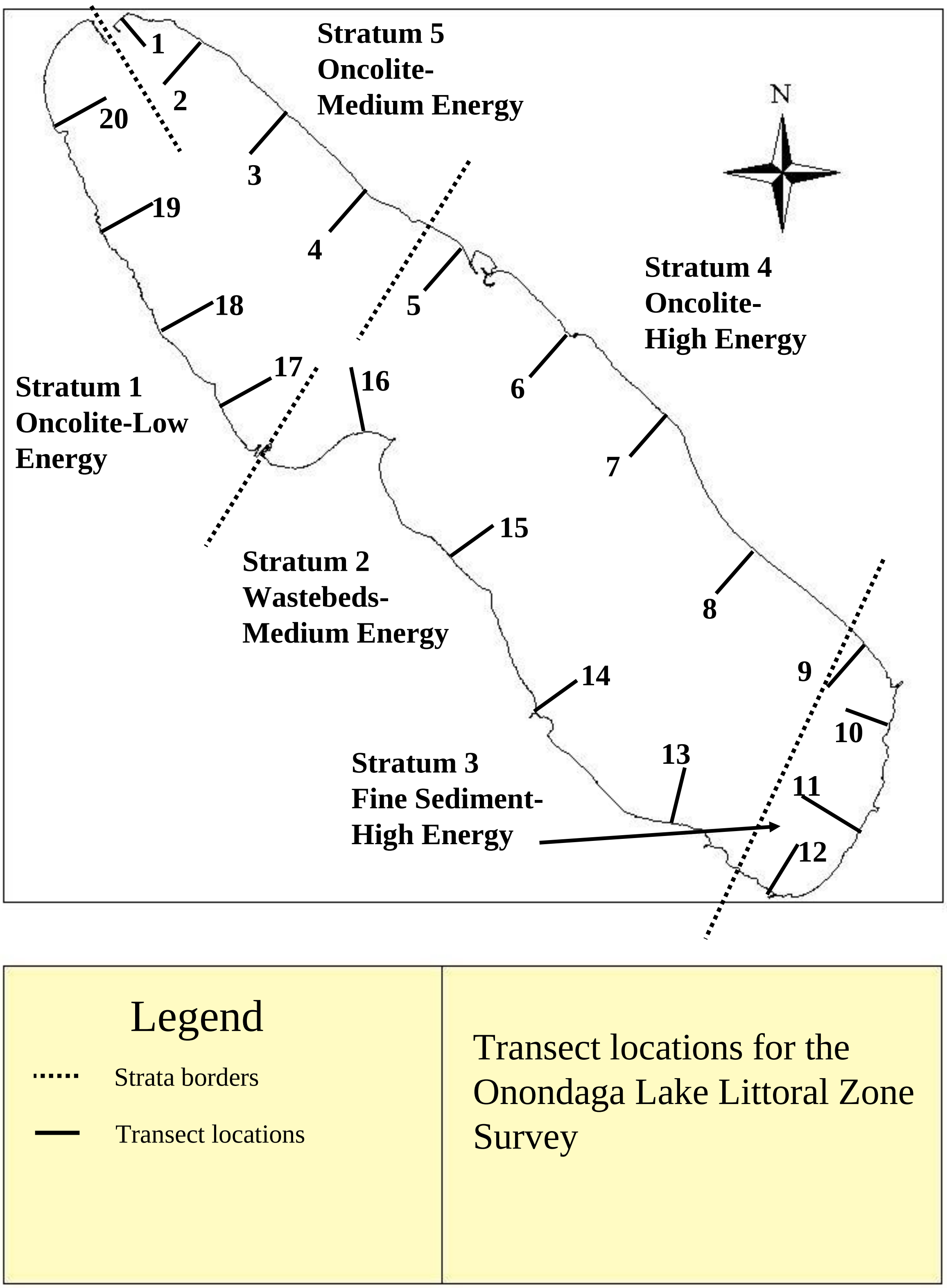


Figure 7.5.3.2 Transect locations for the Onondaga Lake littoral zone survey



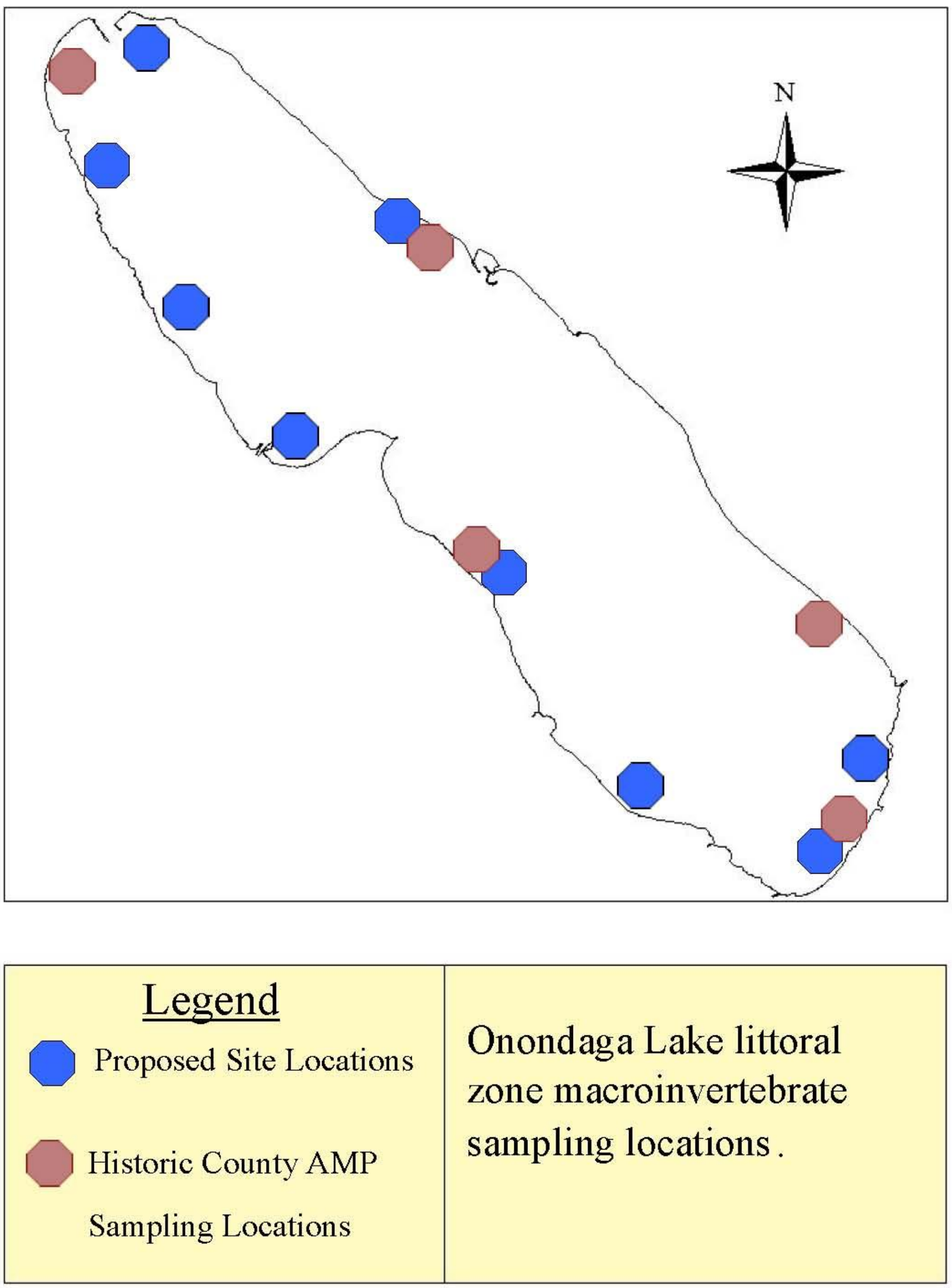
7.5.4 *Lake Benthic Macroinvertebrate Assessment*

Since 2000, lake benthic macroinvertebrates have been assessed every 5 years, with sampling conducted at five littoral zone locations (1 per each of the five strata based on energy and sediment type), with 18 replicates per location. The lake benthic macroinvertebrate sampling will be conducted once during the five-year monitoring program (2015) in coordination with the Honeywell program. WEP field staff could collect, sieve, and sort the samples, and Honeywell could package and ship the samples to the laboratory for species identification similar to the combined efforts conducted in 2008 (Table 7.5.4.1 and Figure 7.5.4.1). The data would be available for both parties.

Table 7.5.4.1 Lake Benthic Macroinvertebrate Assessment Program

Component	Methodology/ Gear	Sampling Objectives	Location and Number of Samples	Timing
Onondaga Lake Littoral Zone Macroinvertebrate Sampling	Petite Ponar Dredge in the littoral zone.	NYSDEC Water Quality Assessment Protocol. HBI - Hilsenhoff Biotic Index. % Oligochaetes.	9 locations At each site 3 replicate petite ponar samples are collected from 1.0-1.5 meters.	June (once in 2015)

Figure 7.5.4.1 Map of Sampling Stations for Onondaga Lake macroinvertebrate sampling. Red locations depict sampling locations used by Onondaga County since 2000 and will be removed from future sampling events. Blue sampling locations depict those currently used by Honeywell to be adopted by Onondaga County.



SECTION 8: Reporting Requirements

This section summarizes the reporting requirements to comply with the ACJ and the ACJ Fourth Stipulation.

8.1 Reporting Exceedances

1. Exceedances of AWQS will be reported to the Regional Water Engineer at NYSDEC following receipt of final analytical data from the laboratory.
2. Exceedances of AWQS at a CSO will also be reported to the Regional Water Engineer at NYSDEC for review and approval prior to conducting the next in-stream water quality sampling event for that CSO. OC could implement a trackdown program immediately and prior to NYSDEC approval.

8.2 Monthly Non-Compliance Report

OC will submit a monthly non-compliance report to NYSDEC and ASLF to include raw analytical data (in excel format) of the monthly tributary sampling event results, with a list of samples that do not comply with the AWQS applicable to those waterbodies sampled. These reports will be transmitted electronically (via e-mail); within 60 days of the sampling event.

8.3 Quarterly Status Report

A quarterly report will be submitted to the Regional Water Engineer at NYSDEC and ASLF on a quarterly basis, to include the raw analytical laboratory results of AMP sampling events conducted in the quarter and will be transmitted electronically (via e-mail) on a quarterly basis - January 1st, April 1st, July 1st, and October 1st of each year.

8.4 Annual AMP Sampling Work Plan

OC will submit an annual AMP sampling work plan to the NYSDEC and ASLF each year for the five-year period. The annual sampling work plan will reflect the findings from the previous year's sampling efforts and any changes in the NYS AWQS or guidance values. Any changes will be implemented following NYSDEC review and approval.

8.5 Annual ACJ Report

The Annual ACJ Report summarizes the County's gray and green projects implemented and an evaluation of the scheduled percent capture requirements for overflows from the combined sewers to satisfy the requirements of the ACJ Fourth Stipulation. In addition to this summary, a summary of the compliance assessment of the annual AMP tributary sampling program will be included. The 2013 Annual ACJ report will be transmitted as hard copy to NYSDEC and ASLF by April 1, 2014.

8.6 Annual AMP Report

Approvable annual AMP reports for 2014-2018 will be submitted by December 1 of the following year as required by the ACJ and will include a comprehensive analysis for determination of compliance with water quality standards for the AMP related sampling events (Onondaga Lake and Onondaga Lake Tributaries). While the AMP is designed to assure compliance with specific requirements in the ACJ, Onondaga County collects and analyzes additional data to meet related program objectives. In some cases, additional data are collected that enable a more integrated analysis of water quality conditions and the response of the biota. Details of how data collected through the AMP are interpreted and reported are presented in Table 8.6.1 (tributaries), Table 8.6.2 (lake), and Table 8.6.3 (biology).

Table 8.6.1 Detailed Reporting of the Tributary Water Quality Monitoring Program

Parameter	Data Analysis and Reporting	Data Interpretation Strategy	Sites	Frequency Sampling Interval	Method
Fecal coliform bacteria	Abundance (colony forming units per 100 mL) Compliance (monthly geometric mean less than 200 cfu/100 mL)	• Potential presence of pathogens • Trends • Compliance with standards • Effectiveness of CSO control measures	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Harbor Brook@Hiawatha Harbor Brook@Velasko Ley Creek@Park Metro effluent Ninemile Creek@Lakeland Bloody Brook@LakePark Sawmill Creek@RecTrail Trib5A Onondaga Lake Outlet	Minimum 5 samples per month (April-October)	Grabs
Total organic carbon (TOC)	Concentration	• Trends • Loads	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Harbor Brook@Hiawatha Harbor Brook@Velasko Ley Creek@Park Metro effluent Ninemile Creek@Lakeland Bloody Brook@LakePark Trib5A Onondaga Lake Outlet	Biweekly and high flow events (January-December)	Depth Integrated Sampling Techniques
Cyanide – Free	Concentration	• Compliance	Ley Creek@Park	Quarterly	Depth Integrated Sampling Techniques

Table 8.6.1 Detailed Reporting of the Tributary Water Quality Monitoring Program

Parameter	Data Analysis and Reporting	Data Interpretation Strategy	Sites	Frequency Sampling Interval	Method
Metals: Cadmium-diss, copper-diss, lead-diss)	Concentration	• Compliance	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Trib5A (Cu-diss and Pb-diss only)	Quarterly	Depth Integrated Sampling Techniques
Metals: Total recoverable mercury (Hg-total), dissolved mercury (Hg-diss)	Concentration	• Compliance (Hg-diss) • Trends	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Harbor Brook@Hiawatha Harbor Brook@Velasko Ley Creek@Park Metro effluent Ninemile Creek@Lakeland Bloody Brook@LakePark Trib5A Onondaga Lake Outlet	Quarterly	Grab
Ca and Na	• Concentration • Hardness	• Compliance (Metals)	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Trib5A	Quarterly	Depth Integrated Sampling Techniques
Chloride (Cl)	Concentration	• Loading • Trends • Conservative tracer	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Harbor Brook@Hiawatha Harbor Brook@Velasko Ley Creek@Park Metro effluent Ninemile Creek@Lakeland Bloody Brook@LakePark Trib5A Onondaga Lake Outlet	Biweekly (January-December)	Depth Integrated Sampling Techniques

Table 8.6.1 Detailed Reporting of the Tributary Water Quality Monitoring Program

Parameter	Data Analysis and Reporting	Data Interpretation Strategy	Sites	Frequency Sampling Interval	Method
Nitrogen: Total kjeldahl nitrogen (TKN), total ammonia (NH_3-N), nitrate (NO_3-N), nitrite (NO_2) Total nitrogen (TN) is calculated as the sum of TKN, NO_3-N and NO_2-N	Concentration	• Trends • Loading • Compliance	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Harbor Brook@Hiawatha Harbor Brook@Velasko Ley Creek@Park Metro effluent Ninemile Creek@Lakeland Bloody Brook@LakePark Trib5A Onondaga Lake Outlet	Biweekly (January-December)	Depth Integrated Sampling Techniques
Phosphorus: Total phosphorus (TP), total dissolved phosphorus (TDP), soluble reactive phosphorus (SRP)	Concentration	• Trends • Loading	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Harbor Brook@Hiawatha Harbor Brook@Velasko Ley Creek@Park Metro effluent Ninemile Creek@Lakeland Bloody Brook@LakePark Trib5A Onondaga Lake Outlet	Biweekly (January-December)	Depth Integrated Sampling Techniques
Solids: Total suspended solids (TSS), total dissolved solids (TDS)	Concentration	• Trends • Loading • Compliance (TDS)	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Harbor Brook@Hiawatha Harbor Brook@Velasko Ley Creek@Park Metro effluent Ninemile Creek@Lakeland Bloody Brook@LakePark Trib5A Onondaga Lake Outlet	Biweekly (January-December)	Depth Integrated Sampling Techniques

Table 8.6.1 Detailed Reporting of the Tributary Water Quality Monitoring Program

Parameter	Data Analysis and Reporting	Data Interpretation Strategy	Sites	Frequency Sampling Interval	Method
			Sawmill Creek@RecTrail - TDS only		
Turbidity	Concentration	• Proxy for TSS	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Harbor Brook@Hiawatha Harbor Brook@Velasko Ley Creek@Park Metro effluent Ninemile Creek@Lakeland Bloody Brook@LakePark Trib5A Onondaga Lake Outlet	Biweekly (January-December)	Depth Integrated Sampling Techniques
Field data: pH, temperature (T), salinity (S), specific conductance (SC), redox potential (ORP), dissolved oxygen (DO)	pH (standard units) T (°C) SC (mS/cm) ORP (mV) DO (mg/L)	• Compliance • Trend analysis • Use attainment (habitat)	Onondaga Creek@Kirkpatrick Onondaga Creek@Dorwin Harbor Brook@Hiawatha Harbor Brook@Velasko Ley Creek@Park Metro effluent Ninemile Creek@Lakeland Bloody Brook@LakePark Sawmill Creek@RecTrail Trib5A Onondaga Lake Outlet	Biweekly, Quarterly (January- December)	In-situ sonde measurements

Table 8.6.1 Detailed Reporting of the Tributary Water Quality Monitoring Program

Parameter	Data Analysis and Reporting	Data Interpretation Strategy	Sites	Frequency Sampling Interval	Method
Sampling in CSO affected tributaries during storm & overflow events: • Bacteria • Floatables • Priority pollutants • Ammonia N • Total N & Total P • In-situ	Concentration	• Compliance • Evaluation of effectiveness of CSO abatement	Sampling will rotate among sites downstream of representative CSOs in Onondaga Creek and Harbor Brook.	As conditions allow: target four overflow events per site, over a two-year period (rotating between sewersheds). High frequency, short duration sampling at transects across the stream.	Combination of depth-integrated samples (VOC collected using special apparatus), grabs, and composite samples.

Table 8.6.2 Detailed Reporting of the Onondaga Lake Water Quality Monitoring Program

Parameter	Data Analysis and Reporting	Data Interpretation Strategy	Sites	Depths	Frequency Sampling Interval	Method
Total alkalinity (ALK-T)	Concentration	• Trends	South Deep North Deep	3 and 15 meters	South Deep: Biweekly (April-December) North Deep: Quarterly	Wildco Beta horizontal sampler/ Churn
Fecal coliform bacteria	• Abundance (colony forming units per 100 mL) • Compliance (monthly geometric mean less than 200 cfu/100 mL)	• Potential presence of pathogens • Trends • Compliance with standards • Effectiveness of CSO control measures	South Deep North Deep Nearshore sites	0 meters	South Deep: 5 samples/month (April - October) North Deep: 5 samples/month (April - October) Nearshore: 5 samples/month (April - October)	Grab sample into sterile bottle
Total inorganic carbon (TIC), total organic carbon (TOC), silica (SiO_2-diss)	Concentration	• Trends	South Deep North Deep	3 meters	South Deep: Biweekly (April - December) North Deep: Quarterly	Peristaltic pump
Metals: Total recoverable mercury (Hg-total), dissolved mercury (Hg-diss), methylmercury (Hg-methyl)	Concentration	• Compliance (Hg-diss) • Trends	South Deep and North Deep	3 and 15 meters	April, August, October	Teflon Dunker Modified USEPA 1669
Chloride (Cl)	Concentration	• Trends • Conservative tracer	South Deep and North Deep	3 and 15 meters	South Deep: Biweekly (April-December)	Submersible pump

Table 8.6.2 Detailed Reporting of the Onondaga Lake Water Quality Monitoring Program

Parameter	Data Analysis and Reporting	Data Interpretation Strategy	Sites	Depths	Frequency Sampling Interval	Method
					North Deep: Quarterly	
Chlorophyll-a (CHLOR-A), Phaeophytin-a (PHAEO-A)	Concentration	• Trends • Trophic state • Magnitude and frequency of blooms	South Deep and North Deep	Upper mixed layer composite	South Deep: Biweekly (April-December) North Deep: Quarterly	¾" Tygon tube sampler (depth-integrated tube samples)
Nitrogen: Total kjeldahl nitrogen (TKN), total ammonia (NH_3-N), nitrate (NO_3-N), nitrite (NO_2) Total nitrogen (TN) is calculated as the sum of TKN, NO_3-N and NO_2-N	Concentration	• Trends • Compliance	South Deep and North Deep	3 and 15 meters	South Deep: Biweekly (April-December) North Deep: Quarterly	Peristaltic pump
Phosphorus: Total phosphorus (TP), total dissolved phosphorus (TDP), soluble reactive phosphorus (SRP)	Concentration	• Trends • Compliance • Trophic status	South Deep and North Deep	0, 3, 6, 9, 12, 15 and 18 meters	South Deep: Biweekly (April-December) North Deep: Quarterly	Peristaltic pump

Table 8.6.2 Detailed Reporting of the Onondaga Lake Water Quality Monitoring Program

Parameter	Data Analysis and Reporting	Data Interpretation Strategy	Sites	Depths	Frequency Sampling Interval	Method
Solids: Total suspended solids (TSS), total dissolved solids (TDS)	Concentration	• Trends • Compliance (TDS)	South Deep and North Deep	3 and 15 meters	South Deep: Biweekly (April-December) North Deep: Quarterly	Peristaltic pump
Turbidity	Nephelometric turbidity units (NTU)	• Proxy for TSS • Measure of water clarity	South Deep and North Deep	3 meters	South Deep: Biweekly (April-December) North Deep: Quarterly	Peristaltic pump
Field data: pH, temperature (T), salinity (S), specific conductance (SC), redox potential (ORP), dissolved oxygen (DO)	• pH (standard units) • T (°C) • SC (mS/cm) • ORP (mV) • DO (mg/L)	• Compliance • Trend analysis • Use attainment (habitat)	South Deep and North Deep	0.5 meter depth intervals throughout the water column	South Deep: Biweekly (April-December) North Deep: Quarterly	YSI multi-probe

Table 8.6.2 Detailed Reporting of the Onondaga Lake Water Quality Monitoring Program

Parameter	Data Analysis and Reporting	Data Interpretation Strategy	Sites	Depths	Frequency Sampling Interval	Method
Field data: pH, temperature (T), specific conductance (SC), dissolved oxygen (DO), chlorophyll-a (Chl-a). turbidity (TURB)	• pH (standard units) • T (°C) • SC (mS/cm) • DO (mg/L) • Chl-a (µg/L) • TURB (NTU)	• Compliance • Trend analysis • Use attainment (habitat)	South Deep	1 meter depth intervals throughout the water column	Daily (April-November)	Honeywell funded buoy outfitted with YSI multi-probes
Secchi disk transparency	• Average Secchi, percent of measurements meeting 1.2 m (nearshore), 1.5 m (South Deep)	• Compliance • Trends • Trophic Status • Indicator of water clarity	South Deep North Deep Nearshore sites	Depth at which the disk is no longer visible from the surface	South Deep: Biweekly (April - December) North Deep: Quarterly Nearshore: Weekly (May - September)	20 cm black and white quadrant disk

Table 8.6.3 Detailed Reporting of the Onondaga Lake and Tributary Biological Monitoring Programs

Parameter	Data Analysis and Reporting	Data Interpretation Strategy	Sites	Depths	Frequency Sampling Interval	Methods
Stream benthic macroinvertebrates (BMI)	NYSDEC biological assessment profile, Hilsenhoff Biotic Index, Percent contribution of oligochaetes	Change from baseline conditions	4 sites in Onondaga Creek; 3 sites in Ley Creek; 2 sites in Harbor Brook		2015 2017	Various methods, most BMI collected using kick screens
Stream characteristics	NRCS visual stream assessment protocol	Change from baseline conditions	27 sites in Onondaga Creek; 9 sites in Ley Creek; 7 sites in Harbor Brook		2017	Visual assessment; kick sampling for inverts; water quality meter
Macrophytes Aerial Photography	Plant Distribution	Percent cover	Entire Lake	To maximum depth of plant growth	Once, 2018 August	Digitize beds from aerial photographs using GIS
Macrophytes Littoral Zone Survey	Species composition, percent cover, biomass maximum depth	Change from baseline conditions	20 line transects	6m	Once in 2018 (as needed)	SCUBA/wading
Fish Nesting Survey	Count, Where possible, identify species	Change over time: lake wide and at five strata used for biological programs	Entire lake divided into 24 sections	1m	Annual, June	Visual Count around littoral zone
Fish Littoral Larvae (seines)	Species Identification Length Frequency Catch per unit effort (CPUE)	• Community Structure • Growth rate, compared to regional lakes and to historical data • Species Richness • Pollution tolerance	15 sites lake wide	Approx. 1 m	Annual, Mid-June Mid-July	Larval Fish Seine 10 m sweep
Fish Littoral Juvenile (seines)	Number and species of juveniles CPUE	• Community Structure • Size/length distribution • Species Richness • Evidence of recruitment • Pollution tolerance	15 sites lake wide	Approx. 1 m	Annual, 2 events between June and September	¼" mesh bag seine sweep
Fish Littoral Adults	Number and species captured CPUE	• Community Structure • Size/length distribution • Species richness • Evidence of recruitment • Pollution tolerance • Index of Biological Integrity	24 sections	<1 m	Annual, September	Night Electrofishing
Fish Deformities, Erosions, Lesions, Tumors, Fungal, and Multiple Anomalies (DELT-FM)	Number and types of anomalies	Change over time	lake wide	All (most are adults captured by electrofishing)	Screening on all captured fish	Visual analysis by trained field teams
Benthic Macro-invertebrates	NYSDEC indices Percent oligochaetes and chironomids Species richness	Change from baseline conditions	9 locations in Littoral Zone	1.0 to 1.5 m	Once, 2014 or 2015 coordinate with Honeywell program	Petite ponar dredge

Onondaga Lake
AMBIENT MONITORING PROGRAM

Five-Year Work Plan
(2014-2018)

APPENDICES 1-3

October 2014

Onondaga County Department of
WATER
ENVIRONMENT
PROTECTION

Onondaga Lake
AMBIENT MONITORING PROGRAM
2014 Work Plan

APPENDIX 1
October 2014

Onondaga County Department of
WATER
ENVIRONMENT
PROTECTION

APPENDIX 1.A
2014 Non-Event Water Quality
Sampling Schedule (September 18, 2014 - March 2015)

DATE/DAY	PROGRAM	EVENT	APPENDIX
September 2014			
September 18/Thursday	Onondaga Lake	Lake Bacteria	1.F
September 22/Monday	Onondaga Lake	Lake Special Weekly	1.F
September 23/Tuesday	Tributary	Tributary Biweekly	1.B
September 25/Thursday	Tributary	Tributary Bacteria	1.B
September 30/Tuesday	Onondaga Lake	Lake South Deep Biweekly	1.E & 1.F
September 25/Thursday	Tributary	Tributary Bacteria	1.B
September 30/Tuesday	Onondaga Lake	Lake South Deep Biweekly (w/Special Weekly)	1.E & 1.F
October 2014			
October 20/Monday	Onondaga Lake	Lake Bacteria	1.F
October 21/Tuesday	Tributary	Tributary Biweekly	1.B
October 23/Thursday	Tributary	Tributary Bacteria	1.B
October 28/Tuesday	Onondaga Lake	Lake Biweekly (w/Special Weekly)	1.E & 1.F
November 2014			
November 4/Tuesday	Tributary	Tributary Quarterly	1.B
November 12/Wednesday	Onondaga Lake	Double Lake Quarterly	1.E
November 18/Tuesday	Tributary	Tributary Biweekly	1.B
November 25/Tuesday	Onondaga Lake	Lake Biweekly	1.E
December 2014			
December 2/Tuesday	Tributary	Tributary Biweekly	1.B
December 9/Tuesday	Onondaga lake	Lake Biweekly	1.E
December 16/Tuesday	Tributary	Tributary Biweekly	1.B
January 2015			
January 6/Tuesday	Tributary	Tributary Biweekly	1.B
January 14/Wednesday	Tributary	Tributary Biweekly	1.B
January 27/Tuesday	Tributary	Tributary Biweekly	1.B
February 2015			
February 10/Tuesday	Tributary	Tributary Biweekly	1.B
February 24/Tuesday	Tributary	Tributary Biweekly	1.B
March 2015			
March 10/Tuesday	Tributary	Tributary Biweekly	1.B
March 24/Tuesday	Tributary	Tributary Biweekly	1.B

APPENDIX 1.A (Continued)
Non-Event Biological
Sampling Schedule (April 2014 - March 2015)

DATE/DAY	PROGRAM	EVENT	APPENDIX
September 2014			
Week of September 21rd [3]	Fish Community	Adult Electrofishing	Appendix I.G

[1] Nesting Survey event occurs once in June dependent upon water temperatures of 15-20°C, clarity, and peak spawning of select gamefish.

[2] Littoral Larval sampling events will begin in June when the water temperatures are 15-20°C; all events are weather dependent.

[3] Electrofishing occurs at night; dependent on weather conditions and water temperatures of 15-20°C; (Tentative back-up dates week of September 28th).

APPENDIX 1.B
2014 Tributary Sampling Program

Sampling site numbers correspond to the following sites:

1	Ninemile Creek at Lakeland (Route 48 @ State Fair Boulevard)
2a	Harbor Brook at Hiawatha Boulevard
2b	Harbor Brook at Velasko Road
3a	Onondaga Creek at Kirkpatrick Street
3b	Onondaga Creek at Dorwin Avenue
4	Ley Creek at Park Street
5	Tributary 5A at State Fair Boulevard[1]
6	Metro Effluent[2]
7	Onondaga Lake Outlet at Long Branch Road - 12 feet (3.66 meters)
8	Bloody Brook at Onondaga Lake Park
9	Sawmill Creek at Onondaga Lake Recreational Trail

PARAMETER/ FREQUENCY	SAMPLING SITE/ FREQUENCY (B-Biweekly and Q-Quarterly)										
	1 (B)	2a (B)	2b (B)	3a (B)	3b (B)	4 (B)	5 (Q)	6 (B)	7 (B)	8 (Q)	9 (Q)
T-Hg, Hg-diss/Quarterly	X	X	X	X	X	X	X	X	X	X	X
Cd-diss, Cu-diss, Pb-diss/(Quarterly), Ca, Mg				X	X		X[3]				
Cyanide-Free/Quarterly						X					
TP, SRP, TDP/Biweekly	X	X	X	X	X	X	X	X	X	X	
TSS, TDS, Cl, TOC, Turbidity/ Biweekly	X	X	X	X	X	X	X	X	X	X	X[4]
TKN, NH_3-N, NO_3-N, NO_2-N, Org-N, TN[5]/Biweekly	X	X	X	X	X	X	X	X	X	X	
Fecal Coliform[6]/ (Minimum 5 samples/month)	X	X	X	X	X	X	X	X		X	X
Floatables (visual observation)		X	X	X	X	X					
In-situ: pH, Temperature, Salinity, Conductivity, Redox Potential, Dissolved Oxygen/ Biweekly	X	X	X	X	X	X	X	X	X	X	X

APPENDIX 1.B (Continued)
2014 Tributary Sampling Program

PARAMETER/ FREQUENCY											
Equipment Blank 1 - Dunker-Churn (Crew A - Biweekly)/ TSS, TOC, NO_2-N, TP, NH_3-N, TKN, Org-N, SRP, TDP, Turbidity											
Equipment Blank 1 - Dunker-Churn (Crew A - Quarterly)/ Cd-diss, Cu-diss, Pb-diss, TSS, TOC, NO_2-N, TP, NH_3-N, TKN, Org-N, SRP, TDP, Turbidity											
Equipment Blank 2 - Churn (Crew B - Biweekly)/ TSS, TOC, NO_2-N, TP, NH_3-N, TKN, Org-N, SRP, TDP, Turbidity											
Equipment Blank 2 - Churn (Crew B - Quarterly)/ TSS, TOC, NO_2-N, TP, NH_3-N, TKN, Org-N, SRP, TDP, CN-Free, Turbidity											
Equipment Blank 3 - Teflon Dunker (Quarterly)/ Hg-Diss, T-Hg											

FOOTNOTES:

[1] Tributary 5A will be flow monitored during the Quarterly Tributary sampling event.

[2] If any flow is bypassed from Metro thru 002 discharge on a tributary sampling date, this water is sampled for the same parameters as all other tributaries.

[3] Cu-diss and Pb-diss only for Tributary 5A at State Fair Boulevard.

[4] TDS only for Sawmill Creek at Onondaga Lake Recreational Trail.

[5] TN (Total Nitrogen) is a calculated value adding the TKN result and the combined NO_2-N and NO_3-N results.

[6] A minimum total of five (5) fecal coliform bacteria samples will be collected each month, during the disinfection period (April-October), at each of the designated tributary sampling sites, to compare results with the NYS Ambient Water Quality Standard for Fecal Coliform bacteria. These include samples collected during the Tributary Biweekly, Quarterly and Tributary Bacteria sampling events scheduled during each month (refer to Appendix A for list of dates). Fecal Coliform bacteria samples are collected just below the water surface (depth <1m), at each of the designated tributary sampling sites.

In addition to these sites, a minimum total of five (5) fecal coliform bacteria samples will be collected each month through October 2014 at each of these sites:

- Harbor Brook @Manhole (at the corner of Waite and Dewey Avenue)
- Harbor Brook @ Floatables Control Facility (upstream side of FCF bridge)
- Harbor Brook @ Hiawatha Boulevard bridge (upstream side of bridge)
- Harbor Brook @ Harbor Brook at State Fair Boulevard bridge (downstream side of bridge)
- Onondaga Creek @ Dickerson Street bridge (downstream side of bridge)
- Onondaga Creek @ Walton Street bridge (upstream side of bridge)

Note: During predetermined high flow conditions, a minimum of 5 sampling events will be conducted per year with a focus on conducting the events during the summer recreational period; high flows are defined as one standard deviation above the long-term monthly mean flow value based on the USGS gage height at Onondaga Creek (Spencer Street site).

APPENDIX 1.C

Representative CSO Outfalls - CSO 003 & 004 (Event 1 and 2)

2014 POST CONSTRUCTION COMPLIANCE MONITORING (PCCM) PROGRAM

Location	Parameter	Fecal Coliform [3]	Nutrients (TN [4] &TP); TDS	In-Situ	Floatables	Priority Pollutants[1]: Metals (except Hg-Diss)	Priority Pollutants[1]: Hg-Diss[5]	Priority Pollutants[1]: Free-Cyanide	Priority Pollutants[1]: Organics
IN-STREAM LOCATION (UPSTREAM OF CSO 003 & 004): Harbor Brook @ MH at the corner of Waite and Dewey Avenue	**Sample Type**	G	G	G	Visual Observation	G	G	G	G
	Cycle								
	Pre-Storm (Cycle 0)	x	x	x	x				
	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x				
	Post-Storm	x	x	x	x				
CSO 003 Outfall (@ Overflow Structure)	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x				
CSO 004 Outfall (@ Manhole Regulator)	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x				

Location	Parameter	Fecal Coliform: Left	Fecal Coliform: Mid	Fecal Coliform: Right	Nutrients: Left	Nutrients: Mid	Nutrients: Right	In-Situ: Left	In-Situ: Mid	In-Situ: Right	Floatables	Metals: Left	Metals: Mid	Metals: Right	Hg-Diss: Left	Hg-Diss: Mid	Hg-Diss: Right	Free-Cyanide: Left	Free-Cyanide: Mid	Free-Cyanide: Right	Organics: Left	Organics: Mid	Organics: Right
IN-STREAM LOCATION (DOWNSTREAM OF CSO OO3 & 004): Harbor Brook @ FCF (upstream side of FCF bridge)	**Transect**	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right		Left	Mid	Right	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right
	Depth	S	S	S	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S	S, M, B	S, M, B	S, M, B	M	M	M	M	M	M	WC	WC	WC
	Sample Type	G	G	G	VC	VC	VC	G	G	G	Visual Observation	VC	VC	VC	G	G	G	G	G	G	DI	DI	DI
	Cycle																						
	Pre-Storm (Cycle 0)	x	x	x	x	x	x	x	x	x	x												
	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x	x	x	x	x	x	x												
	Post-Storm	x	x	x	x	x	x	x	x	x	x												

Location	Parameter	Fecal Coliform	Nutrients	In-Situ	Floatables	Metals	Hg-Diss	Free-Cyanide	Organics
IN-STREAM DOWNSTREAM OF ALL CSOs - Harbor Brook @ Hiawatha Boulevard bridge (downstream side of bridge)	Storm (Cycle 1: 0-1 hour) [2]	x	x		x				
	Storm (Cycle 2: 1-2 hour) [2]	x	x		x				

TRANSECTS/DEPTHS/SAMPLE TYPES:

Transects: Sample will be collected from bridge site at three transects ("Left", "Middle", "Right").

Depths/Sample Types:

"Grab (G)": Sample will be collected as a single grab at a specified depth and analyzed separately.

"Vertical Composite (VC)": Attempt to collect three (3) individual grab samples using a horizontal Kemmerer from each of the three (3) bridge transects at the following depths: near surface "S", mid-depth "M", and near bottom "B" samples; the three (3) individual grab samples will be composited for a single "Vertical Composite" sample for analysis for each of the three (3) transects.

"Depth Integrated (DI)": Samples will be collected using the Stainless Steel "Winkler Bucket" sampling device through the water column ("WC").

FOOTNOTES:

[1] Priority Pollutant samples for Event 2 only.

[2] Total number of "Storm" samples collected during the hourly cycles for the event will be dependent on the duration of CSO overflow.

[3] Fecal Coliform sample (with Total Residual Chlorine) to be collected from just below the water suface ("S") using a Coli sampler.

[4] TN includes TKN, Nitrite-N, Nitrate-N to be analyzed and reported separately.

[5] Hg-Diss samples will be collected as grabs with a "Teflon Dunker."

JS 10/15/14 - revision

APPENDIX 1.C

Lower Harbor Brook Storage Facility - CSO 004A Outfall (Event 1 and 2)

2014 POST CONSTRUCTION COMPLIANCE MONITORING (PCCM) PROGRAM

Location	Parameter	Fecal Coliform [3]			Nutrients (TN [4] &TP); TDS			In-Situ			Floatables	Priority Pollutants [1]											
												Metals (except Hg-Diss)			Hg-Diss [5]			Free-Cyanide			Organics		
IN-STREAM LOCATION (UPSTREAM OF CSO 003 & 004): Harbor Brook @ State Fair Boulevard bridge (downstream side of bridge)	**Sample Type**	G			G			G			Visual Observation	G			G			G			G		
	Cycle																						
	Pre-Storm (Cycle 0)	x			x			x			x												
	Storm (Cycle 1: 0-1 hour) [2]	x			x			x			x	x			x			x			x		
	Storm (Cycle 2: 1-2 hour) [2]	x			x			x			x												
	Post-Storm	x			x			x			x												
Lower Harbor Brook Storage Facility Overflow (CSO 004A Outfall)	Storm (Cycle 1: 0-1 hour) [2]	x			x			x			x	x			x			x			x		
	Storm (Cycle 2: 1-2 hour) [2]	x			x			x			x												
IN-STREAM LOCATION (DOWNSTREAM OF CSO 004A - Lower Harbor Brook Storage Facility): Harbor Brook @ Hiawatha Boulevard bridge (upstream side of bridge)	**Transect**	**Left**	**Mid**	**Right**	**Left**	**Mid**	**Right**	**Left**	**Mid**	**Right**		**Left**	**Mid**	**Right**	**Left**	**Mid**	**Right**	**Left**	**Mid**	**Right**	**Left**	**Mid**	**Right**
	Depth	**S**	**S**	**S**	**S, M, B**	**S, M, B**	**S, M, B**	**S, M, B**	**S, M, B**	**S, M, B**	**S**	**S, M, B**	**S, M, B**	**S, M, B**	**M**	**M**	**M**	**M**	**M**	**M**	**WC**	**WC**	**WC**
	Sample Type	G	G	G	VC	VC	VC	G	G	G	Visual Observation	VC	VC	VC	G	G	G	G	G	G	**DI**	**DI**	**DI**
	Cycle																						
	Pre-Storm (Cycle 0)	x	x	x	x	x	x	x	x	x	x												
	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x	x	x	x	x	x	x												
	Post-Storm	x	x	x	x	x	x	x	x	x	x												
IN-STREAM DOWNSTREAM OF ALL CSOs - Harbor Brook @ Hiawatha Boulevard bridge (downstream side of bridge)	Storm (Cycle 1: 0-1 hour) [2]	x			x						x												
	Storm (Cycle 2: 1-2 hour) [2]	x			x						x												

IN-STREAM DOWNSTREAM OF ALL CSOs - Harbor Brook @ Hiawatha Boulevard bridge

"Grab (G)": Sample will be collected as a single grab at a specified depth and analyzed separately.

"Vertical Composite (VC)": Attempt to collect three (3) individual grab samples using a horizontal Kemmerer from each of the three (3) bridge transects at the following depths: near surface "S", mid-depth "M", and near bottom "B" samples; the three (3) individual grab samples will be composited for a single "Vertical Composite" sample for analysis for each of the three (3) transects.

"Depth Integrated (DI)": Samples will be collected using the Stainless Steel "Winkler Bucket" sampling device through the water column ("WC").

FOOTNOTES:

[1] Priority Pollutant samples for Event 2 only.

[2] Total number of "Storm" samples collected during the hourly cycles for the event will be dependent on the duration of CSO overflow.

[3] Fecal Coliform sample (with Total Residual Chlorine) to be collected from just below the water suface ("S") using a Coli sampler.

[4] TN includes TKN, Nitrite-N, Nitrate-N to be analyzed and reported separately.

[5] Hg-Diss samples will be collected as grabs with a "Teflon Dunker."

APPENDIX 1.C

Representative CSO Outfall - CSO 030 (Event 1 and 2)

2014 POST CONSTRUCTION COMPLIANCE MONITORING (PCCM) PROGRAM

Location	Parameter	Fecal Coliform [3]			Nutrients (TN [4] &TP); TDS			In-Situ			Floatables	Priority Pollutants[1]											
												Metals (except Hg-Diss)			Hg-Diss[5]			Free-Cyanide			Organics		
IN-STREAM LOCATION (UPSTREAM OF CSO 030): Onondaga Creek @ Dickerson Street (upstream side of bridge)	**Transect**	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right		Left	Mid	Right	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right
	Depth	S	S	S	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S	S, M, B	S, M, B	S, M, B	M	M	M	M	M	M	WC	WC	WC
	Sample Type	G	G	G	VC	VC	VC	G	G	G	Visual Observation	VC	VC	VC	G	G	G	G	G	G	DI	DI	DI
	Cycle																						
	Pre-Storm (Cycle 0)	x	x	x	x	x	x	x	x	x	x												
	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x	x	x	x	x	x	x												
	Post-Storm	x	x	x	x	x	x	x	x	x	x												
CSO 030 Outfall (@ Manhole Regulator)	Storm (Cycle 1: 0-1 hour) [2]		x			x			x		x		x			x			x			x	
	Storm (Cycle 2: 1-2 hour) [2]		x			x			x		x												
IN-STREAM LOCATION (DOWNSTREAM OF CSO 030): Onondaga Creek @ Walton Street (upstream side of bridge)	**Transect**	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right		Left	Mid	Right	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right
	Depth	S	S	S	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S	S, M, B	S, M, B	S, M, B	M	M	M	M	M	M	WC	WC	WC
	Sample Type	G	G	G	VC	VC	VC	G	G	G	Visual Observation	VC	VC	VC	G	G	G	G	G	G	DI	DI	DI
	Cycle																						
	Pre-Storm (Cycle 0)	x	x	x	x	x	x	x	x	x	x												
	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x	x	x	x	x	x	x												
	Post-Storm	x	x	x	x	x	x	x	x	x	x												
IN-STREAM DOWNSTREAM OF ALL CSOs - Onondaga Creek @ Hiawatha Boulevard bridge (downstream side of bridge)	Storm (Cycle 2: 1-2 hour) [2]		x			x			x		x												
	Post-Storm		x			x			x		x												

TRANSECTS/DEPTHS/SAMPLE TYPES:

Transects: Sample will be collected from bridge site at three transects ("Left", "Middle", "Right").

Depths/Sample Types:

“Grab (G)”: Sample will be collected as a single grab at a specified depth and analyzed separately.

"Vertical Composite (VC)": Attempt to collect three (3) individual grab samples using a horizontal Kemmerer from each of the three (3) bridge transects at the following depths: near surface "S", mid-depth "M", and near bottom "B" samples; the three (3) individual grab samples will be composited for a single “Vertical Composite” sample for analysis for each of the three (3) transects.

"Depth Integrated (DI)": Samples will be collected using the Stainless Steel "Winkler Bucket" sampling device through the water column ("WC").

FOOTNOTES:

[1] Priority Pollutant samples for Event 2 only.

[2] Total number of "Storm" samples collected during the hourly cycles for the event will be dependent on the duration of CSO overflow.

[3] Fecal Coliform sample (with Total Residual Chlorine) to be collected from just below the water suface ("S") using a Coli sampler.

[4] TN includes TKN, Nitrite-N, Nitrate-N to be analyzed and reported separately.

[5] Hg-Diss samples will be collected as grabs with a "Teflon Dunker."

JS 10/14/14 - revision

APPENDIX 1.C
Clinton Storage Facility - CSO 033A Outfall (Event 1 and 2)
2014 POST CONSTRUCTION COMPLIANCE MONITORING (PCCM) PROGRAM

Location	Parameter	Fecal Coliform [3]			Nutrients (TN [4] &TP); TDS			In-Situ			Floatables	Priority Pollutants[1]											
												Metals (except Hg-Diss)			Hg-Diss[5]			Free-Cyanide			Organics		
IN-STREAM LOCATION (UPSTREAM OF CSO 033A): Onondaga Creek @ Dickerson (downstream side of bridge)	**Transect**	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right		Left	Mid	Right	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right
	Depth	S	S	S	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S	S, M, B	S, M, B	S, M, B	M	M	M	M	M	M	WC	WC	WC
	Sample Type	G	G	G	VC	VC	VC	G	G	G	Visual Observation	VC	VC	VC	G	G	G	G	G	G	DI	DI	DI
	Cycle																						
	Pre-Storm (Cycle 0)	x	x	x	x	x	x	x	x	x	x												
	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x	x	x	x	x	x	x												
	Post-Storm	x	x	x	x	x	x	x	x	x	x												
CSO 033A Storage Facility Outfall	Storm (Cycle 1: 0-1 hour) [2]		x			x			x		x		x			x			x			x	
	Storm (Cycle 2: 1-2 hour) [2]		x			x			x		x												
IN-STREAM LOCATION (DOWNSTREAM OF CSO 033A - Clinton Storage Facility): Onondaga Creek @ Walton Street bridge (upstream side of bridge)	**Transect**	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right		Left	Mid	Right	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right
	Depth	S	S	S	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S	S, M, B	S, M, B	S, M, B	M	M	M	M	M	M	WC	WC	WC
	Sample Type	G	G	G	VC	VC	VC	G	G	G	Visual Observation	VC	VC	VC	G	G	G	G	G	G	DI	DI	DI
	Cycle																						
	Pre-Storm (Cycle 0)	x	x	x	x	x	x	x	x	x	x												
	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x	x	x	x	x	x	x												
	Post-Storm	x	x	x	x	x	x	x	x	x	x												
IN-STREAM DOWNSTREAM OF ALL CSOs - Onondaga Creek @ Hiawatha Boulevard bridge (downstream side of bridge)	Storm (Cycle 2: 1-2 hour) [2]		x			x					x												
	Post-Storm		x			x					x												

TRANSECTS/DEPTHS/SAMPLE TYPES:

Transects: Sample will be collected from bridge site at three transects ("Left", "Middle", "Right").

Depths/Sample Types:

"Grab (G)": Sample will be collected as a single grab at a specified depth and analyzed separately.

"Vertical Composite (VC)": Attempt to collect three (3) individual grab samples using a horizontal Kemmerer from each of the three (3) bridge transects at the following depths: near surface "S", mid-depth "M", and near bottom "B" samples; the three (3) individual grab samples will be composited for a single "Vertical Composite" sample for analysis for each of the three (3) transects.

"Depth Integrated (DI)": Samples will be collected using the Stainless Steel "Winkler Bucket" sampling device through the water column ("WC").

FOOTNOTES:

[1] Priority Pollutant samples for Event 2 only.

[2] Total number of "Storm" samples collected during the hourly cycles for the event will be dependent on the duration of CSO overflow.

[3] Fecal Coliform sample (with Total Residual Chlorine) to be collected from just below the water suface ("S") using a Coli sampler.

[4] TN includes TKN, Nitrite-N, Nitrate-N to be analyzed and reported separately.

[5] Hg-Diss samples will be collected as grabs with a "Teflon Dunker."

JS 9/26/14 - revision

APPENDIX 1.C

Representative CSO 034 Outfall (Event 1 and 2)

2014 POST CONSTRUCTION COMPLIANCE MONITORING (PCCM) PROGRAM

Location	Parameter	Fecal Coliform [3]			Nutrients (TN [4] &TP); TDS			In-Situ			Floatables	Priority Pollutants[1]: Metals (except Hg-Diss)			Priority Pollutants[1]: Hg-Diss[5]			Priority Pollutants[1]: Free-Cyanide			Priority Pollutants[1]: Organics		
IN-STREAM LOCATION (UPSTREAM OF CSO 034): Onondaga Creek @ West Onondaga Street (upstream side of bridge)	**Transect**	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right		Left	Mid	Right	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right
	Depth	S	S	S	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S	S, M, B	S, M, B	S, M, B	M	M	M	M	M	M	WC	WC	WC
	Sample Type	G	G	G	VC	VC	VC	G	G	G	Visual Observation	VC	VC	VC	G	G	G	G	G	G	DI	DI	DI
	Cycle																						
	Pre-Storm (Cycle 0)	x	x	x	x	x	x	x	x	x	x												
	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x	x	x	x	x	x	x												
	Post-Storm	x	x	x	x	x	x	x	x	x	x												
CSO 034 Outfall (@ Manhole Regulator)	Storm (Cycle 1: 0-1 hour) [2]		x			x			x		x		x			x			x			x	
	Storm (Cycle 2: 1-2 hour) [2]		x			x			x		x												
IN-STREAM LOCATION (DOWNSTREAM OF CSO 034): Onondaga Creek @ Dickerson Street (upstream side of bridge)	**Transect**	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right		Left	Mid	Right	Left	Mid	Right	Left	Mid	Right	Left	Mid	Right
	Depth	S	S	S	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S, M, B	S	S, M, B	S, M, B	S, M, B	M	M	M	M	M	M	WC	WC	WC
	Sample Type	G	G	G	VC	VC	VC	G	G	G	Visual Observation	VC	VC	VC	G	G	G	G	G	G	DI	DI	DI
	Cycle																						
	Pre-Storm (Cycle 0)	x	x	x	x	x	x	x	x	x	x												
	Storm (Cycle 1: 0-1 hour) [2]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x
	Storm (Cycle 2: 1-2 hour) [2]	x	x	x	x	x	x	x	x	x	x												
	Post-Storm	x	x	x	x	x	x	x	x	x	x												
IN-STREAM DOWNSTREAM OF ALL CSOs - Onondaga Creek @ Hiawatha Boulevard bridge	Storm (Cycle 2: 1-2 hour) [2]		x			x					x												
	Post-Storm		x			x					x												

TRANSECTS/DEPTHS/SAMPLE TYPES:

Transects: Sample will be collected from bridge site at three transects ("Left", "Middle", "Right").

Depths/Sample Types:

"Grab (G)": Sample will be collected as a single grab at a specified depth and analyzed separately.

"Vertical Composite (VC)": Attempt to collect three (3) individual grab samples using a horizontal Kemmerer from each of the three (3) bridge transects at the following depths: near surface "S", mid-depth "M", and near bottom "B" samples; the three (3) individual grab samples will be composited for a single "Vertical Composite" sample for analysis for each of the three (3) transects.

"Depth Integrated (DI)": Samples will be collected using the Stainless Steel "Winkler Bucket" sampling device through the water column ("WC").

FOOTNOTES:

[1] Priority Pollutant samples for Event 2 only.

[2] Total number of "Storm" samples collected during the hourly cycles for the event will be dependent on the duration of CSO overflow.

[3] Fecal Coliform sample (with Total Residual Chlorine) to be collected from just below the water suface ("S") using a Coli sampler.

[4] TN includes TKN, Nitrite-N, Nitrate-N to be analyzed and reported separately.

[5] Hg-Diss samples will be collected as grabs with a "Teflon Dunker."

JS 9/26/14 - revision

APPENDIX 1.D
Sewer Separation Projects (CSO 022 and 045)
2014 Post Construction Monitoring Program

Location	Parameters	Frequency
CSO 022		
In-stream sampling location upstream of CSO 022 outfall - Onondaga Creek @ Water Street Bridge	Fecal Coliform, Total Suspended Solids, Turbidity, dissolved oxygen, and Floatables	Minimum of 4 samples per year during storm events to confirm effectiveness of sewer separation
CSO 022 outfall – Wallace & West Genesee Street	Fecal Coliform, Total Suspended Solids, Turbidity, dissolved oxygen, and Floatables	Minimum of 4 samples per year during storm events to confirm effectiveness of sewer separation
In-stream sampling location downstream of CSO 022 Outfall - Onondaga Creek @ West Genesee Street	Fecal Coliform, Total Suspended Solids, Turbidity, dissolved oxygen, and Floatables	Minimum of 4 samples per year during storm events to confirm effectiveness of sewer separation
CSO 045		
In-stream sampling location - Upstream of CSO 045 Outfall - Onondaga Creek @ Rich Street Bridge	Fecal Coliform, Total Suspended Solids, Turbidity, dissolved oxygen, and Floatables	Minimum of 4 samples per year during storm events to confirm effectiveness of sewer separation
CSO 045 outfall - West Castle & Hudson Street	Fecal Coliform, Total Suspended Solids, Turbidity, dissolved oxygen, and Floatables	Minimum of 4 samples per year during storm events to confirm effectiveness of sewer separation
In-stream sampling location - Downstream of CSO 045 Outfall - Onondaga Creek @ South Avenue	Fecal Coliform, Total Suspended Solids, Turbidity, dissolved oxygen, and Floatables	Minimum of 4 samples per year during storm events to confirm effectiveness of sewer separation

APPENDIX 1.E
2014 Onondaga Lake
Annual Sampling Program

	DEPTH, METERS							
PARAMETER	**0**	**3**	**6**	**9**	**12**	**15**	**18**	**FREQUENCY[1]**
Hg (Total[2], Diss, Methyl)		X					X	April (pre-stratification), August (stratification), and October (post-turnover)
Cl		X				X		Biweekly
TSS, TDS		X				X		Biweekly
SiO_2-diss, TOC		X						Biweekly
TIC		X						Biweekly
Turbidity		X						Biweekly
TP, SRP, TDP	X	X	X	X	X	X	X	Biweekly
NO_3-N, NO_2-N		X				X	X	Biweekly
TKN, NH_3-N, Org-N, F-TKN		X				X		Biweekly
ALK-T		X				X		Biweekly
Fecal Coliform [3]	X							Biweekly
Chlor-*a*[4], Phaeo-*a*	Tube Composite							Biweekly
Temperature, pH, Salinity, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential	Measured every half-meter from 0- to 18-meter depth							Biweekly
Secchi Disk Transparency	Recorded at each site							Biweekly
Phytoplankton[5]	Tube Composite							Biweekly
Zooplankton[6]	X			X				

APPENDIX 1.E (Continued) 2014 Onondaga Lake Annual Sampling Program		
Equipment Blank 1 – Pump Turbidity, TSS, SiO2-diss, TOC, TP, SRP, TDP, TKN, NH3-N, Org-N, F-TKN		Biweekly

[1] Samples are taken at the South Deep Station, which is representative of the lake conditions.
Additional quarterly sampling is conducted at the North Deep Station (during Double Lake sampling events for the following parameters: Total Phosphorus (0m, 3m, 6m, 9m, 12m, 15m and 18m), Chlorophyll-a (Tube Composite 0-3m), Secchi disk, and YSI in-situ data (at 0.5m increments).

[2] Hg - Includes ultra-low-level Hg samples for Total, Dissolved and Methyl Mercury analysis. A duplicate sample will be collected at the 18m depth during each sampling event. Also, a separate equipment rinsate blank will be collected for analysis.

[3] Bacteria samples collected just below the water surface (depth <1m).

[4] The Chlorophyll-*a* tube composite sample has been standardized to a depth of 0-3m year round.

[5] Phytoplankton tube composite sample has been standardized to a depth of 0-3m year round.
Frequency of Phytoplankton samples at the South Deep station: biweekly from April - November.

[6] Zooplankton will be collected with a flowmeter attached to the net to quantify the volume of water filtered at the following depths:
- i) a 15 meter net haul will be collected during each event; and in addition
- ii) a 6 meter vertical net haul will be collected only during the thermally stratified period (June - September)
  Note: For additional flowmeter details, refer to Appendix 2 (Quality Assurance Program Plan for the 2014 Water Quality Monitoring Program).
  Frequency of Zooplankton samples at the South Deep station will be biweekly from April - November.

APPENDIX 1.F
2014 Onondaga Lake
Special Weekly Sampling Program

PARAMETERS	FREQUENCY	LOCATIONS
Fecal Coliform[1] Turbidity Secchi Disk Transparency Temperature	Weekly sampling: April 1 - October 30 Bacteria sampling: Minimum 5 x month	Onondaga Lake (Nearshore sites)[2] GPS Coordinates: Site 1 - Ninemile Creek 43° 05.477' N; 76° 13.650' W Site 2 - Harbor Brook 43° 03.877' N; 76° 11.043' W Site 3 - Metro 43° 03.937' N;76° 10.931' W Site 4 - Ley Creek 43° 04.407' N; 76° 10.768' W Site 5 - Eastside 43° 06.529' N; 76° 13.598' W Site 6 - Willow Bay 43° 06.873' N; 76° 14.156' W Site 7 - Maple Bay 43° 06.732' N; 76° 14.713' W Site 8 - Bloody Brook 43° 05.720' N; 76° 12.225' W Site 9 - Wastebeds 43° 04.880' N; 76° 12.620'W Site 12 - Onondaga Creek 43° 04.087' N; 76° 10.731'W
Fecal Coliform[1] Turbidity Secchi Disk Transparency In-situ field data (measured every half-meter from 0- to 18-meter depth): pH, Temperature, Salinity, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential	Weekly sampling: April 1 - October 30 Bacteria sampling: Minimum 5 x month	Onondaga Lake South Deep station - Site 10 43° 04.670' N 76° 11.880' W
Fecal Coliform[1] Turbidity Secchi Disk Transparency In-situ field data (measured every half-meter from 0- to 18-meter depth): pH, Temperature, Salinity, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential	Weekly sampling: April 1 - October 30 Bacteria sampling: Minimum 5 x month	Onondaga Lake North Deep station - Site 11 43° 05.930' N 76° 13.730' W

1 Fecal Coliform only for the bacteria sampling events at the nearshore, South & North Deep stations.

2 The nearshore sampling stations are standardized to water depths of 4-5 feet of water. Bacteria samples collected from just below the water surface (<1m).

NOTE: Special Weekly sampling program: Sampling on a weekly basis for the ten (10) lake near shore, South and North Deep stations for the parameters Fecal Coliform, Turbidity, Secchi Disk Transparency, and Temperature.

Bacteria sampling program: Sampling conducted to supplement the four (4) Special Weekly bacteria samples in order to collect a minimum of five (5) Fecal Coliform samples per month at each of the ten(10) lake nearshore, South and North Deep stations, to allow for compliance assessment with the AWQS.

APPENDIX 1.G
2014 Onondaga Lake
Fish Community Sampling Program

Component	Methodology/Gear	Location and Number of Samples	Frequency/ Timing
Littoral Larvae	Larval fish seine swept for 10 m in littoral zone	- 5 strata with 3 sites in each strata and 1 sweep at each site. - No. of Sites = 15 - Total No. of events = 2 - Total No. of samples = 30	- Annually - Daytime Twice per year - Mid-June - Mid-July
Juvenile Fish	50' x 4' x 1/4" bag seine swept into shore in the littoral zone.	- 5 strata with 3 sites in each strata and 1 sweep at each site. - No. of Sites = 15 - Total No. of events = 2 - Total No. of samples = 30	- Annually - Daytime - Twice per year - Mid-August - Mid-September
Juvenile Fish (boat electrofishing)	Boat mounted electrofisher in the littoral zone at night.	- Entire perimeter of lake shocked in 24 contiguous transects. - Total No. of events = 1 - Total No. of samples = 24	- Annually - Night-time - Once in the fall when water temp. between 15° and 20 °C.
Nesting Fish	Lake wide nest survey.	- Entire perimeter of lake divided into 24 equal length sections. - Total No. of events = 1 - Total No. of samples = 24	- Once in June when water temperature is between 15° and 20 °C.
Adult Fish-Littoral Zone	Boat mounted electrofisher in the littoral zone at night.	- Entire perimeter of lake shocked in 24 contiguous transects. - Alternating all-fish/gamefish transects. - Total No. of events = 2 - Total No. of samples = 48	-Night-time. -Twice per year; Spring and Fall. -Spring and Fall. - Water temp. between 15º and 21 ºC.

APPENDIX 2

QUALITY ASSURANCE PROGRAM PLAN
FOR THE
2014 WATER QUALITY MONITORING PROGRAM

AMBIENT MONITORING PROGRAM

October 2014

Prepared for the NYSDEC

by:

Onondaga County
Department of Water Environment Protection

TABLE OF CONTENTS

I. TECHNICAL DESIGN

A. INTRODUCTION

The Onondaga County Department of Water Environment Protection (OCDWEP) has monitored the water quality of Onondaga Lake and its tributaries since 1970.

Refer to Appendix A Year 2013 Water Quality Program-Ambient Monitoring Program (non-event sampling schedule).

Water samples for analysis will be collected and analyzed according to EPA requirements for Water Planning and Management (40 CFR 136, 1991 or latest version) and EPA 600/4-82-029. Sampling and analysis will be consistent with New York State's Environmental Laboratory Approval Program (ELAP). The OCDWEP Environmental Laboratory is certified by New York State (ELAP #10191) and the National Environmental Laboratory Accreditation Conference (NELAC).

B. ONONDAGA LAKE

Onondaga Lake will be sampled from April through November 2013, according to the calendar included in Appendix A Year 2013 Ambient Monitoring Program (non-event sampling schedule). The parameters to be sampled and their schedules are also detailed. Samples will be collected from the locations identified as "South Deep" and "North Deep" stations.

The exact sampling location will be at the mooring buoys deployed at the South and North Deep stations as listed below.

The coordinates of the monitoring stations are as follows:

South Deep:	43° 04.670' N	Latitude
	76° 11.880' W	Longitude
North Deep:	43° 05.930' N	Latitude
	76° 13.730' W	Longitude

Studies have shown that sampling from these basins will reflect the condition of the remainder of the lake.

In-situ data for pH, Dissolved Oxygen (DO), Temperature, Specific Conductance, and Oxidation-Reduction Potential (ORP) will be collected at half-meter intervals throughout the water column using either a YSI 600 or a YSI 6600 in-situ monitoring sonde. Calibration and instrument calibration drift checks will be conducted before and after each sampling event.

Samples will be collected using a submersible pump and a Wildco Horizontal Beta sampler, depending on the sample parameter. However, samples of bacteria will be collected in sterile containers. When pumping, sufficient time will be allowed in order to evacuate the pump lines of all previous samples. In addition, all sample containers will be rinsed with sample water, unless they are pre-preserved. All sampling equipment used on Onondaga Lake is dedicated for this purpose only.

Other field data to be collected include Secchi disk transparency. In addition to the above, OCDWEP partially funds the gauging stations on Onondaga Lake and its tributaries in conjunction with the United States Geological Survey. Flow data are used to calculate loading rates.

C. TRIBUTARIES

Onondaga Lake tributaries are sampled throughout the year, according to the calendar included as Appendix 1 2014 Ambient Monitoring Program (non-event sampling schedule). The parameters to be sampled and their schedules are detailed in Appendix C Year 2013 Ambient Monitoring Program (Tributary Sampling Program).

In-situ data for pH, Dissolved Oxygen, Temperature, Specific Conductance, and Oxidation-Reduction Potential will be collected using a YSI sonde. Calibration and calibration drift checks will be conducted before and after each sampling event.

Tributary samples will be collected using the stainless steel pail blank from just below the water surface and in the center channel of the stream. A vertical Kemmerer Bottle sampler will be used at the Onondaga Lake Outlet monitoring site. Samplers and sample containers are rinsed prior to dispensing sample water for analysis into the sample containers. Bacteria samples will be collected in sterile containers. All sampling equipment used on the tributaries is dedicated for this purpose. Stage gauge measurements will be taken to record the water surface elevation during each sampling event.

D. DATA VALIDATION

1. Results of laboratory analyses are submitted to the program team members within four weeks of collection.

Interim product: monthly data summaries (paper and diskette) will be compiled with codes flagging any limitations to data usability identified during the data validation process. Data validation will occur within four weeks of receipt of laboratory data.

E. FIELD SAMPLE COLLECTION & PRESERVATION

A. Field sampling techniques are consistent with those described in the following U.S. Government publications:

   1. EPA 600/4-82-029 (September 1982)

   2. 40 CFR 136 (March 1991)

   3. EPA 821-R-95-034 (Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Criteria Levels).

B. Field QC consists of replicates and equipment rinsate blanks as specified in ELAP protocol.

C. Sample preservation requirements:

Due to the variety of possible sample types, only generalizations can be made. Preservatives are added in compliance with the analytical protocols (reference Attachment C – Analytical Methodologies). Analysis begins as soon as possible. A complete chain-of-custody record is maintained on each sample to provide a history of sample handling from collection to analysis.

Table 1 indicates the criteria for sample collection and preservation. All samples are aqueous.

TABLE 1 - SAMPLE COLLECTION AND PRESERVATION				
ANALYTE	**VOLUME**	**CONTAINER**	**PRESERVATION**	**MAXIMUM HOLDING TIME**
Biological				
Coli, Fecal	125 mL	P	Cool ≤6° C	8 Hrs.*
Chlorophyll *a*	2000 mL	P	Cool ≤6° C	After Filtration (frozen 28 days)
Phaeophytin *a*	2000 mL	P	Cool ≤6° C	
Phytoplankton	500 mL	P	Lugol's solution, Cool ≤6° C	
Zooplankton	1000 mL	P	Ethanol (70% by Volume), Cool ≤6° C	
Inorganic Tests				
Biochemical Oxygen Demand	1/2 Gallon	P	Cool ≤6° C	48 Hrs.
Cyanide, Free	1000 mL	P	Cool ≤6° C, NaOH to pH > 12, 0.6g ascorbic acid	14 Days
Kjeldahl and Organic Nitrogen	1000 mL	P	Cool ≤6° C, H_2SO_4 to pH < 2	28 Days
Ammonia-N	1000 mL	P	Cool ≤6° C, H_2SO_4 to pH < 2	28 Days
Total Phosphorus	1000 mL	P	Cool ≤6° C, H_2SO_4 to pH < 2	28 Days
Soluble Reactive Phosphorus	125 mL	P	Filter and Cool ≤6° C	48 Hrs.
Total Dissolved Phosphorus	125 mL	P	Filter and Cool ≤6° C, H_2SO_4 to pH < 2	28 days
All Metals				
Arsenic	1000 mL	P	HNO_3 to pH<2	6 Months
Cadmium	1000 mL	P	HNO_3 to pH<2	6 Months
Calcium	1000 mL	P	HNO_3 to pH<2	6 Months
Chromium (GFA)	1000 mL	P	HNO_3 to pH<2	6 Months
Copper	1000 mL	P	HNO_3 to pH<2	6 Months
Iron	1000 mL	P	HNO_3 to pH<2	6 Months
Lead (GFA)	1000 mL	P	HNO_3 to pH<2	6 Months
Magnesium	1000 mL	P	HNO_3 to pH<2	6 Months
Manganese	1000 mL	P	HNO_3 to pH<2	6 Months
Nickel	1000 mL	P	HNO_3 to pH<2	6 Months
Potassium	1000 mL	P	HNO_3 to pH<2	6 Months

TABLE 1 - SAMPLE COLLECTION AND PRESERVATION
(Continued)

ANALYTE	VOLUME	CONTAINER	PRESERVATION	MAXIMUM HOLDING TIME
Sodium	1000 mL	P	HNO_3 to pH<2	6 Months
Selenium	1000 mL	P	HNO_3 to pH<2	6 Months
Zinc	1000 mL	P	HNO_3 to pH<2	6 Months
Mercury	1000 mL	P	HNO_3 to pH<2	28 Days
Mercury – Low Level	250 mL	G	1% HCl to pH<2	28 Days
Organic Carbon, Total	1/2 Gallon	P	Analyze within 24 hours or Cool ≤6^{o}C H_2SO_4 to pH < 2	28 Days
Organic Carbon, Filtered Total	1/2 Gallon	P	Analyze within 24 hours or Cool ≤6^{o}C H_2SO_4 to pH < 2	28 Days
Inorganic Carbon, Total	1/2 Gallon	P	Cool ≤6^{o}C	48 Hours
Phenols	1000 mL	G	Cool ≤6^{o}C, H_2SO_4 to pH < 2	28 Days
Solids, Total Suspended	1/2 Gallon	P	Cool ≤6^{o}C	7 Days
Solids, Total Volatile	1/2 Gallon	P	Cool ≤6^{o}C	7 Days
Solids, Total Suspended	1/2 Gallon	P	Cool ≤6^{o}C	7 Days
Volatile	1/2 Gallon	P	Cool ≤6^{o}C	7 Days
Solids, Total Dissolved	1/2 Gallon	P	Cool ≤6^{o}C	7 Days
Silica - Dissolved	1/2 Gallon	P	Cool ≤6^{o}C	28 Days
Sulfate	1/2 Gallon	P	Cool ≤6^{o}C	28 Days
Sulfide	300 mL	G	Cool ≤6^{o}C add zinc acetate plus sodium hydroxide to pH > 9	7 Days
Specials				
T-Alkalinity	500 mL	P	Cool ≤6^{o}C (no air bubbles present)	14 Days

All samples are aqueous.
Containers: P = Plastic; G = Glass

*Fecal Coliform: Sample analysis should begin immediately, preferably with 2 hours of collection. The maximum transport time to the laboratory is 6 hours, and samples should be processed within 2 hours of receipt at the laboratory.

II. FIELD SAMPLING PROCEDURES

A. ONONDAGA LAKE

1. Mercury

i. Special samples for Total, Dissolved and Methyl Mercury will be collected at 3m and 18m depths in 500-ml Teflon bottles using the "clean hands-dirty hands" technique for sample collection. The Teflon® Dunker used shall be pre-cleaned and stored in accordance with the procedures contained in the OCDWEP SOP titled "Onondaga Lake Sampling Preparation", document number 00077. Use of the Teflon® Dunker will be in accordance with the procedures contained in the OCDWEP SOP titled "Onondaga Lake Sampling Methodology", document number 00085. The dirty hands sampling technician will be responsible for handling the Teflon® Dunker and pouring the sample. The clean hands sampling technician shall only touch the sample container and cap.

ii. A separate equipment rinsate blank for the Teflon Kemmerer Water Sampler will be collected for special low-level mercury analysis.

iii. A field blank will also be collected at the sampling site, prior to sample collection. This will consist of reagent water, supplied by the contract laboratory, processed through the sampling device.

iv. The analysis of samples for the determination of Total Mercury will be achieved by Cold Vapor Atomic Fluorescence (CVAFS) Spectrometry. The methodology is described by Fitzgerald and Gill (1979), Bloom and Crecelius (1983), Gill and Fitzgerald (1985); Bloom and Fitzgerald (1988), Method 1631 (USEPA, 1995).

2. Conventionals

i. "Conventional" discrete samples are collected at 3m, and 15m depths using a submersible pump.

ii. The pump is allowed to flow freely for a minimum of two minutes prior to filling sample bottles in order to evacuate the hoses of all previous samples. Sample bottles are also rinsed with lake water collected from the appropriate depth prior to filling.

iii. One gallon plastic or gallon sample bottles are filled to the shoulder and then cooled to ≤6^{o}C (no further preservation is required). Note: TOC & TOC-F are taken from NP bottle.

iv. "Conventional" parameters include:

TS, TSS, TDS, SiO_2-diss, TOC, TIC, Turbidity, NO_2-N, NO_3 -N, Cl, $SO_{4.}$

3. TKN, NH_3-N & TP

i. Samples are collected in one liter disposable plastic bottles from 0m, 3m, 6m, 9m, 12m, 15m, and 18m depths. Samples are collected via the submersible pump, in a manner consistent with that described above for "conventionals."

ii. Determine Cl_2 residual with a LaMotte Test Kit. If Cl_2 residual is measured, add 30% Sodium Thiosulfate drop-wise; 1 drop/1 ppm Cl_2, then add 1 drop excess.

iii. Preservation: Adjust pH < 2 with H_2SO_4, cool to ≤6 °C.

    Example: Cl_2 measures 2.5 ppm - add 4 drops Sodium Thiosulfate - then H_2SO_4 to pH 1.5 - 2.0.

iv. Org-N results are calculated by subtracting the results of analyses of samples for Total Kjeldahl Nitrogen (TKN) and Ammonia Nitrogen (NH_3-N).

v. This sample will also be analyzed for Total Phosphorus (TP).

4. Soluble Reactive Phosphorus (SRP)

i. SRP samples are collected at 0m, 3m, 6m, 9m, 12m, 15m, 18m depths using a submersible pump.

ii. The pump is allowed to flow freely for a minimum of two minutes prior to filling sample bottles in order to evacuate the hoses of all previous samples. Sample bottles are also rinsed with lake water at the appropriate depth prior to filling.

iii. The sample will be filtered on site.

iv. Collect sample in a new disposable container.

v. Place a previously washed 0.45-micron filter into filter apparatus.

vi. Filter sample into the SRP container (250-ml plastic disposable) leaving a small airspace.

vii. Discard filter and rinse apparatus.

    NOTE: When sample turbidity prevents using one filter to fill container; remove clogged filter, replace with another washed filter and continue filtration. Under extreme conditions of algal density (i.e., when filter clogs yielding less than 20 ml filtrate) sample may be pre-filtered using a washed glass-microfiber filter, and filtered into a clean container before final filtration with a 0.45 micron filter.

viii. The 250-ml plastic disposable sample bottles are then cooled to ≤6°C (no further preservation is required).

5. Total Dissolved Phosphorus (TDP)

i. TDP samples are collected at 0m, 3m, 6m, 9m, 12m, 15m, 18m depths using a submersible pump.

ii. The pump is allowed to flow freely for a minimum of two minutes prior to filling sample bottles in order to evacuate the hoses of all previous samples. Sample bottles are also rinsed with lake water at the appropriate depth prior to filling.

iii. The sample will be filtered on site.

iv. Collect sample in new disposable container.

v. Place a previously washed 0.45-micron filter into filter apparatus.

vi. Filter sample into the TDP container (250-ml plastic disposable) leaving a small airspace.

vii. Discard filter and rinse apparatus.

NOTE: When sample turbidity prevents using one filter to fill container; remove clogged filter, replace with another washed filter and continue filtration. Under extreme conditions of algal density (i.e., when filter clogs yielding less than 20 ml filtrate), sample may be pre-filtered using a washed glass-microfiber filter, and filtered into a clean container before final filtration with a 0.45 micron filter.

viii. Preservation: Adjust pH < 2 with H_2SO_4.

ix. The 250-ml plastic disposable sample bottles are then cooled to ≤6^oC.

6. Chlorophyll-*a*

i. Chlorophyll-*a* samples are collected as depth-integrated tube samples through the standard depth of 0-3m of the water column year round. A 3/4" tygon tubing is used as the sample collection device.

ii. Samples are analyzed for chlorophyll-*a* and phaeophytin-*a* content.

Equipment Requirements: 3/4" Tygon Tube compositing apparatus
Chlorophyll Bottle
YSI Unit
Secchi disc

Bottle Requirements: (1) 2 liter Amber Bottle

iii. Lower the tube sampler to the 3m depth (Step 1). Place a stopper in the end of the tube (Step 2). Rinse the sample bottle with the sample water and pour out (Step 3). Repeat Steps 1 and 2 pull the tube from the water and pour the entire tube contents into the dedicated carboy. Repeat tube composites until sufficient volume is collected. Use only a full tube composite. Thoroughly mix sample prior to pouring off into container.

7. Zooplankton (Net Haul)

i. A net haul sample is obtained for zooplankton analysis.

Equipment Requirements:	0.5 Meter Wildco Beta Plankton Net with 80 um mesh 80 um sieve and Mechanical flowmeter (RIGO Type 5571-A)
Bottle Requirements:	(1) 1000-ml bottle (2) 500 ml containers of 95% Ethanol/Alka-Seltzer

Collect samples as follows: 0-15 Meters (during each event)
0-6 Meters (during the thermally stratified period)

ii. Record the flowmeter dials, and place the net into the water to allow the sample bucket to fill with water. Allow the net to sink to a depth of 15 meters. Draw the net to the surface at a rate of 0.5 meter per second or less and record the final flowmeter dials. Carefully wash all the residual sample clinging to the net into the quick disconnect bucket. Filter as much water as possible. Pour the entire sample into the 80 um sieve and filter further until you have a slurry of sample. Pour the entire sample into the 1000-ml plastic jar and rinse any residual into the jar with wash bottle. Place a quarter tablet of Alka-Seltzer into the jar and wait for zooplankton movement to stop. Add 70% by volume of 95% reagent grade non-denatured ethanol. (More ethanol is better.) Example: 150-ml sample requires 350-ml ethanol. The same procedure should be followed for the sample to be collected at the 6 meter depth. Record the depth and flowmeter reading on the chain of custody form.

An "efficiency" reading will be recorded two times per year. This will entail performing a vertical tow with a netless ring and flowmeter at a known depth (Note: a netless ring will be kept in the boat at all times). This will also ensure that the depth being sampled is accurately being sampled by the net tow. Extreme caution should be used for samples collected during conditions of strong winds and high current, to minimize the error in the flowmeter readings and to prevent the net from floating to the surface.

Refer to the flowmeter Standard Operating Procedure (SOP) for flowmeter operation and calibration checks.

Note: The UML composite depth shall be determined by the temperature profile.

8. Phytoplankton

i. Phytoplankton samples are obtained by OCDWEP for analysis.

Equipment Requirements: (1) 500 ml Bottle
Dedicated Carboy
3/4” Tygon Tube
Secchi Disk
YSI Unit

Sampling Requirements: 0-3 meter Composite

ii. Record a Secchi Disk Reading.

iii. The composite sample is collected using the tube composite sampler from 0-3 meters in the water column.

iv. Preserve the samples with enough Lugols Solution to turn the sample iodine color (maroon in Color), approximately 5 to 7 mls. per 100-mls of sample.

9. T-Alk

i. T-Alk samples are to be analyzed for Total Alkalinity as $CaCO_3$.

ii. T-Alk samples are collected at the 3m and 15m sample depths.

iii. T-Alk samples are poured-off from the churn into a rinsed 500-ml plastic bottle. The bottle is carefully stopped in order to exclude air and then cooled to $\leq 6^{o}$C.

10. Fecal Coliform

i. A Fecal Coliform sample is collected at just below the water surface (depth <1m). Two sterile 125-ml plastic containers will be used.

The first container will be filled from the source (just below the water surface, depth <1m). The second container (disposable), pre-preserved with Sodium Thiosulfate crystals will be filled from the first container leaving a small airspace to enable the sample to be shaken, and then cooled to ≤6°C. This is the sample to be delivered to the laboratory for analysis. Samples will be checked for residual chlorine using a LaMotte “DPD Chlorine Test Kit.”
******Sample volumes for this parameter are crucial. Fill the bottle to just above the shoulder of the bottle leaving a small (approximately 2.5 cm) airspace to enable sample to be shaken. Do not allow the water to rise above the threads of the bottle. Sample will be analyzed for Fecal Coliform.***

B. ONONDAGA LAKE TRIBUTARIES

The procedures used for the collection of samples from Onondaga Lake Tributaries are as follows:

1. All samples will be collected as grabs, using a stainless steel pail just below the water surface, in the middle of the stream.

2. The Onondaga Lake Outlet is sampled at 12 feet (3.7m) depth using the Kemmerer tube-sampling device from mid-channel. The sample for Fecal Coliform will be collected from mid-channel just below the water (depth <1m).

3. Most sample bottles are rinsed in sample water prior to filling, and preserved according to the instructions detailed above.

4. Mercury: Special samples for Mercury will be collected in 250 mL glass bottles using the "clean hands-dirty hands" technique as described in EPA Method 1669. The dirty hands sampling technician will be responsible for handling the sample container and pouring the sample. The clean hands sampling technician shall only touch the sample container and cap. A field blank will also be collected at the sampling site, prior to sample collection. This will consist of reagent water, supplied by the laboratory, and processed through the sampling device. Analysis will be conducted by OCDWEP Environmental Laboratory using USEPA Method 1631 E, 2001). Sampling equipment to be used for each tributary sampling site will be evaluated based on flow and access to the sites. Sampling options include using an Extended Pole with Stainless Steel Claim, Teflon Dunker and Hand Operated Pump with Pre-cleaned Tubing.

   NOTE: A dedicated dunker with only silicone end seals will be utilized for the trace metals quarterly sampling events (except Mercury).

A. ENHANCED TRIBUTARY SAMPLING

Field sampling procedures to be transmitted as an addendum to the Year 2013 AMP.

III. QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

A. FIELD DUPLICATES

1. One field duplicate will be collected by using a separate sample collected for each parameter analyzed for Onondaga Lake, its tributaries, and the Seneca River. These are collected as separate samples taken from the same site at the same time. These provide a check on sampling equipment and precision techniques.

2. For Onondaga Lake, all field duplicates will be collected at the 3m sampling depth except for F. Coli (<1m).

For the Onondaga Lake Tributaries, the sampling site for field duplicate sample collection is rotated for the different sampling events.

For the Seneca River, two field duplicates will be collected at Buoy 316 during each sampling event (at the 1-meter below the water surface and 1-meter above the river sediment depths).

Some field duplicates are identified only as quality control "blind" duplicate samples, which are unknown to laboratory personnel. These "blind" duplicate samples will be collected four times a year for the Onondaga Lake and Tributary sampling events.

B. EQUIPMENT RINSEATE BLANKS

1. Equipment rinseate blanks will be collected for the submersible pump and churn used on Onondaga Lake. Blank samples will be collected prior to collecting water quality samples from Onondaga Lake and analyzed for all parameters. This schedule complies with the minimum frequency of one field blank per 20 samples.

2. Equipment rinseate blanks will be collected for the churn and dunker used for the Onondaga Lake Tributaries and analyzed for all parameters. Blank samples will be collected prior to the collection of water quality samples from any of the tributaries. This schedule also complies with the minimum frequency of one field blank per 20 samples.

C. SAMPLE CONTAINERS:

1. Mercury sampling bottles for quarterly tributary sampling events are purchased from a commercial supplier and each lot certified to be clean. Bottles from the lot are tested as bottle blanks and demonstrated to be free of mercury. All purchased bottles come double bagged in new polyethylene zip-type bags and stored in wooden or plastic boxes until use.

IV. SAMPLE CUSTODY

A. FIELD SAMPLE CUSTODY

1. When samples are delivered to the OCDWEP Laboratory for analysis following sample collection, the original C-O-C forms are submitted to the Laboratory.

2. For samples sent to a contract laboratory for analysis, two copies of an Engineering and Laboratory Services (ELS) Contract Laboratory C-O-C form will be used. The original C-O-C form will be maintained by the OCDWEP Laboratory, one copy will be shipped to the contract laboratory with the samples, for analysis. The contract laboratory will retain one copy.

3. Attachment B is a typical example of a C-O-C form. The “Remarks” area is used to record specific considerations associated with sample acquisition such as sample type, container type, sample preservation methods, and analyses to be performed. The original copy of this record follows the samples to the laboratory. The laboratory maintains the completed original and also scans the record into a computer.

B. LABORATORY SAMPLE CUSTODY

1. The field team leader notifies the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be delivered as well as the anticipated date and time of arrival.

2. The laboratory sample program meets the following criteria:

   The laboratory has designated a sample custodian who is responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.

3. Upon receipt of the samples, the custodian will check the original chain-of-custody documents and compare them with the labeled contents of each sample container for correctness and traceability. The pH of preserved samples is checked at the time of sample receipt. The sample custodian signs the chain-of-custody record and records the date and time received.

4. Care is exercised to annotate any labeling or descriptive errors. In the event of discrepant documentation, the laboratory will immediately contact the field team leader as part of the corrective action process. A qualitative assessment of each sample container is performed to note any anomalies, such as broken or leaking bottles. This assessment is recorded as part of the incoming chain-of-custody procedure.

5. The samples are stored in a secured area at a temperature of approximately ≤6°C until analyses are to commence.

6. A laboratory chain-of-custody record accompanies the sample or sample fraction through final analysis for control. These forms are scanned by the lab into the computer (Adobe PDF format) and placed in a centrally located directory.

7. A copy of the chain-of-custody form will accompany the laboratory report and will become a permanent part of the program records.

C. FINAL EVIDENCE FILES

Final evidence files include all originals of laboratory reports and are maintained under documented control in a secure area.

A sample or an evidence file is under custody if:

- it is in your possession;
- it is in your view, after being in your possession;
- it was in your possession and you placed it in a secure area; and
- It is in a designated secure area.

V. FIELD EQUIPMENT CALIBRATION PROCEDURES/MAINTENANCE

A. YSI SONDES

1. Calibration procedures for the YSI 600 & 6600, which are used to monitor water quality parameters in Onondaga Lake, are included as Attachment D. Calibration data including the date of calibration, the results of calibration, the technician's initials, and the results of the post-use instrument calibration for drift checks are maintained in a bound notebook.

2. The YSI units (sondes) are calibrated no more than 24-hours prior to each day of use. If the DO membrane is replaced, the unit is allowed to stabilize overnight. Calibration is typically performed in the morning before use. A calibration check is performed after use to ensure that calibration drift is acceptable.

3. Temperature calibration is set by the factory and, reportedly, does not require frequent recalibration.

3. Depth is calibrated in air, just above the water surface, as 0 meters.

4. Preventative Maintenance:

   i. Dissolved oxygen membranes are checked and replaced as needed after each use.

   ii. The pH reference probe and the temperature probes are cleaned with 1:1 HCl and a cotton swab after each use.

   iii. The pH probe calibration solution is replaced once per day.

   iv. For long term storage, the sondes are stored clean and dry in a case in order to prevent physical damage. For short term storage, the sondes are stored in a calibration cup with tap water.

   v. Watertight connectors are lubricated when necessary in order to ensure a waterproof connection, which will prevent faulty readings.

B. SECCHI DISK

Taped depth markings for the Secchi disk are calibrated annually.

C. WILDCO BETA SAMPLE TUBES

1. The Wildco Beta sample tubes are cleaned in DI water after each use. Prior to use, the tubes are rinsed in Onondaga Lake water.

2. Depth markings are calibrated annually.

D. SUBMERSIBLE PUMP

1. The submersible pump is cleaned using DI water after each use. Prior to use, the pump and hoses are rinsed in Onondaga Lake water.

2. Hoses for the submersible pumps are replaced annually or as needed.

3. Depth markings are calibrated annually.

VI. ANALYTICAL PROCEDURES

A. INTRODUCTION

Appropriate use of analytical data generated under the great range of analytical conditions encountered in environmental analyses requires reliance on the quality control practices incorporated in the methods and procedures used by the Onondaga County Department of Water Environment Protection Environmental Laboratory (OCDWEP). Attachment C lists the methodologies utilized for the analysis of water quality samples. As a participating member of the New York State Department of Health Environmental Laboratory Approval Program (ELAP), this laboratory uses only those methods and equipment certified by NYS to generate data. Inaccuracies can result from many causes, including unanticipated matrix effects, equipment malfunctions, and operator error. Therefore, the QA/QC aspects of this laboratory are indispensable. The data acquired from QA/QC procedures is used to estimate and evaluate the information content of analytical data and to determine the necessity of corrective action procedures. The means used to estimate information content are also an important part of the ELAP program to which we adhere.

This section defines the QA/QC procedures and components that are mandatory in the performance of analysis performed by the OCDWEP laboratory, and indicates the QA/QC information which must be generated with the analytical data.

B. CHEMICALS AND REAGENTS

1. Reagent grade water

Reagent grade water in the OCDWEP environmental laboratory consists of DI water purified by means of mixed bed deionization. The processed water is required to attain a minimum resistivity of 10 mSiemen. A final pass through another mixed bed deionization filter at point of use maintains the highest quality possible (18 mS output). Actual Conductivity is determined daily. The date, conductivity @ 25°C, and analyst's initials are recorded in a tabular format in a bound notebook.

To monitor the quality of reagent grade water for bacteriological use, the following tests are performed:

TABLE III - REAGENT GRADE WATER TESTS

Parameter	Frequency	Acceptable
Free Residual Chlorine	Monthly	None acceptable
Standard Plate Count	Monthly	<500 colonies/ml
Heavy Metals (Pb,Cd,Cu,Cr,Ni,Zn)	Yearly	<0.05 mg/l per metal <0.1 mg/l total
Suitability Test	Yearly	Ratio between 0.8-3.0

2. Reagents

Only American Chemical Society (ACS) grade or better chemicals are used. Chemicals are discarded within manufacturer's expiration date or 2 years after opening, whichever comes first. Date of receipt is recorded on each container.

3. Standard Solutions/Titrants

Anhydrous reagent chemicals are oven dried @ 100-105°C for at least 2 hours. Standard solutions or titrants not prepared from a primary standard are standardized against a primary standard at the frequency specified by the method or every 6 months if no frequency is specified. Standard solutions or titrants are kept no longer than 1 year after opening or within the manufacture's expiration date, whichever comes first. The date prepared and the expiration dates appear on the container, along with title of standard or titrant, concentration, and preparer's initials. In a bound notebook, the preparation date, title of solution, concentration, manufacturer and lot number of reagent grade chemical(s) used, quantity prepared, expiration date, preparer's signature and, if appropriate, drying times & temperatures, tare and net weight, citation of preparation of primary standard, standardization titers and calculations are recorded.

4. Bench or Shelf Reagents

These are non-standardized solutions prepared by laboratory personnel. All of the pertinent information listed for standard solutions is recorded on both bottle label and in a bound notebook.

C. MICROBIOLOGY: CHEMICALS AND REAGENTS

1. Bacteriological Media

Dehydrated media is discarded within six months when opened and stored in a dessicator, or within manufacturer's expiration date, if unopened. If opened, each new lot is compared to an existing lot that has been found acceptable. The date, name of media, lot #'s of control and test media, results of comparison, and analyst's initials are recorded in a tabular format in a bound notebook. On each bottle of media, dates of receipt and opening and discard date are recorded. Media is prepared according to method instructions. Sterilized glassware is used in the preparation of media. Date, name of medium, gross, tare, and net weights, volumes used, quantity prepared, pH of finished medium, and preparer's initials are recorded.

2. Autoclaving

The appropriate sterilization times @ 121°C and a pressure of 15-pounds per square inch for various materials are determined as follows:

Membrane filters and pads	10 min.
Carbohydrate containing media (Lauryl tryptose, BGB broth, etc.)	15 min.
Contaminated material, discarded cultures	30 min.
Membrane filter assemblies (wrapped to include all glass/plastic ware used to filter samples)	45 min.
Dilution water in screw-cap bottles	30 min.
Rinse water (200-1000-ml)	≥ 30 min.

3. Bacti Glassware

Every batch of glassware is checked after washing for detergent with 4-5 drops of bromthymol blue indicator, added to 4-ml of final rinse water from randomly chosen items of glassware; a neutral indication allows glassware use. The date, description of glassware, indicator reaction and analyst's initials are recorded in a tabular format in a bound notebook.

Each batch of sterilized bacti sample bottles is checked for sterility by aseptically adding 25-ml of tryptic soy broth into a randomly chosen sample bottle. After 24 hrs. of incubation @ 35°C +/- .5°C, the sample is checked for growth. The date, batch identifier, turbidity check, disposition of the batch, and analyst's initials are recorded in tabular form in a bound notebook.

4. Prepared Media Shelf Life

The following table indicates the holding times for bacteriological media prepared in advance:

TABLE IV - HOLDING TIMES BACTERIOLOGICAL MEDIA

Medium	Holding Time
Confirmation Broth in capped tubes	@ Room Temperature for 3-months
Poured MF agar plates with tight-fitting covers in sealed plastic bags	2 Weeks @ 4°C

5. Membrane Filter Sterility Blanks

a. The sterility of each lot number of membranes is verified by checking for growth after 1 membrane is placed in 50-ml of tryptic soy broth for 24 hrs. @ 35°C+/- 0.5°C incubation. The date, lot number, check for turbidity, and analysts initials are recorded.

b. At the beginning and end of each membrane filter series, a sterility check is performed. The date, # of samples analyzed during run, counts for blanks and analyst's initials are recorded in a tabular format in a bound notebook.

6. Negative and Positive Controls

a. Prior to the first use of a medium, each prepared, ready-to-use lot of medium and each batch of medium prepared in the laboratory shall be tested. Tests will consist of using at least one pure culture of a known positive reaction and at least one negative culture control, as appropriate to the method.

D. CALCULATIONS AND CHARTS

1. Reference Sample

A chart is constructed as follows:

a. The measured values and dates of analysis of the reference sample are tabulated;

b. When at least 20 reference samples have been tabulated, compute the mean: x;

c.. Using the mean, compute the standard deviation (SD), as in the following example using the formula:

$$SD = \sqrt{\frac{\Sigma (x - \overline{x})^2}{N-1}}$$

Where:

	x	= the measured value of an individual reference sample
	$\overline{x}$	= the mean of the measured values
	N	= the number of data points
	$(x - \overline{x})^2$	= the sum of the squares of all the differences of the mean and measured values.

Example:

	Date	X	(X - X̄)		(X - X̄)^2	
1.	4-25-96	207	(207 - 207 = 0)	0	(0 x 0 = 0)	0
2.	5-03-96	214	(214 - 207 = +7)	+7	(7 x 7 = 49)	49
3.	5-10-96	200	(200 - 207 = -7)	-7	(7 x 7 = 49)	49
4.	5-17-96	210	(210 - 207 = +3)	+3	(3 x 3 = 9)	9
5.	6-10-96	219	(219 - 207 = +12)	+12	(12 x 12 = 144)	144
6.	6-10-96	190	(190 - 207 = -17)	-17	(17 x 17 = 289)	289
7.	6-18-96	203	etc.	-4	etc.	16
8.	6-27-96	210	"	+3	"	9
9.	7-03-96	204	"	-3	"	9
10.	7-11-96	207	"	0	"	0
11.	7-19-96	207	"	0	"	0
12.	8-01-96	201	"	-6	"	36
13.	8-10-96	204	"	-3	"	9
14.	8-17-96	200	"	-7	"	49
15.	8-27-96	221	"	+14	"	196
16.	9-03-96	205	"	-2	"	4
17.	9-11-96	210	"	+3	"	9
18.	9-20-96	201	"	-6	"	36
19.	9-30-96	217	"	+10	"	100
20.	10-10-96	210	"	+3	"	9

N=20 Total X = 4140 = 1022

Example

N = 20

$\sum (X - \overline{X})^2 = 1022$

$SD = \sqrt{(X - \overline{X})^2 / N-1}$

$SD = \sqrt{1022 / 19}$

SD= 7.33

2. Determine the warning limits

Determine the warning limits (WL), and the control limits (CL) as in the following example using the formulas:

$WL = \overline{X} \pm 2SD$

$CL = \overline{X} \pm 3SD$

Where $\overline{X}$ = the previously computed mean

SD = the standard deviation

WL = 207± (2 x 7.33)

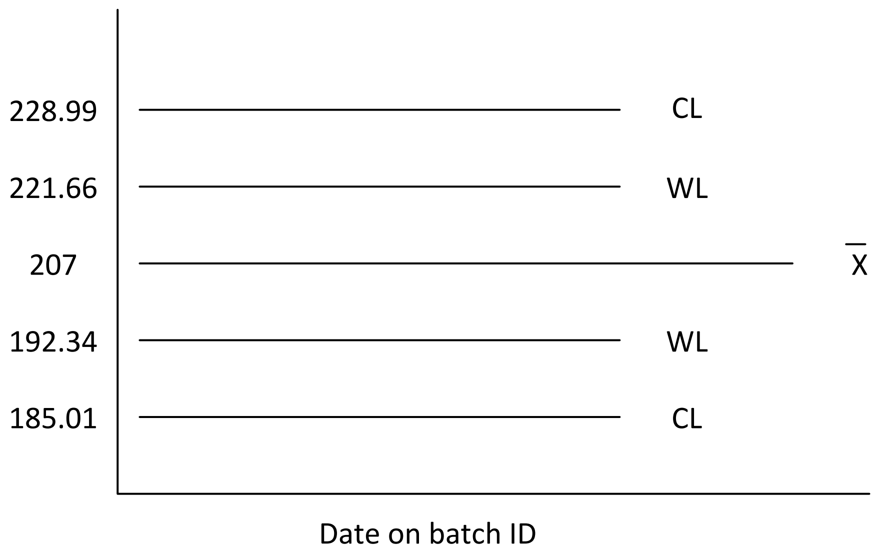
The warning limits (WL) in the example, are 221.66 for the upper warning limit and 192.34 for the lower warning limit.

CL = 207± (3 x 7.33)

The control limits (CL) in the example are 228.99 for the upper control limit and 185.01 for the lower control limit.

3. Construct a control chart

Construct a control chart as done below for the example. The measured values of the reference samples are then plotted in the chart.



4. Percent Recovery

The percent recovery, P is calculated as follows:

P = 100 (M - B)/T

Where: T = the target value, i.e. the known concentration of analyte spiked into the sample aliquot.

M = the measured concentration of analyte in the spiked sample aliquot.

B = the background concentration of the unspiked sample aliquot.

The percent recovery data are used to construct a control chart with control limits with acceptance limits as follows:

a. The percent recoveries and analysis dates of the spiked samples are tabulated.

b. When a minimum of five percent recoveries have been tabulated, compute P (the mean percent recovery).

c. Compute SD, the standard deviation (see section on reference standard for example).

5. Surrogate Standard

The percent recovery, P, is calculated as follows:

$P = 100 (M/T)$

Where: M = the measured value

T = the target value, (i.e. the known value of surrogate spiked into the sample)

A tabulation of percent recoveries is maintained for each surrogate. The tabulation includes the analysis date, the percent recovery and the control limits for P. Control limits, using a minimum of 5 data points for each surrogate standard are calculated as follows:

$CL = X \pm 3SD$

Where: CL = the control limits

X = the mean percent recovery

SD = the standard deviation (see section on reference standard for example)

Compute WL, the warning limits, and CL, the control limits as follows:

$WL = X \pm 2SD$

$CL = X \pm 3SD$

The computed limits are recorded on the tabulation or control chart.

6. Duplicate Analysis

The percent relative difference between duplicate analyses is determined as follows:

$\%RPD = [(X_1 - X_2) / (X_1 + X_2) / 2] \times 100$

X_1 = the greater of the measured values

X_2 = the lower of the measured values

A tabulation of duplicates is maintained for each analyte listing dates of analysis, X_1, X_2, R, and the acceptance limit for RPD. The acceptance limit is established using the following equation:

$UCL = 3.27 \times RPD$

Where: UCL = the acceptance limit

RPD = the average %RPD range for a minimum of 20 sets of duplicates in a specified concentration range.

VII. LABORATORY CALIBRATION/EQUIPMENT MAINTENANCE PROCEDURES

A. LABORATORY EQUIPMENT

1. Analytical Balance

a. Analytical balances are serviced and calibrated internally by a qualified service organization 1/year and a dated certification sticker is provided.

b. Analytical balances are checked daily in two ranges with Class S weights. The ranges selected reflect the routine use of the balance. For example, the analytical balance used principally for evaporating dishes and aluminum dishes would need Class S weights having target values of bracketing the expected weights of the dishes. The date, target reading, actual reading, and analyst's initials are recorded in a bound notebook.

2. pH meter

pH meters are calibrated daily using standard buffers and a two point calibration. This consists of creating a slope using standard pH buffers of pH 4.0 and 10.0. The slope is then checked using a standard buffer of pH 7.0, with an acceptable reading of + /- 0.05 pH units. The date, pH buffer target values, set points, actual readings, and analyst's initials are recorded in a tabular format in a bound notebook.

3. Conductivity meter and cell

a. The conductivity cell constant is determined annually using a 0.01-M potassium chloride solution. The date, resistance readings, average resistance, temperature, calculations, and analyst’s initials are recorded in a bound notebook.

b. The conductivity meter and cell is calibrated daily with a 0.001 M potassium chloride solution. An acceptable reading is +/- 20% of target value. The date, target value, actual reading, temperature, and analyst's initials are recorded in a tabular format in a bound notebook.

4. Dissolved Oxygen Meter

The dissolved oxygen meter and probe is calibrated daily using air calibration. The calibration is checked against a second dissolved oxygen meter for verification.

5. Turbidimeters

The turbidimeter is calibrated per manufacturer’s recommendation using a certified secondary gelex standard with each use. The date, target and observed values, and the analyst's initials are recorded in a tabular format in a bound notebook.

6. Thermometers

a. The OCDWEP environmental laboratory possesses an NIST (National Institute of Standardized Temperature) traceable, factory-certified thermometer, which is checked at the various temperatures required by a variety of analytical requirements. Correction factors and adjustments to correction factors, new correction factors and analysts initials are recorded in a tabular format in a bound notebook.

b. Each working thermometer has a dedicated use, and is calibrated annually at the temperature of interest using the NBS thermometer. The date, thermometer designation, calibration temperature, correction factor, and the analyst's initials are recorded in a bound notebook.

7. Refrigerators

Laboratory refrigerators maintain a temperature of 1° to 6°C. These temperatures are checked once daily. An NIST certified thermometer with 1°C graduations is used. The date, times, temperature readings and analyst’s initials are recorded in tabular format in a bound notebook.

8. Bacteriological Incubators

a. The air bath incubators maintain a temperature of 35°+/- 0.5°C. A thermometer with graduations of 0.1°C is used. Temperatures are taken twice a day and the same data is recorded.

b. The water bath incubator maintains a temperature of 44.5°+/- 0.2°C. A thermometer with graduations of 0.1°C is used. The same temperature reading schedule and data recording is used as for the air bath incubator.

9. Ovens

Ovens are maintained at the target temperature of interest during use. Temperatures are checked at the beginning and end of each use. A dedicated thermometer with graduations of 1°C is used. The date, target temperature, time and temperature at the start and end of each cycle, oven use, and analysts initials are recorded in a tabular format in a bound format.

10. Autoclave

Autoclave maintains sterilization temperature and pressure during the sterilization cycle and completes the entire cycle within 45 minutes when a 10-12 min. sterilization period is used. A separate calibrated thermometer is used in combination with a sterilization indicator. The date, time material is placed in autoclave, time of sterilization period, time material was removed, description of sterilized material and analyst's initials are recorded.

11. Automated Analyzer

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

12. Atomic Absorption Spectrophotometer

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

13. Inductively Coupled Plasma (ICP) Spectrophotometer

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

14. TOC Analyzer

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c.. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

B. LABORATORY QUALITY CONTROL DOCUMENTATION REQUIREMENTS

1. Standard Curves

Standard curves are prepared as specified in QA/QC manuals. All standard curves are dated and labeled with method, analyte, standard concentrations, and instrument responses.

A best-fit, straight line is drawn on graphed curves: the axis is labeled. The correlation coefficient is calculated. An acceptable correlation coefficient is 0.995 or greater.

Instrument response for samples is less than the highest standard. The lowest standard is at the method reporting limit.

If a specific method does not provide guidance in the preparation of a standard curve, the following guidelines are followed. For manual colorimetric methods, a blank and five standards that lie on the linear portion of the curve are used. A new curve is prepared each time an analysis is run. At each use, the curve is checked with a blank and a high standard. The high standard selected is greater than the expected sample concentrations. For automated colorimetric methods, a blank and a minimum of five standards are used. A new curve is prepared for each run. Instrument response is checked with a QC reference sample after each 10 samples. Low level standards are freshly prepared for each run.

2. Method Blank

A method blank consists of laboratory-pure water, which is processed and analyzed as if it were a sample. A method blank is run daily or with each batch of samples. Samples are related to the method blank by means of a date or batch identifier. Where applicable, the blank is calculated as a sample and a tabulation of blank results for each analyte with the date run and its appropriate acceptance criteria is maintained. Acceptance criteria for a method blank is a result less than the Method Reportable Limit (MRL) only.

3. Instrument Blank

An instrument blank consists of laboratory water, which is analyzed without adding reagents, filtering, etc. It is used for instrument set-up and no readings are recorded.

4. Trip Blank - Special

Trip blanks are required when analyzing volatile compounds in water. A trip blank is a sample of laboratory-pure water contained in a sample bottle appropriate to the analyte to be determined. Trip blanks are present but unopened at the sampling site and shipped to the laboratory with the environmental samples taken. A trip blank is included with samples collected at each sampling site. The trip blank is analyzed only when samples from a specific sampling site are positive for the analyte of interest. If reportable levels of the analyses of interest are demonstrated to have contaminated the field blank, resampling is required.

5. Reference Sample

A reference sample is prepared by spiking a known amount of analyte into an appropriate solvent. The concentrate or quality control sample is preferably obtained from an external source. When necessary, a sample prepared in-house is prepared independently of the calibration standard. A reference sample is analyzed with every tenth sample or monthly samples if fewer than ten samples per month are analyzed. Environmental samples are tied to the reference standard by means of a date or batch identifier.

Data generated by the analysis of reference standard are used to construct a control chart and control limits established. Instructions for constructing a control chart and computing limits are to be found later in this section.

Should a result fall outside the control limits, the analysis is out of control and immediate action is taken to determine the cause of the outlying result. Data generated on the same day as the outlying result are regarded as unreliable and the analyses repeated after corrective action has been taken and the procedure is back in control.

A new control chart with freshly computed control limits is generated annually. The last 20 reference standard data points for the previous year are used to compute the new control limits.

6. Spiked Recovery

Spiked recovery for an environmental sample is determined by dividing the sample into two aliquots of the same sample. The first aliquot is analyzed as usual. The second aliquot is spiked with a known concentration of the analyte of interest. The spike should be approximately 10 times the method's standard deviation (at the level of interest). A spiked environmental sample is analyzed when appropriate at a frequency of 1 spiked sample for every 20 samples or 1 spiked sample per month if fewer than 20 samples per month are analyzed. Samples are related to the spiked recovery date by means of a date or batch identifier.

Data generated by the analysis of spiked samples are used to calculate the percent recovery. The percent recovery data is used to construct a control chart and tabulation and limits established. Instructions for constructing a chart or tabulation and computing limits are to be found later in this section.

A new control chart of tabulation, the analysis is regarded as out of control and immediate action is taken to determine the cause of the outlying result. Data generated on the same day as the outlying result are regarded as unreliable and the analysis repeated after corrective action has been taken and the procedure is back in control. A new control chart or tabulation with freshly computed limits is generated annually.

7. Duplicate Analysis

A duplicate analysis is required only when a sample yields a positive result. A minimum of 10 percent of all positive samples for a given analyte is analyzed in duplicate. The range between the duplicates is tabulated and acceptance limits established. Instructions for the tabulation and the computation of limits are to be found later in this section.

A new tabulation with a freshly computed acceptance limit is generated annually.

8. External QA/QC

The OCDWEP laboratory is a NYSDOH-ELAP certified laboratory. Part of this program consists of a biennial inspection by NYS Laboratory Inspectors, who spend one or more days at each facility checking all aspects of the operation. In addition, performance evaluations are conducted twice per year. This consists of unknown samples sent to the laboratory to be analyzed and the results reported back to ELAP. The laboratory is required to submit results for each parameter that we are certified for, including bacteriology, metals, nutrients, etc.

The USEPA also uses the results from this program to satisfy the requirements of the SPDES permit program that regulates the various wastewater treatment plants in the OCDWEP system.

9. Internal QA/QC

In addition to the above, the OCDWEP laboratory conducts an internal QA/QC program consisting of unknowns that are generated periodically by the OCDWEP staff and given to technicians as “typical” samples, occurring without the analysts' knowledge. The object of this is to ensure that “typical” samples are analyzed using the same care as the “official” samples.

C. LABORATORY QUALITY CONTROL REQUIRED - BY PARAMETER

Inorganic Analytes		
Sub-Category or Analytical Group	**QC Measure Record Acquired**	**Frequency**
Demand/Residue		
TOC	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 20th sample or monthly if less than 20 samples per month are analyzed.
	Duplicates Tabulation Of all positive samples	On positive samples only, a minimum of 10% of all samples.
Mineral		
Alkalinity and Hardness	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
All other analyses except pH	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 20th sample or monthly if less than 20 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.

Sub-Category or Analytical Group	QC Measure Record Acquired	Frequency
Nutrient		
All nutrient analyses	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 20th sample or monthly if less than 20 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.
Wastewater Metals		
ICP (same as Flame)	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.
Flame Method	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.
Furnace Method	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Post only if Dupes are ±15%.
	Duplicates Tabulation	Double matrix spiked every 10th sample.
Mercury	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Post only if Dupes are ±15%.
	Duplicates Tabulation	Double matrix spiked every 10th sample.

Sub-Category or Analytical Group	QC Measure Record Acquired	Frequency
Miscellaneous Analytes		
Oil & Grease	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
Cyanide, Phenols, and Silica - Dissolved	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 20th sample or monthly if less than 20 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.
Organic Analytes		
Organic Purgeables		
Priority Pollutants by GC	Laboratory Blank Tabulation	Daily or with each batch run.
	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Surrogate Standard Tabulation	All samples.
Organic Extractables		
Priority Pollutants and Pesticides by GC	Laboratory Blank Tabulation	Daily or with each batch run.
	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.

Sub-Category or Analytical Group	QC Measure Record Acquired	Frequency
	Spiked Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Surrogate Standard Tabulation	All samples.
Solid Waste Metals		
All Methods	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.
All Other Analytes		
Inorganic	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Spiked Sample Chart	Every 20th sample or monthly if less than 20 samples per month are analyzed.
	Duplicates Tabulation	On positive samples only, a minimum of 10% of all samples.

Sub-Category or Analytical Group	QC Measure Record Acquired	Frequency
All Other Analytes		
Organic	Laboratory Blank Tabulation	Daily or with each batch run.
	Duplicates Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Reference Sample Chart	Every 10th sample or monthly if less than 10 samples per month are analyzed.
	Matrix Check	Daily or with each batch run.

VIII. PROGRAM ASSESSMENTS

OCDWEP has designed several means of assessing whether the goals of the data acquisition program are being met. Both the field and laboratory components of the Ambient Monitoring Program will be assessed on an ongoing basis, with formal checkpoints each month.

The program team reviews the workplan with key field and laboratory personnel. An annual calendar is put together, noting field sampling days. Weekly coordination meetings are held with field and laboratory personnel in attendance. Any significant activities or problems identified in either the field or laboratory component of the program are discussed. A formal list of action items is kept from these weekly meetings.

Data are received from the laboratory on a monthly basis and are reviewed. Charge balances (summing the milliequivalent of the major anions and cations) of the inorganic data are performed to screen for data quality. Relative percent difference between field replicates is calculated.

A field audit will be conducted during the Year 2013 monitoring season. Members of the project team will accompany the field sampling team and observe sample collection and field data acquisition. A formal report of the field assessment will be maintained in the OCDWEP lake files. A laboratory audit will also be scheduled. The procedures for sample handling and analysis will be evaluated whether the criteria defined in the workplan are being consistently implemented.

IX. DATA QUALITY ASSESSMENT

Choices made in design of the sampling program (spatial and temporal), field sampling procedures, laboratory procedures, and data evaluation and interpretation can greatly influence the ability to draw conclusions. In this section, we describe the quantitative and qualitative decisions made to ensure that the data quality is adequate to meet the needs of this program. Data quality will be assessed using EPA's 40 CFR 30.503 standard criteria; precision, accuracy, representativeness, completeness, and comparability. In addition, a field audit will be performed to assess field procedures and sample handling. QA/QC methods for field and analytical procedures are those mandated by the New York State Department of Health Environmental Laboratory Approval Program (ELAP).

A. PRECISION

The plan to monitor and control the precision and accuracy of analytical measurements is described in the section on analytical procedures. Precision of field samples will be assessed through a program of field replicate analyses: one replicate per sample delivery group, or twenty samples. For routine lake and tributary monitoring, one sampling depth (lake) and station (tributary) will be sampled in duplicate for the complete suite of parameters.

B. ACCURACY

Accuracy, or how close the reported concentrations of concern are to "true" values, can be difficult to assess. The laboratory analytical program describes how this data quality indicator is monitored through a program of audit samples. A second approach Onondaga County has implemented is a validation program, using an outside expert in limnology and statistics to audit the results. The data validation program cannot be a final arbiter of what values in a data set are true, but it can help test for outliers and systematic differences between researchers that warrant further investigation. In addition, ELAP Laboratories require proficiency samples.

C. REPRESENTATIVENESS

Representativeness refers to the degree to which the samples acquired reflect the nature of the underlying population. Any monitoring program relies on the results of a limited number of samples drawn from a much larger underlying population to provide information regarding the nature of that larger population. The sampling program described in this document has been designed to accommodate the known temporal and spatial variability of the lake and its tributaries. Onondaga Lakes undergoes thermal stratification.

This requires both temporal and spatial adjustments to the annual monitoring program. Water quality analyses and data manipulation reflects the nature of the lake's stratification. Samples are taken at 3m intervals that span the thermal regime. Upper Mixed Layer (UML) results are separated from the Lower Water Layer (LWL) results in the calculations of annual and growing season (5/15 - 9/15) means and medians. Trends in concentrations during both the mixed and stratified periods are calculated. The primary sampling station in the Year 2013 Monitoring Program is a point in the southern lake basin (South deep). This station has been sampled throughout the 37 years of lake monitoring. Four times each year, Onondaga County monitors a second station (designated North Deep) to determine whether water quality results differ. Tributary monitoring is on a bi-weekly basis. Judgment will be used to select the number and location of transects to collect water samples in the tributaries. Samples of the Lake Outlet are obtained at 12-feet depth.

D. COMPARABILITY

Documentation of procedures and results of the monitoring program have been maintained by OCDWEP since 1968. Our goal is for data generated during the Year 2013 program to be comparable to the historical data. To meet this goal, we are committed to fully documenting the sampling and analytical procedures used, including any special modifications necessary to maximize precision, accuracy, or sensitivity in the lake water matrix.

E. COMPLETENESS

We are fortunate to have an extensive database of Onondaga Lake water quality to provide guidance regarding optimal sampling design with respect to variability of the measured parameters. An analysis of the reduction on the coefficient of variation achieved by different sampling strategies for the lake indicates that a monthly sampling program is adequate for most parameters (Walker 1992). Other parameters associated with short-term fluctuations in algal populations such as Chlorophyll-*a* require more frequent (weekly) monitoring from May through September.

Non-parametric statistics has been selected to indicate trends in water quality over time. The seasonal Kendall test allows us to differentiate seasonal variations within years from changes between years. The non-parametric statistics will maintain their power even with occasional missing values. Our goal for Year 2013 is to complete and validate 100% of the planned samples.

F. FIELD AUDIT

An annual field audit will be conducted by a member of the AMP Consultant staff to assess the field procedures and sample handling will perform an annual field audit. The audit findings and recommendations are included in the annual monitoring report.

G. EQUIPMENT RINSEATE BLANKS

Wildco Beta Dunker, Churn, and Pump QA/QC equipment rinseate blanks will be collected for each of the AMP sampling events, as appropriate.

X. DATA REVIEW AND VALIDATION

Data will be screened for both technical defensibility (were procedures followed, were the laboratory control limits for precision and accuracy observed and usability, are the sample results sufficient to allow inferences regarding the nature of the underlying population?). Both of these criteria are important to meet the objectives of the lake-monitoring program.

Technical defensibility includes evaluation of the following:

a. Internal laboratory quality control: blanks, spikes, replicates, and standard curves;

b. Chain-of-custody complete; and

c. Holding times for all parameters met in accordance with analytical method.

Data usability includes evaluation of the following:

a. Charge balance of major anions and cations;

b. Results of field replicates; and

c. Statistical evaluation of outliers.

XI. DOCUMENTATION

A. FIELD AND LABORATORY DATA

Field and laboratory data are stored both on the Laboratory Information Management System (LIMS) and on paper copy to be filed at OCDWEP. Data may be retrieved at any time from either of these sources.

B. LABORATORY REPORTS

Samples are delivered to the laboratory along with chain of custody forms on the date of sampling. YSI sondes' field data are delivered to the laboratory by the next day. Laboratory reports are finalized and delivered to the program manager and field supervisor within 30 days of the sample date.

C. PRELIMINARY DATA VALIDATION

Preliminary data validation is performed within 30 days of receipt of final laboratory data.

D. TREND ANALYSIS

Statistical trend analysis of the data will be performed. The non-parametric seasonal Kendall test will be performed on the lake and tributary data to test for long-term trends and changes in lake water quality in response to the major reductions in external loading.

E. ANNUAL TRIBUTARY LOADS

The flow-weighted concentrations of the constituents will be summarized. Dr. Walker's refined program used to estimate loading to Onondaga Lake will be used. The improved estimation technique, called "Method 5", was developed in conjunction with the compilation of the OCDWEP long-term integrated water quality data base and supporting software. The new technique was developed to support estimation of daily loads, to support development of monthly and seasonal lake mass balances, and to improve the accuracy and precision of the annual load estimates. Method 5 differs from AUTOFLUX Method 2 in several ways. Data are stratified by flow regime (similar to AUTOFLUX Method 2) and are also stratified by season using a multiple regression technique. Conditions during the unmonitored period are projected using a residual interpolation method that includes a flow derivative term.

F. ANNUAL REPORT

At the end of the monitoring year, data are compiled and manipulated into a report of analyses computation and evaluation of the ambient monitoring program.

ATTACHMENTS

ATTACHMENT A:

Chain-Of-Custody Form (Example)

CHAIN OF CUSTODY RECORD	Sample Number		

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION
Engineering and Laboratory Services Division
(Revision: Sept 2007 – COC_62002Dbaseportraitmod.DOC)

Project Name	
IC/FC #	
Sewer#/WCode	
Invoice#	
DEC Permit	
Req. By	

Origin of Sample (i.e., Name of Industry, Treatment Plant, Hauler, etc.)

CATEGORY: AMP IND TP WHC SPECIAL QA/QC

CONTRACT LABORATORY - LIST NAME:

Start Date	End Date	Pickup Date	Start Time	End Time	Samp Type	Bottle #	Container Type	Initial	Preserved YES	Preserved NO	SAMPLE NOTES (Lab) Receipt Temp
			Field pH		Meter #			Chlorine Residual			

Bottles/Comp		Aliquot/Bottle		Sample Interval		Sampler ID		Refrig/Iced	
Preservation Checklist	Oxidizer Present?		Oxidizer Removed?		PreKit#		FLOW (Date/Time) >1. 2.		
	Yes	No	Yes	No	Initials		2nd Reading		
NH3-N							1st Reading		
TKN							TOTAL		
Color Interference?			If yes, added [ ] drops Na Thio				UNITS		

MATRIX: Solid WasWater SurWater PotWater | Remarks (sample / collection details):

SPLIT WITH (Name/Title/Date):

PARAMETERS AS LISTED IN ANNUAL SCHEDULE? YES NO → If NO, List Parameters below for all samples:

Lab Comments:

CHAIN OF CUSTODY (Print Name, Signature, Title, Date of Possession)

1.
2.
3.
4.
5.
6.

Attachments included? YES / NO If yes, list pages: Page ____ of ____.

ATTACHMENT B:

Analytical Methodologies

TABLE 2-4

ANALYTICAL PROCEDURES FOR WATER QUALITY ANALYSES
2013 MONITORING PROGRAM

Onondaga Lake 2013 Annual Report
Onondaga County, New York

Parameter	Code	Methods *	Method Reportable Limit (mg/L)	Accuracy (%)	Precision (%)
Bio Oxy Demand 5-day	BOD5	2:(5210 B)	2.0	104	11.0
Carbon. Bio Oxy Demand 5-day	CBOD5	2:(5210 B)	2.0	104	11.0
Total Alk as CaCO3	ALK-T	2:(2320 B)	1.0	99.3	1.5
Total Organic Carbon	TOC	2:(5310B)	0.5	100.6	2.1
Total Organic Carbon - Filtered	TOC-F	2:(5301B)	0.5		
Total Inorganic Carbon	TIC	2:(5301B)	0.5 (5.0)[1]	99.1	2.4
Total Kjeldahl Nitrogen as N	TKN	3:(10-107-06-2-H)	0.15	99.8	5.6
Low Ammonia Nitrogen as N	NH3-N	3: (10-107-6-1-B)	0.01 (0.03)[2]	96.7	4.7
Organic Nitrogen as N	ORG-N	Calculated [4]	0.01		
Nitrate as N	NO3	3:(10-107-04-1-C)	0.01	101.2	2.4
Nitrite as N	NO2	3:(10-107-04-1-C)	0.01	101.2	1.2
Total Phosphorus (Manual)**	TP	2:(4500-P E))	0.003	101.0	2.5
Total Dissolved Phosphorus	TDP	2:(4500-P E)	0.003	101.0	2.5
Soluble Reactive Phosphorus	SRP (OP)	2:(4500-P E)	0.001	101.5	1.8
Silica	SiO2	2:(4500-Si-D)	0.5	103.4	8.5
Sulfates	SO4	6:(426 C)	10.0	98.2	4.6
Total Sulfides	S=	1:(376.1)	0.2		
Total Phenol	Phenol	3:(10-210-00-1-A)	0.010	98.9.	10.9
Total Solids	TS	2:(2540 B)	20.0		
Total Volatile Solids	TVS	2:(2540 E)	20.0		
Total Suspended Solids	TSS	2:(2540 D)	2.5		
Total Volatile Suspended Solids	VSS	2:(2540 E)	2.5		
Total Dissolved Solids	TDS	2:(2540 C)	20.0		
Total Arsenic - furnace	As - GFA	4:(200.9)	0.002	104.0	5.5
Total Cadmium-furnace	Cd - GFA	4:(200.9)	0.0008	104.0	4.4
Total Calcium	Ca	2:(3111B)	1.0	102.6	2.9
Total Chromium	Cr	4:(200.7)	0.008(0.002)*	102.0	2.2
Chloride- Lachat	Cl	3:(10-117-07-1-B)	1.0	102.2	1.9
Residual Chlorine	CL2 RES	1:(330.4)	0.1		
Total Copper	Cu	4:(200.7)	0.01(0.0025)*	103.6	2.7
Total Cyanide	CN-T	3:(10-204-00-1-A) [3]	0.003	100.2	9.9
Total Iron	Fe	4:(200.7)	0.04	100.3	3.1
Total Lead - furnace	Pb - GFA	4:(200.9)	0.002	98.0	4.1
Total Magnesium	Mg	2:(3111B)	0.1	102.4	3.2
Total Manganese	Mn	4:(200.7)	0.02	104.2	2.7
Total Low Level Mercury	Hg	7:(1631E)	0.0000005	94.9	8.8
Total Mercury (Cold Vapor)	Hg	1:(245.2)	0.00002	98.8	4.5
Total Selenium - furnace	Se - GFA	4:(200.9)	0.002	101.4	5.8
Total Sodium	Na	2:(3111B)	3.0	102.1	5.9
Total Nickel	Ni	4:(200.7)	0.015(0.00375)*	100.8	2.0
Total Potassium	K	2:(3111B)	0.020	98.6	4.4
Total Silver	Ag	4:(200.7)	0.01	104.3	2.7
Total Zinc	Zn	4:(200.7)	0.02(0.005)*	99.6	2.1
Turbidity		2:(2130B)	0.1	92.7	0.6

TABLE 2-4 (CONTINUED)

Parameter	Code	Methods *	Limit of Detection (mg/L)	Accuracy (%)	Precision (%)
Conductivity	COND	2:(2510B)	-		
Dissolved Oxygen - Field	DO - Field	1:(360.1)	0.1		
Dissolved Oxygen - Lab	DO - Lab	1:(360.1)	-		
Dissolved Oxygen - Winkler	DO - Winkler	1:(360.2)	-		
pH	pH	1:(150.1)	-		
Temperature	TEMP	1:(170.1)	-		
Phaeophytin *a*	PHEO-A	2:(10200 H.2)	0.2 (mg/m3)		
Chlorophyll *a*	CHLOR-A	2:(10200 H.2)	0.2 (mg/m3)		
Enterococci	ECOCCI	5:(1600)	1.0 (cells/100mL) MPN		
E. Coliform	ECOLI-Colilert	2:(9223 B)	1.0 (cells/100mL) MPN		
Fecal Coliform	FCOLI-MF	2:(9222 D)	1.0 (cells/100 mL)		

Methods listed are applicable for all matrices of water, wastewater, and surface waters.

* Indicates method has a lower level of detection due to sample concentration

**Started in August 2000 for all AMP samples.

Footnote[1] : reporting limit for TIC changed from 0.5 mg/L to 5.0 mg/L on 04/16/2013

Footnote[2] : reporting limit for NH3-N changed from 0.01 mg/L to 0.03 mg/L on 12/01/2013

Footnote[3] : method changed from 10-204-00-1-A to method 10-204-00-1-X on 08/01/2013

Footnote[4] : result is a calculation (TKN-NH3-N) = Org-N

Method Reference Codes:

1: Indicates USEPA Methods for Chemical Analysis of Water and Waste 1979

2: Indicates Standard Methods (18th Edition)

3: Indicates Lachat Instruments QuickChem Methods: Approved for use by USEPA - NYSDOH - ELAP

4: Indicates USEPA "Methods for the Determination of Metals in Environmental Samples" Supplement 1, May 1994

5: Enterolert EPA 1997

6: Indicates Standard Methods (15th Edition)

7: Indicates USEPA Method 1631, Revision E, August 2002

ATTACHMENT C:

YSI 600/6600 Calibration Procedures

<u>YSI 600 & 6600 Calibration</u>

The YSI 600 & 6600 sonde units are calibrated in the OCDWEP Laboratory located at the Henry Clay Boulevard Facility (HCBF). All calibration solutions e.g. (20^0C DI water; pH buffers 7,10; Conductivity KCl buffers 0.01N & 0.02N) are purchased and supplied with a certificate of analysis and stored in the laboratory. The YSI 600 & 6600 are calibrated no more than 24 hours prior to use on the day that it is used in the field. Post-calibration checks are conducted after use, on the same day (to the extent possible or the following day), on all calibrated parameters. All calibration records are maintained in a bound book.

Dissolved Oxygen (DO) Calibration

1. Bring the DI water bucket, which can be found in the 20^0C walk-in incubator room, to the ELS Field Staging Room. Place the sonde unit (with attached weighted probe guard) into the 20° C DI water bucket. Allow the unit to stabilize in the bucket for 10 minutes.

2. Record the current barometric pressure (from the MDS 650). Record the mm of Hg value in the bound calibration notebook.

3. The DI water in the bucket should be well stirred, and the YSI 600 or 6600 should be temperature stabilized before proceeding with DO calibration.

4. Once stable, record in the calibration log book the DO and temperature value on the display unit. Collect two Winkler bottle DO samples from the DI water bucket, and turn these samples over to the laboratory technician responsible for DO analysis.

5. The DO concentration is determined in each of the two bottles using the Winkler method. Record each result and the average value of the two DO concentrations in the calibration logbook.

6. If the concentration results of the two bottles, using the Winkler method, are greater than 0.2 ppm different, the DO concentrations should be determined again.

7. If the “average Winkler DO” value is not within five-hundredths (0.05) of the value on the display unit, then it is necessary to calibrate the YSI 600 or 6600, using the “average Winkler DO” value.

8. Select **“Sonde Menu,”** then **“Calibrate,”** then **“DO %”** on the display unit. Enter the calculated barometric pressure **“mm/Hg.”** The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed DO value as the initial reading. Then select "enter"; the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". For calibration to a DO Winkler value, select **"DO mg/L”**, enter the average Winkler DO value. The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed DO value as the initial reading. Then select "enter"; the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". The DO is now calibrated.

9. <u>After use in the field</u>, conduct the post-calibration procedure repeating steps 1 through 5 as listed above. The difference between the displayed DO value recorded in the log book and the “average Winkler DO” is the drift, which should be recorded in the log book.

pH Calibration

1. Remove the weighted probe guard from the sonde unit and screw on the calibration cup. Rinse the cup with DI water. Thoroughly mix the container of pH 6 buffer, making sure the solution is dated, and fresh. Rinse the probes in the calibration cup with pH 6 buffer, then fill the cup with the buffer until all probes are submerged. Allow the readings to stabilize for approximately 90 seconds.

2. Select **"Sonde Menu,"** then **"Calibrate,"** then **"pH,"** then **"2 point cal"** on the display unit. Enter the first pH buffer for calibration (pH 6.00). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed pH value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter".

3. Rinse the cup with DI water. Thoroughly mix the container of pH 10 buffer, making sure the solution is dated, and fresh. Rinse the probes in the calibration cup with pH 10 buffer, then fill the cup with the buffer until all probes are submerged. Allow the readings to stabilize for approximately 90 seconds.

4. Next, enter the second pH buffer for calibration (pH 10.00). The display will then return to the data display screen, with the option "**calibrate**" highlighted. Record the displayed pH value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value as the calibrated pH in the logbook. The display will show "**continue**" highlighted, select "enter" to continue with options.

5. Next, put the display unit in run mode. Rinse the cup with DI water. Thoroughly mix the container of pH 7.00 buffer, making sure the solution is dated, and fresh. Rinse the probes in the calibration cup with pH 7.00 buffer, then fill the cup with the buffer. All probes should be submerged. Allow the readings to stabilize for approximately 90 seconds. Record the value on the display unit. This value should be recorded in the logbook as the check value. (Target value +/- 0.05 Standard Units)

6. After use in the field, conduct the post-calibration procedure by repeating steps 1 and 3. The displayed value should be recorded as the "after use" value. The difference between the "after use" value and the "calibrated" value is the drift. Record this value in the logbook.

Conductivity Calibration

1. Rinse the calibration cup twice with DI water, then once with the 0.02N KCl solution. Fill the calibration cup with the 0.02N KCl solution such that the conductivity block is fully submerged. Tap the sonde unit to dislodge any possible air bubbles.

2. Select **"Sonde Menu,"** then **"Calibrate,"** then **"conductivity,"** then **"sp. cond."** Enter the value 2.76 mS/cm for calibration of (0.02N KCl). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed sp.cond. value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". The display will then continue with options. Advance to **"sonde run."**

3. Rinse the calibration cup twice with DI water, then once with the 0.01N KCl solution. Fill the calibration cup with the 0.01N KCl solution such that the entire conductivity block is fully submerged. Tap the sonde unit to dislodge any possible air bubbles.

4. Record the displayed conductivity value in the logbook as the “initial reading”.

5. After use in the field, conduct the post-calibration procedure by repeating steps 1 and 3. The displayed value for each solution should be recorded as the “after use” value. The difference between the “after use” value and the “calibrated value” (for 0.02N KCl) and “initial value” (for 0.01N KCl) should be recorded as the drift.

Depth Calibration

1. Calibration of depth should occur in the field, immediately prior to use. Suspend the sonde unit by holding the cable, such that the probes are just above the water surface. Select **“Sonde Menu,”** then **“Calibrate”**, then **“Pressure-ABS”** on the display unit. Enter the calibrated value (0.0 meters). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Select "enter", the calibration will stabilize and be completed. Select the highlighted option **"continue"** by pressing "enter". The display will then continue with options. Advance to **"sonde run.”**

Battery Voltage Evaluation

1. Internal battery voltage is shown on the display unit. Batteries are replaced when the battery voltage indicator is down to 1/4 charge. Replace with four C cell batteries.

Temperature Calibration

1. The temperature sensor is factory calibrated.

2. Quarterly calibration checks are performed by the OCDWEP Lab.

ORP Calibration

The ORP sensor is factory calibrated. However, it is possible to calibrate or check the sensor using a standard Zobel’s solution. This calibration will be done quarterly.

2. Rinse the calibration cup twice with DI water, then once with the Zobel's solution. Fill the calibration cup with the Zobel's solution such that the ORP probe is fully submerged.

3. Select **“Sonde Menu,”** then **“Calibrate,”** then **“ORP”**. Record the temperature of the unit and enter the correct value for Zobel's solution which corresponds to the temperature value at 5ºC (See instrument manual for table). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed ORP value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". The display will then continue with options. Advance to **"sonde run.”**

Turbidity Calibration (6600 Sondes Only)

1. The Turbidity sensor is calibrated as needed for each use. A three- point calibration is performed at the office or in the field.

2. Rinse the calibration cup twice with DI water. (Note: Presence of air can cause erroneous readings.

DI water should be allowed to stand prior to calibration.)

3. Carefully fill the calibration cup with DI water by pouring the DI water gently onto the side of the calibration chamber to reduce air bubbles. Place the calibration cup/chamber with a black cover on the countertop. Approximately two to three inches of water will be sufficient.

4. Carefully place the sonde on top of the calibration cup. Loosely screw the cap on. Be sure that the sonde is stable and not going to fall over.

5. Select **"Sonde Menu"**, then **"Calibrate".** Scroll down to select **"Optic T-Turbidity".** Press Enter. Scroll to" **3- point calibration**". Press the "enter" key.

6. At this point, press the ESC and Enter key simultaneously. The screen will then ask if you want to **Uncal**. Select yes. The display will return to the calibration value screen.

7. The display will then ask for a calibration value, enter 0.0. Press the "enter" key. The unit will stabilize and display "Calibrate" and "Clean Optics". Scroll to "**clean optics**". When complete, scroll to "**calibrate**". When the display is stable, press the enter key. Unit will display "**Continue**" and press the enter key.

8. Rinse the calibration cup with 10 NTU standard. Check the expiration date on the standard prior to use. (**NOTE:** If you are limited on standard volume, the probes must be clean and dry prior to immersing in the standard.) Fill calibration cup with 10 NTU standard. Pour the standard gently onto the side of the calibration cup to prevent air bubbles. Be sure to use the black chamber cover. The standard should not be shaken or agitated. Again the sonde is placed on top of the chamber loosely. Follow the keypad instructions. The black turbidity probes are 6136 probes. The 10 NTU standard is adjusted to a value of 11.2 NTU. If the turbidity probe is gray in color the NTU standard value would be 10.0. Enter the second point **11.2** value. Press the "enter "key.

9. Rinse the calibration cup with 100 NTU standard. Check the expiration date on the standard prior to use.

10. Fill calibration cup with 100 NTU standard. Follow the keypad instructions. Again if the turbidity probe is black, it is a 6136 probe and the 100 NTU standard value is adjusted to 123 NTU. Enter third point **123** value. Press the "Enter" key.

10. Calibration is complete. Press **ESC** to go back to main screen.

ATTACHMENT D:

YSI 600/6600 Maintenance Procedures

YSI 600 & 6600 Maintenance

General Maintenance

1. After use, the YSI 600 / YSI 6600 units are stored clean and dry in the Field Support Staging room at the HCBF. Batteries are replaced on the 650 MDS when the battery voltage indicator is down to 1/4 charge. Replace with four C cell batteries.

2. The cable is cleaned and recoiled, clean and lubricate the rubber connectors. Store the sonde unit with ~ 1 inch of tap water in storage cup.

3. Check the Dissolved Oxygen (DO) membrane after each use and replace as needed. Avoid over stretching the membrane, invert sonde unit several times, check for trapped air bubbles under the membrane.

4. Rinse pH bulb with tap water to remove any film or debris. If good readings are not established, soak the probe in a dishwashing liquid solution for 10-15 minutes. A cotton swab can be used gently to clean the bulb, if needed.

Quarterly Maintenance

1. If the sonde does not have a good response time, soak the pH electrode in a 1:1 HCl solution for 30 - 60 minutes. Remove and rinse the electrode with water. If biological contamination is present soak the probe in a 1 to 1 dilution of chlorine bleach. Then rinse the probe in clean tap water for one hour, swirl occasionally.

2. Clean the Conductivity block and electrodes with a dishwashing liquid solution.

3. Maintain the ORP sensor in the same manner as the pH probe.

4. The depth sensor port should be inspected for blockages or build-ups of mineral or biological matter. A syringe can be used to flush out the ports with tap water.

5. The temperature sensor is factory set and requires no calibration, however, it should be checked against a certified laboratory thermometer quarterly. Wipe down the temperature sensor with a clean cloth.

6. The function of the Redox (ORP) sensor can be checked quarterly against a standard Zobel's solution.

Special Maintenance on the 6600 Sonde Units

1. The Turbidity optical sensor should be cleaned, as needed, using the attached wiper mechanism. The wiper should be changed as needed.

ATTACHMENT E:

YSI 600/6600 Operation Procedures

YSI 600 & 6600 Operation

Tributary Field Sampling

1. Transport the YSI 600 or 6600 sonde unit along with the 650 MDS in the carry case, with the storage cap secured. Be sure to keep the cable coiled neatly and secure the unit such that it does not slide in the cab of the vehicle. When using the unit in the field, set the case on a plastic crate, keeping it off the ground and clean.

2. Before lowering the sonde unit, attach the weighted probe guard. Throughout the day, and in between sampling sites, the probe guard may be removed and the storage cup is replaced.

3. Lower the sonde unit into the stream at mid-stream & mid-depth. This method should be used at all sampling locations except for the following sites. At the **Lake Outlet** sampling site collect a mid-channel profile along the bridge, obtain readings at half-meter increments and at 3.7 meters (corresponding to the sample depths of 2' and 12').

4. When securing the sonde unit cable to a railing be sure not to overly bend it, as that could damage the coaxial **cable**.

5. Log the data after approximately 2 minutes or when the readings appear stable. Record data by: selecting **"sonde run"** from the 650 Main Menu, then **select "log one sample"** from the 650 column, selecting **"enter"**. Choose a file name and select **"ok."** The display will tell you that the sample is logged. Note that the sonde unit will take longer to stabilize in cold weather.

Lake Sampling

1. Transport the YSI 600 or 6600 sonde unit along with the 650 MDS in the carry case, with the storage cap secured to the sonde unit. Be sure to keep the cable coiled neatly and secure the unit such that it does not slide in the cab of the vehicle.

2. Before lowering the sonde unit, attach the weighted probe guard. Throughout the day, and in between sampling sites, the probe guard may be removed and the storage cup is replaced.

3. Record data at every 0.5 meter increment, starting at the surface to the bottom. Log the data after approximately 2 minutes or when **the** readings appear stable. To record data for the event select **"sonde run"** from the 650 Main Menu, then **select "log one sample"** from the 650 column, selecting **"enter"**. Choose a file name and select **"ok."** The display will tell you that the sample is logged. Note that the sonde unit will take longer to stabilize in cold weather.

APPENDIX 3

QUALITY ASSURANCE PROGRAM PLAN

ONONDAGA LAKE AMP
2014 FISH SAMPLING PROGRAM

October 2014

Onondaga County Department of
WATER ENVIRONMENT PROTECTION

TABLE OF CONTENTS

1.0 INTRODUCTION/PURPOSE

As part of the Onondaga Lake Ambient Monitoring Program the Onondaga County Department of Water Environment Protection has prepared a Quality Assurance Program Plan (QAPP) for the Onondaga Lake Fish Sampling Program for 2014-2018. This document provides written documentation of the QAPP associated with a baseline fisheries investigation that was initiated in 2000, and subsequent revision or modifications to the program.

The County's long-term monitoring program includes assessment of physical, chemical, and biological attributes of the aquatic resource. The baseline Onondaga Lake Fisheries Monitoring Program, and subsequent annual efforts, are expected to address the goal of the *Ambient Monitoring Program* to assess progress towards "swimmable and fishable" conditions in Onondaga Lake by monitoring fish reproductive success and changes in the structure of the fish community.

Background

The Onondaga Lake fish sampling program was developed in consultation with expert technical advisors in limnology, engineering, statistics, and fisheries. In addition, Ichthyological Associates, Inc assisted with the development of the original document, and Ecologic, LLC assisted with the development of the original document and subsequent revisions. The 2014 lake fisheries program is summarized in Table 1.

Development of the QAPP

OCDWEP (formerly OCDDS), Ichthyological Associates, Inc. (IA), and EcoLogic, LLC (EcoLogic) staff met on August 15, 2000 to review the schedule and services to be provided for the AMP. Following those discussions, IA/EcoLogic began a series of meetings with OCDWEP technical staff to document procedures used for the Onondaga Lake 2000 Fisheries AMP. The meetings included interviews of OCDWEP staff involved in each aspect of the program. Following initial interviews IA/EcoLogic staff observed field collections of ongoing program and reviewed data entry requirements for each program. Following the initial interviews and review of the *Onondaga County Ambient Monitoring Program: Year 2000 Onondaga Lake Fish Sampling Program* (EcoLogic 2000), IA/EcoLogic prepared the initial draft of the QAPP for review and comment by the OCDWEP.

The purpose of the QAPP is to mesh field collection procedures and data requirements into a comprehensive document that provides a template for field, laboratory, and data management methods. The QAPP is meant to supplement in-house training of OCDWEP technicians and provide a framework from which trained staff can conduct consistent field surveys. The QAPP is considered to be a living document. That is, as changes are made in the Onondaga Lake Fisheries AMP, revisions will be made to the QAPP to reflect those changes.

Changes or revisions to the QAPP may include:

- intensity of the sampling program;
- incorporation of new elements to the program, or deletion of specific;
- revisions, clarifications, and improvements to methodologies; and
- incorporation of new methodologies into the program.

Thus the QAPP serves multiple purposes. It provides annual documentation of Standard Operating Procedures (SOPs), although more formal and detailed SOPs have developed for in-house training and documentation purposes. It also provides a framework of data forms designed to ensure collection and entry of data, and a framework for training of OCDWEP's staff via consistent mentoring by more senior, experienced staff through the structure of the QAPP.

The QAPP for the Onondaga Lake fish sampling program has been divided into chapters, with each chapter representing a major field component of the AMP. Each chapter provides a purpose and description of the component, the procedures for sampling that component, appropriate data sheets, maps, and descriptions of stations and station codes. The February 2014 version of the QAPP, incorporates program modifications to the 2014 fisheries assessment program.

Table 1. Summary of Year 2014 Onondaga Lake Fish Community AMP Sampling Plan.

2014 Onondaga Lake Fish Community Sampling Program

Component	Methodology/Gear	Sampling Objectives	Location and Number of Samples	Timing	Changes
Littoral Larvae	Larval fish seine swept for 10 m in littoral zone	Determine community structure and species richness.	-5 strata with 3 sites in each strata and 1 sweep at each site. -No. of Sites = 15 -Total No. of events = 2 -Total No. of samples = 30	-Annually -Daytime Twice per year -Mid-June -Mid-July	-Delete the mid-May sampling event
Juvenile Fish	50' x 4' x 1/4" bag seine swept into shore in the littoral zone.	Determine community structure and species richness.	-5 strata with 3 sites in each strata and 1 sweep at each site. -No. of Sites = 15 -Total No. of events = 2 -Total No. of samples = 30	-Annually -Daytime -Twice per year -Mid-August -Mid-September.	-Delete the first two sampling events in July and early August. Delete October sampling event
Nesting Fish	Lake wide nest survey.	Document spatial distribution and species composition	-Entire perimeter of lake divided into 24 equal length sections. -Total No. of events = 1 -Total No. of samples = 24	-Annually -Once in June when water temperature is between 15° and 20 °C.	-No Change from previous year.
Adult Fish-Littoral Zone	Boat mounted electrofisher in the littoral zone at night.	Determine community structure, species richness, CPUE, and relative abundance.	-Entire perimeter of lake shocked in 24 contiguous transects. -Alternating all-fish/gamefish transects. -Total No. of events = 1 -Total No. of samples = 24	-Annually -Night-time. -Once in the fall when water temp. between 15º and 21 ºC.	-Delete spring sampling event.
Adult Fish-Littoral Profundal Zone	Experimental gill nets of standard NYSDEC dimensions.	Determine community structure, and species richness.	-Two nets per strata. -Nets set on bottom, perpendicular to shore at a water depth of 3-10m for two hours. -Total No. of events = 2 -Total No. of samples = 20	-Annually -Night-time. -Twice per year, within one week of littoral electrofishing.	Delete adult fish littoral profundal zone sampling 2014-2018.

2.0 STAFF TRAINING

The OCDWEP has approached the AMP under the self-monitoring element that is central to the Federal Clean Water Act. OCDWEP has acquired a staff with a wide range of academic education supplemented by experience gained by working for state fisheries agencies, universities, and environmental consulting and research firms. This staff of scientists and technicians are supported by maintenance and operation personnel that provide the skills to build, construct, maintain, and modify gear needed to conduct the fisheries surveys. This expertise allows the OCDWEP to successfully train and mentor qualified individuals to provide a high level of quality to the data of the fisheries program. As with any long-term monitoring program, individuals will advance in their careers, retire, or move to new locations. This matriculation will require periodic in-house training of new individuals. The QAPP is integral to this training. Its use and understanding will provide each individual with an easy to understand document to ensure day-to-day and year-to-year consistency of the Onondaga Lake Fish Sampling Program.

In addition to the QAPP and SOPs, the County, conducts annual audits for each biological monitoring component. The audits are intended to ensure that the field technicians conducted their work in a professional manner and comply with the procedures outlined in the QAPP and SOPs. In addition, the audits determine if any observation would jeopardize the quality of the data (technique, field logs, training, etc.). The biological monitoring component to be audited annually includes the nesting survey, littoral larval seining, juvenile seining, adult electrofishing.

Thus the use of the QAPP in conjunction with the formal Standard Operating Procedures (SOPs) and internal audits for the biological monitoring program activities, the *Onondaga County Ambient Monitoring Program: Onondaga Lake Fish Sampling Program (2014)*, and subsequent programs, will provide OCDWEP with a successful fisheries assessment program.

3.0 LITTORAL LARVAE – LARVAL SEINE

3.1 **Procedures**

Littoral larval samples will be collected using a 500 um seine (seine dimension - 10' x 3.5') during two sampling events occurring in mid-June, and early to mid-July. Three randomly selected sites within each of five strata encompassing the littoral zone of the lake were selected in 2000 and are revisited for each sampling event (Figure 7.5.2.3: Location of Larval Seine Sites in 7.5 Biological Monitoring Programs). These sites are physically marked on the shoreline and their coordinates documented with a GPS unit. One sample will be collected at each sampling site for a total of 15 samples collected from Onondaga Lake during each sampling event.

3.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs
Step 2. Assemble field data sheet packet and equipment.
Step 3. Examine equipment for needed repairs.
Step 4. Print labels and pre-label sample jars.
Step 5. Check calibration of water quality (WQ) meter.
Step 6. Review weather reports.

3.1.2 Field:

Step 1. Proceed to appropriate station and record WQ meter number, facility code/location, date, time, and WQ data at surface.
Step 2. Stretch the seine out on shore and remove any material lodged in mesh. Check for holes and repair if necessary.
Step 3. Bring net to the beginning of the sampling site (previously selected and marked).
Step 4. Walk seine (out of water) off shore until 1-m depth is reached, and deploy it perpendicular to the shoreline being sure to remove any twists.
Step 5. With net stretched, both technicians in unison sweep the net perpendicular to the shoreline for a distance of 10 m. A sample will be rejected if the net must be lifted or stopped to dislodge a snag.
Step 6. When 10 m is reached, both ends of the net (lead line only) are lifted in unison to a horizontal position with the float line.
Step 7. Walk net to shore and carefully place net into a tub large enough to handle the entire net and provide suitable room for wash down.
Step 8. With the net in the tub, stretch a portion of the net out and wash all material on it into the tub with lake water filtered with a 541-micron wash bucket.
Step 9. Repeat step 2
Step 10. Pour the entire contents of the tub into a 541-micron wash bucket and place contents into a sample jar and preserve it with 10% buffered formalin.
Step 11. Review data sheets for completeness before proceeding to next station.

3.1.3 End of Sample Day

Step 1 Review field notes for completeness and QAPP sign offs.
Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs.

3.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.
Step 2. Submit duplicate copy of data sheets/notes for data entry.

3.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

Facility code/station description (Table 2, Appendix A1)
Station data sheet (Table 3, Appendix A1)
Map showing location of sampling stations (Figure 7.5.2.3: Location of Larval Seine Sites in 7.5 Biological Monitoring Programs).
Sample labels
Chain-of-custody forms (as appropriate)

Appendix A1 contains examples of the station data sheet and a list of facility codes/station description.

4.0 LITTORAL YOUNG-OF-YEAR (YOY)/JUVENILE FISH – BAG SEINE

4.1 Procedures

Littoral YOY/juvenile fish will be collected using a bag seine (seine dimension - 50' x 4' x 1/4") during two sampling events occurring in mid-August and mid-September, resulting in a total of two (2) sampling events. Three (3) randomly selected sites within each of five (5) strata encompassing the littoral zone of the lake were selected in 2000 and are revisited for each sampling event (Figure 7.5.2.2: in 7.5 Biological Monitoring Programs). These sites are physically marked on the shoreline and their coordinates documented with a GPS unit.

4.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: field data sheet packet and equipment.

Step 3. Examine equipment for needed repairs.

Step 4. Check calibration of water quality (WQ) meter.

Step 5. Review weather reports for sampling feasibility.

4.1.2 Field:

Step 1. Proceed to appropriate station and record WQ meter number, facility code/location, date, time, and WQ data at the near surface. Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

Step 2. Stretch the seine out on shore and remove any material lodged in the mesh. Check for holes and repair if necessary.

Step 3. Bring net to the marked site location. (Note: Sites have been previously selected and marked by OCDWEP staff).

Step 4. Walk one end of the seine off shore until full length of net is deployed perpendicular to the shoreline.

Step 5. Check the bag section of the seine to make sure it is fully deployed and not tangled.

Step 6. With one person holding the in-shore brail stationary, a second person sweeps the offshore brail to shore. A third person walks behind the bag end of the seine to dislodge the seine if it becomes stuck. A sample will be rejected if the leadline of the seine must be lifted or the seine must be fully stopped in order to dislodge the snag. In this case, the site will be returned to later during the sampling event to collect the sample.

Step 7. As the offshore brail approaches shore, the two brails will be worked together, and the seine will be beached while being careful to maintain the integrity of the bag section of the seine and keeping the leadline on bottom.

Step 8. Immediately upon retrieval of the seine all fish will be picked and placed in holding tanks. Care shall be taken to sort through captured debris (algae mats and macrophytes) in order to retrieve all fish. In the event adult fish are captured, they should be identified to species, counted, released back into the lake, and noted as such on the data forms. Representative adult bass and other selected game fish should be tagged with a numbered floy tag, measured and sampled for scales (scales are only collected in the fall) prior to release. The tag number, scale envelope number, and other related information should be recorded on the appropriate data form.

Step 9. Stretch the seine out on shore and remove any material lodged in the mesh. Check for holes and repair if necessary.

Step 10. Stretch out seine to dry while processing samples.

Step 11. A minimum of 30 random individuals in each life stage (YOY and juvenile) and species should be measured (total length in mm). Remaining fish should be mass-counted based on life stage (YOY, juvenile, adult). YOY sunfish should be grouped as "*Lepomis* sp." All other individuals should be identified to species. All fish should be returned to the lake after completing measurements.

Unknown species should be noted as such on the data forms by number (for example *Unknown Species No.1* and *Unknown Species No. 2*) and placed in a formalin-filled, labeled jar and identified later in the laboratory (wear Nitrile gloves, safety glasses, and a full face shield during this operation).

Step 12. Review data sheets for completeness before proceeding to next station.

4.1.3 End of Sample Day

Step 1. Review field notes for completeness and QAPP sign offs.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

4.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

4.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Facility code/station description (Table 4, Appendix A2)
- Station data sheet (Table 5, Appendix A2)
- Individual fish data sheet (Table 6, Appendix A2)
- Bulk fish data sheet (Table 7, Appendix A2)
- Map showing location of sampling stations (Figure 7.5.2.2 in 7.5 Biological Monitoring Programs)
- List of fish species codes/names (Table 8, Appendix A2)
- Sample labels.
- Scale envelopes.

Appendix A2 contains examples of the station data sheet, individual fish data sheet, bulk fish data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names appropriate for use in sampling littoral YOY and juvenile fish.

5.0 NESTING SURVEY

5.1 Procedures

Nesting survey transects were determined in 2000 by dividing the lake's littoral zone into twenty-four (24) approximately equal length transects that encompass the entire perimeter of the lake (Figure 7.5.2.4 in 7.5 Biological Monitoring Programs). These transects are utilized for each annual event, and these are the same transects used for the adult fish boat electrofishing events. The beginning and ends of each transect are designated by GPS coordinates. Fish nests will be identified when possible and counted along these transects that are parallel to the shoreline. Date of the survey will be determined based on the time of year (June), water temperature (between 15 and 20ºC), water clarity (ability to see bottom in 2 m of water), weather conditions (sunny and calm), and observations of peak spawning activities of select gamefish.

5.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of program.

Step 2. Determine if bluegill, pumpkinseed and largemouth bass appear to be near peak spawn (typically observed during other lake sampling events).

Step 3. Determine if water visibility is at least 2 m (based on secchi disc readings).

Step 4. Assemble: field data sheet packet and equipment.

Step 5. Examine equipment for needed repairs.

Step 6. Check calibration of water quality (WQ) meter.

Step 7. Review weather reports for sampling feasibility.

5.1.2 Field:

Step 1. Proceed to appropriate transect and position boat at its start in 1 m of water. Record WQ meter number, facility code/location, date, time, and WQ data at the near surface. Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

Step 2. Post one technician on the bow of the boat with polarized glasses. This technician will serve as nest spotter. Position a second technician in the center of the boat. This technician will serve as the data recorder. A third technician serves as the boat driver.

Step 3. Start boat and proceed parallel to shore keeping the boat in 1 m of water at all times. Speed of travel will be dependent on the nest spotters and nest density.

Step 4. The technician on the bow will count and report to the data recorder all nests observed, and when possible identify species on the nest. The observer shall report nest counts to the recorder every five (5) to ten (10) fish nest observed. An alternative method is to utilize a mechanical handheld counter.

Step 5. The driver will stop the boat at the end of the transect.

Step 6. Review data sheets for completeness before proceeding to next transect.

Step 7. Bring the boat to the beginning of the next transect and repeat steps 1 through 6.

5.1.3 End of Sample Day

Step 1. Review field notes for completeness and QAPP sign offs.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

5.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

5.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Facility code/station description ((Table 9, Appendix A3).
- Station data sheet with list of fish species codes/names (Table 10, Appendix A3).
- Map showing location of sampling stations (Figure 7.5.2.4 in 7.5 Biological Monitoring Programs)

Appendix A3 contains examples of the station data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names (located on station data sheet) appropriate for use in conducting a nest survey.

6.0 ADULT FISH – BOAT ELECTROFISHING

6.1 Procedures

Boat electrofishing stations were determined in 2000 by dividing the lake's littoral zone into twenty-four (24) approximately equal length transects that encompass the entire perimeter of the lake (Figure 7.5.2.1 in 7.5 Biological Monitoring Programs). These transects are utilized for each sampling event and do not change year to year. The beginning and ends of each transect are designated by GPS coordinates. Transects are divided into alternating all-fish/gamefish samples (odd number transects are always all fish and even numbered transects are always game fish only). In "all-fish" transects all species are netted, while in "gamefish only" transects only those species designated as gamefish by the County are netted (Appendix A5). Time spent electrofishing at each transect will be recorded during each sampling event to allow for standardization of catch per unit effort.

Boat electrofishing is conducted in the Fall based on surface water temperatures between 15 and 21° C. During the sampling event, fish will be collected during the night along the twenty-four (24) transects distributed around the perimeter of the lake, resulting in collection of a total of forty-eight (24) boat electrofishing samples/transects for the year (12 all-fish and 12 gamefish).

6.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: field data sheet packet and equipment.

Step 3. Examine equipment for needed repairs.

Step 4. Check calibration of water quality (WQ) meter.

Step 5. Review weather reports for sampling feasibility.

Step 6. Notify the OCDWEP Metro Board operator of proposed night sampling event.

6.1.2 Field:

Step 1. Proceed to predetermined transect location and record facility code/location, date, time, and WQ data taken at near surface depth. Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

This event will require four technicians, two (2) will collect fish with nets at the front of the electrofishing boat, one (1) will be the data recorder, and one (1) will drive and operate the generator/pulsator.

Step 2. Determine if transect is for all fish or game fish (odd number transects are all fish and even numbered transects are game fish).

Step 3. Record start of sample data: time of day, starting seconds on pulsator, and actual GPS coordinates.

Step 4. Place boat into forward gear at idle speed. Start the generator, activate electrofisher and begin collection of fish. The two netting technicians will maintain the foot pedal, that activates the electrofisher, in the "on" position for the entire transect. For gamefish transects any fish that resembles one of the gamefish species should be boated. If the fish is identified as being a non-gamefish species while still in the net it may be immediately released.

For all-fish transects, an attempt should be made to collect all fish encountered, with the exception of common carp, or gizzard shad and alewives occurring in large schools or quantities incapable of boarding. The quantity of common carp within netting distance shall be counted (or estimated if in large numbers) and noted as a count (or estimate) in the bulk fish section of the field sheet.

Gizzard shad and alewives occurring in large schools or un-boardable quantities may be estimated without actually collecting each fish (this will minimize catch mortality and will prevent under estimating significant quantities of "missed/non-boarded" fish. However, these "missed/non-boarded" fish shall be noted in the bulk fish section of the field sheet as an "estimate". Gizzard shad and alewives that are boarded, but are in excess of the 30 individuals initially counted and measured, shall be individually counted (not measured) and noted in the bulk fish section of the field sheets as a "count". Because of the difficulty in differentiating small shad and alewives from one another, if a school of small clupeids (shad/alewives) is encountered, a sample of the school should be netted, brought on board and identified. After positive identification the number of fish in the school can be estimated.

For all other species, missed fish shall be estimated, and recorded in the bulk fish section of the field sheets as an "estimate". Since the two netting technicians will be maintaining a mental tally of "missed/non-boarded" fish, this data should be recorded immediate following the completion of each transect to minimize loss of semi-quantifiable data.

Step 5. Record electrofisher data: voltage, amps, and pulse width. Monitor settings and displays throughout the transect.

Step 6. Maintain the boat electrofisher on course approximately parallel with the shore in one meter of water at approximately idle speed (the motor tilt will need to be adjusted to maintain appropriate speed). The boat may be slowed down in order to try and capture a rare fish that is initially missed by the netters. However, all attempts should be made to keep the boat moving slowly forward in approximately one meter of water for the majority of the transect.

Note: All attempts are made to maintain the monitoring depth of one (1) meter. However, the natural variation of the depth contours or abrupt drop offs (natural or man-made) may result in short periods of shallower or deeper monitoring.

Step 7. When the end of the transect is reached, turn off electrofisher unit, and return boat to neutral.

Step 8. Record time, GPS coordinates, and miscellaneous collection notes (missed/non-boarded fish, estimates, counts, etc.)

Step 9. Proceed to approximately the mid-transect location to work up collected fish.

Step 10. Fish whose numbers were estimated should be entered in the bulk fish section of the field form first to prevent omissions.

Then, collected fish should be identified to species, measured for length (nearest mm), and measured for weight (nearest gram).

Note: Individual fish weighing less than 100 grams will be weighed on the small scale.

If the small scale will not stabilize, multiple fish of the same species and size range may be bulk weighed and divided by the total number of fish to establish a relative weight (e.g. weigh all alewife between 140 mm and 160 mm – divide total weight of all alewife weighed by total number of alewife to establish a relative weight for each of the individual alewife). These weights shall be noted in the comment section of the individual fish data sheet as a "bulk weight".

For samples in which small to moderate numbers of fish are collected (less than 30), all fish should be measured. In samples in which high numbers (greater than 30) of one or more species are collected, random sub-samples of the abundant species will be measured, and the remaining individuals of those species need only be counted and listed in the bulk fish data sheet. This will result in some samples having both individual fish data and bulk fish data. Fish not measured individually should be mass-counted based on life stage (YOY, juvenile, adult). Unknown species should be noted as such on the data forms by number (for example unknown species 1 and unknown species 2) and placed in a formalin-filled, labeled jar and identified later.

Step 11. Representative adult bass and other selected game fish should be tagged with a numbered floy tag and sampled for scales prior to release. In addition, 30 individuals from the following species (bluegill, pumpkinseed, white perch, yellow perch, and gizzard shad) shall also be randomly sampled for scales prior to release during the sampling event.

On spiny-rayed species, including but not limited to largemouth bass, smallmouth bass, bluegill, pumpkinseed, white perch, walleye, yellow perch and black crappie, scales will be removed from left side of the body below the lateral line, near the tip of the depressed left pectoral fin. On soft-rayed species, including trout and salmon, scales will be removed from the middle region of the body above the lateral line, beneath the posterior end of the dorsal fin on the left side.

Fish that are tagged should appear to be in good health and not overly stressed from the capture experience. The tag number, scale envelope number, and other related information should be recorded on the appropriate data form. Any recaptured fish shall be recorded on the individual field sheet data form, and evaluated to determine the need for a replacement tag.

Step 12. Review data sheets for completeness before proceeding to next station.

6.1.3 End of Sample Day

Step 1. Notify Metro Board of safe return from field.

Step 2. Review field notes for completeness and QAPP sign offs.

Step 3. Submit original data sheets and field notes for duplication.

Step 4. Write down needed equipment repairs and report to supervisor.

6.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

6.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Facility code/station description (Table 11, Appendix A4).
- Station data sheet (Table 12, Appendix A4).
- Individual fish data sheet (Table 13, Appendix A4).
- Bulk fish data sheet (Table 14, Appendix A4).
- List of fish species codes/names (Table 8, Appendix A2)
- Map showing location of sampling stations (Figure 7.5.2.1 in 7.5 Biological Monitoring Programs)
- Sample labels.
- Scale envelopes.

Appendix A4 contains examples of the station data sheet, individual fish data sheet, bulk fish data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names appropriate for use in sampling littoral adult fish.

7.0 DEFORMITIES, EROSIONS, LESIONS, TUMORS, FUNGAL INFECTIONS, AND MALIGNANCIES (DELTFM) MONITORING

Tracking of DELTFM parameters will be conducted in conjunction with all fisheries sampling activities with the exception of larval fish sampling and the adult fish nesting survey. DELTFM parameters will be recorded for only individual juvenile fish (not the bulk counts). All captured fish will be screened for any visible abnormalities. The abnormalities will be recorded on the corresponding data sheet. The technicians will be required to record the following abnormalities on the data sheets:

Deformities – Any distorted form of the fish's anatomy.
Erosions – Wear marks, scares, or scrapes.
Lesions – Visible sores, or wounds.
Tumors – A localized swelling of tissue on or in the body that has no physical function.
Fungal Infections – Any visible fungal growth on the fish.
Malignancies – A growth that could be cancerous. (use field judgment).

8.0 CHRONOLOGY OF QAPP

The QAPP for the Onondaga Lake Fish Sampling Program is a living document in that it will be periodically updated to reflect changes in the monitoring program that are instituted to improve the efficiency of data collection, focus on a particular aspect of the fish community, or narrow or expand the scope of investigation. The periodic updating of the QAPP will provide a written record of sampling procedures over the entire life of the Onondaga Lake Fish Sampling Program. This February 2010 version of the QAPP is the ninth version/issue of the document.

The first version (Initial Draft) was submitted to OCDWEP on October 18, 2000 for review and comment by OCDWEP staff. Following review of the Initial Draft by OCDWEP, a meeting was held between IA and OCDWEP in which comments on the Initial Draft were provided. These comments, along with information gathered during data analysis and report preparation for the 2000 fish sampling program were incorporated into a second version of the document submitted to OCDWEP in July 2001. Annual revisions to the QAPP have incorporated various changes made to the fisheries assessment program.

The original QAPP, and subsequent revisions, have been reviewed by the NYSDEC, revised by OCDWEP as requested, and approved by the NYSDEC prior to implementation.

9.0 LITERATURE CITED

EcoLogic, LLC. *Onondaga County Ambient Monitoring Program: Year 2000 Onondaga Lake Fish Sampling Program. Prepared for Onondaga County Department of Drainage and Sanitation, Syracuse, NY. EcoLogic, LLC., Cazenovia, NY.*

OCDWEP *SOP For Fish Scale Age and Growth Determination (DOC No. BIO-001)*

OCDWEP *SOP For Larval Fish Identification (DOC No. BIO-002)*

OCDWEP *SOP For Fish Tagging (DOC No. BIO-003)*

OCDWEP	*SOP For Littoral-Profundal Zone Fixed Deep Water Gill Net Sampling (DOC No. BIO-006)*
OCDWEP	*SOP For Littoral Zone Electrofishing (DOC No. BIO-007)*
OCDWEP	*SOP For Littoral Zone Young-Of-Year and Juvenile Fish Bag Seine (DOC No. BIO-008)*
OCDWEP	*SOP For Fish Nesting Survey (DOC No. BIO-009)*
OCDWEP	*SOP For Littoral Zone Larval Fish Seine (DOC No. BIO-014)*

APPENDIX A1: Field Data Packet for Littoral Larval Fish Sampling

Table 2. Facility Code and Station Description

Facility Code	Site Abbreviation	Site Description
2536	ST1LL1R1	Stratum 1 Larval Seine Site 1
2539	ST1LL2R1	Stratum 1 Larval Seine Site 2
2542	ST1LL3R1	Stratum 1 Larval Seine Site 3
2545	ST2LL1R1	Stratum 2 Larval Seine Site 1
2548	ST2LL2R1	Stratum 2 Larval Seine Site 2
2551	ST2LL3R1	Stratum 2 Larval Seine Site 3
2554	ST3LL1R1	Stratum 3 Larval Seine Site 1
2557	ST3LL2R1	Stratum 3 Larval Seine Site 2
2560	ST3LL3R1	Stratum 3 Larval Seine Site 3
2563	ST4LL1R1	Stratum 4 Larval Seine Site 1
2566	ST4LL2R1	Stratum 4 Larval Seine Site 2
2569	ST4LL3R1	Stratum 4 Larval Seine Site 3
2572	ST5LL1R1	Stratum 5 Larval Seine Site 1
2575	ST5LL2R1	Stratum 5 Larval Seine Site 2
2578	ST5LL3R1	Stratum 5 Larval Seine Site 3

Table 3. Station Data Sheet for Littoral Larval Fish Sampling

Onondaga County Department of Water Envrironment Protection
Onondaga Lake Fish Monitoring Program

Page 1 of ______

LITTORAL LARVAL -- SEINE

Date: ____________ **Stratum:** ____________
Crew: ____________ **Site:** ____________
Time Start: ________ (Start Seining) **Time End:** ________ (Processing Fish) **Facility Code:** ____________

GPS North: 43° ________ West: 76° ________ *(decimal minutes)*

Field Observations - Only Enter One (1) Option

Weather: ____________
OVercast PartlyCloudy HaZy CLear RAining SNowing

Waves: *Calm / Swells / Whitecaps*
Water Clarity: *Poor / Moderate / Good*

Wind: ________ **from:** ________
0-5mph 5-10 10-15 >15 *N,SE,SSE, etc.*

Significant Rainfall in the Last 48 Hours? *Yes / No*

Habitat and Substrate Observations - Include Only The Actual Physical Area Seined.

Habitat: Vegetation ________ Pct cover ________ Structure ________ Pct ________
Emergent Submerged Algae Debris None *overhead Veg. Rocks Logs Dropoff Manmade*
Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%

Substrate: *VeGetated Plant Debris MuD SIlt SAnd* Type ________ Pct ________
GRavel CObble BOulder BedRock CLay Type ________ Pct ________
ONcolites WasteBed ConcreTe MarL UNknown Type ________ Pct ________
Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%

Water Quality:

Depth(m)	*Temp('C)*	*DO(mg/l)*	*DO(%Sat)*	*Cond*	*pH*	*Redox*

Average Depth (m): ________ **Shoreline Length (m)** ________

Comments: *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

____
____
____
____
____

Data Validity Classification: *Good / Conditional / Invalid*
# of Attached Data Sheets: Bulk Fish ________ Indiv. Fish ________

QAPP Signoffs (Initital and Date):
Field: ____________ ____________ Office: ____________ ____________ Data Entry: ____________ ____________

Original Prepared for OCDWEP by Ichthyological Associates, Inc. *Revised by OCDWEP 2/2006*

APPENDIX A2:

Field Data Packet for Littoral YOY/Juvenile Fish Sampling

Table 4. Facility Code and Station Description

Facility Code	Site Abbreviation	Site Description
2581	ST1JS1R1	Stratum 1 Juvenile Seine Site 1
2584	ST1JS2R1	Stratum 1 Juvenile Seine Site 2
2587	ST1JS3R1	Stratum 1 Juvenile Seine Site 3
2590	ST2JS1R1	Stratum 2 Juvenile Seine Site 1
2593	ST2JS2R1	Stratum 2 Juvenile Seine Site 2
2596	ST2JS3R1	Stratum 2 Juvenile Seine Site 3
2599	ST3JS1R1	Stratum 3 Juvenile Seine Site 1
2602	ST3JS2R1	Stratum 3 Juvenile Seine Site 2
2605	ST3JS3R1	Stratum 3 Juvenile Seine Site 3
2608	ST4JS1R1	Stratum 4 Juvenile Seine Site 1
2611	ST4JS2R1	Stratum 4 Juvenile Seine Site 2
2614	ST4JS3R1	Stratum 4 Juvenile Seine Site 3
2617	ST5JS1R1	Stratum 5 Juvenile Seine Site 1
2620	ST5JS2R1	Stratum 5 Juvenile Seine Site 2
2623	ST5JS3R1	Stratum 5 Juvenile Seine Site 3

Table 5. Station Data Sheet for Juvenile Fish Sampling

Onondaga County Department of Water Envrironment Protection
Onondaga Lake Fish Monitoring Program

LITTORAL JUVENILES -- BAG SEINE

Date: ____________ **Stratum:** ____________
Crew: ____________ **Site:** ____________
Time Start: ________ (Start Seining) **Time End:** ________ (Processing Fish) **Facility Code:** ____________

GPS North: 43° ________ West: 76° ________ *(decimal minutes)*

Field Observations - Only Enter One (1) Option

Weather: ____________
OVercast PartlyCloudy HaZy CLear RAining SNowing

Waves: *Calm / Swells / Whitecaps*

Water Clarity: *Poor / Moderate / Good*

Wind: ________ **from:** ________
0-5mph 5-10 10-15 >15 *N,SE,SSE, etc.*

Significant Rainfall in the Last 48 Hours? *Yes / No*

Habitat and Substrate Observations - Include Only The Actual Physical Area Seined.

Habitat: Vegetation ________ Pct cover ________ Structure ________ Pct ________
Emergent Submerged Algae Debris None *overhead Veg. Rocks Logs Dropoff Manmade*
Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%

Substrate: *VeGetated Plant Debris MuD SIlt SAnd* Type ______ Pct ______
GRavel CObble BOulder BedRock CLay Type ______ Pct ______
ONcolites WasteBed ConcreTe MarL UNknown Type ______ Pct ______
Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%

Water Quality:

Depth(m)	*Temp('C)*	*DO(mg/l)*	*DO(%Sat)*	*Cond*	*pH*	*Redox*

Average Depth (m): ________ **Shoreline Length (m)** ________

Comments: *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

____
____
____
____
____

Data Validity Classification: *Good / Conditional / Invalid*
# of Attached Data Sheets: Bulk Fish ________ Indiv. Fish ________

QAPP Signoffs (Initital and Date):
Field: ____________ Office: ____________ Data Entry: ____________

Original Prepared for OCDWEP by Ichthyological Associates, Inc. *Revised by OCDWEP 2/2006*

Table 6. Individual Fish Data Sheet for Juvenile Fish Sampling.

Onondaga County Department of Water Environment Protection
Onondaga Lake Fisheries Assessment Program

Page _____ **of** __________

INDIVIDUAL FISH DATA SHEET

Date: __________ **Program/GearType:** __________
Facility Code: __________ **Location/Site:** __________
(Include Facility Codes for all samples on data sheet)

Facility Code	Species Code	Common Name	Stage *(A,J,Y)*	Length *(mm)*	Weight *(grams)*	Scale #	Tag #	*Is fish Dead?*	DELTFM *Codes*	Comments

QAPP Signoffs (Initital and Date):
Field: __________ Office: __________ Data Entry: __________

Original Prepared for OCDWEP by Ichthyological Associates, Inc. *Revised by OCDWEP 2/2006*

Table 7. Bulk Fish Data Sheet For Juvenile Fish Sampling.

Onondaga County Department of Water Environment Protection
Onondaga Lake Fisheries Assessment Program

Page ______ **of** ______

BULK CATCH DATA SHEET

(Record Individual Fish > Initial 30 Count, and Non-Boarded Estimates and/or Counts)

Date: ______________ **Program/GearType:** ______________________

Facility Code: ______________________________ **Location/Site:** ______________________

(Include Facility Codes for all samples on data sheet)

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
Total Fish:							

QAPP Signoffs (Initital and Date):

Field: ______________ Office: ______________________ Data Entry: ______________________

*** All fish with obvious DELTFM parameters must be listed on the individual fish data form.**

Revised by OCDWEP 2/2

Table 8. List of fish species codes/names.

Species Code	Common Name	Species Code	Common Name	Species Code	Common Name
0	No Catch	390	Spottail shiner	576	White bass
207	Sea lamprey	394	Spotfin Shiner	576.1	Temperate Basses
268	Longnose gar	396	Redfin shiner	591	Rock bass
271	Bowfin	397.1	Notropis sp.	595	Green sunfish
276	American eel	400	Bluntnose minnow	596	Pumpkinseed
285	Blueback Herring	401	Fathead minnow	598	Bluegill
289	Alewife	401.1	Pimephalus sp.	599.1	Lepomis sp.
290.1	Blueback and/or Alewife	403	Longnose dace	600	Smallmouth bass
294	Gizzard shad	406	Creek chub	601	Largemouth bass
297.1	Herring Family (Cluepeidae)	407	Fallfish	601.1	Black Bass (SM or LM)
326	Rainbow trout	408.1	Semotilus sp.	602	White crappie
327	Atlantic salmon	409.1	Minnow Family (Cyprinadae)	603	Black crappie
328	Brown trout	419	White sucker	603.1	Crappie (White or Black)
329	Brook trout	423	Northern hog sucker	603.2	Sunfish Family (Centrarchidae)
329.1	Tiger Trout (hybrid)	432	Shorthead redhorse	613	Johnny darter
332	Splake	433.1	Suckers (Catostomidae)	614	Tesselated darter
332.1	Trout Family (Salmonidae)	443	Yellow bullhead	616.1	Ethostoma sp.
335	Rainbow smelt	444	Brown bullhead	617	Yellow perch
340	Central mudminnow	444.1	Bullhead (species unknown)	618	Logperch
347	Northern pike	445	Channel catfish	624.1	Darter (not YPerch)
349	Chain pickerel	450.1	Freshwater Catfish	626	Walleye
350	Tiger muskellunge	461	Trout perch	628.1	Perch Family (Percidae)
350.1	Pike Family (Esocidae)	493	Burbot	700	Freshwater drum
365	Carp	531	Banded killifish	792	Round Goby
377	Golden shiner	545	Brook Silverside	970	NS (Bullhead sunfish, etc)
381	Emerald shiner	561	Brook stickleback	999	SPECIES UNKNOWN
385	Common shiner	575	White perch		

APPENDIX A3:

Field Data Packet For Nesting Surveys

Table 9. Facility Code and Station Description

Facility Code	Site Abbreviation	Site Description
2626	NS1	Nesting Survey Transect 1
2627	NS2	Nesting Survey Transect 2
2628	NS3	Nesting Survey Transect 3
2629	NS4	Nesting Survey Transect 4
2630	NS5	Nesting Survey Transect 5
2631	NS6	Nesting Survey Transect 6
2632	NS7	Nesting Survey Transect 7
2633	NS8	Nesting Survey Transect 8
2634	NS9	Nesting Survey Transect 9
2635	NS10	Nesting Survey Transect 10
2636	NS11	Nesting Survey Transect 11
2637	NS12	Nesting Survey Transect 12
2638	NS13	Nesting Survey Transect 13
2639	NS14	Nesting Survey Transect 14
2640	NS15	Nesting Survey Transect 15
2641	NS16	Nesting Survey Transect 16
2642	NS17	Nesting Survey Transect 17
2643	NS18	Nesting Survey Transect 18
2644	NS19	Nesting Survey Transect 19
2645	NS20	Nesting Survey Transect 20
2646	NS21	Nesting Survey Transect 21
2647	NS22	Nesting Survey Transect 22
2648	NS23	Nesting Survey Transect 23
2649	NS24	Nesting Survey Transect 24

Table 10. Station Data Sheet with Species Codes for Nesting Survey

Onondaga County Department of Water Environment Protection
Onondaga Lake Fish Monitoring Program

Page 1 of ______

NEST SURVEY COVER SHEET

Date: ______________ **Transect:** ______________
Crew: ______________ **Facility Code:** ______________
Time Start: ________ **End:** ________ **Observer:** ______________

Field Observations - Only Enter One (1) Option

GPS: *Starting Coordinates* North: 43° ________ West: 76° ________ *(decimal minutes)*
Ending Coordinates North: 43° ________ West: 76° ________ *(decimal minutes)*

Weather: ______________
OVercast PartlyCloudy HaZy CLear RAining

Waves: *Calm / Swells / Whitecaps*
Water Clarity: *Poor / Moderate / Good*

Wind: ________ **from:** ________
0-5mph 5-10 10-15 >15 *N,SE,SSE, etc.*

Significant Rainfall in the Last 48 Hours?
Yes / No

Habitat: Vegetation ______ Pct cover ______ Structure ________ Pct ______
Emergent Submerged Algae Debris *overhead Veg. Rocks Logs Dropoff Manmade*
Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%

Substrate: *VeGetated Plant Debris MuD SIlt SAnd* Type ________ Pct ________
GRavel CObble BOulder BedRock CLay Type ________ Pct ________
ONcolites WasteBed ConcreTe MarL UNknown Type ________ Pct ________
Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%

Water Quality:

Depth(m)	Temp('C)	DO(mg/l)	DO(%Sat)	Cond	pH	Redox

Comments: *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

____

____

NUMBER OF NESTS OBSERVED

SppCode	Common Name	Field Marks	#Nests
999	UNKNOWN		
596	Pumpkinseed		
598	Bluegill		
599.1	Lepomis. sp.		
600	Smallmouth Bass		
601	Largemouth Bass		
601.1	Black Bass		
444.1	Bullhead		
		Total No. of Nests Observed:	

Average Water Depth (Meters) ________ **Data Validity Class:** *Good / Conditional / Invalid*

QAPP Signoffs (Initital and Date):
Field: ______________ Office: ______________ Data Entry: ______________

Original Prepared for OCDWEP by Ichthyological Associates, Inc. *Revised by OCDWEP 2/2008*

APPENDIX A4:

Table 11. Facility Code and Station Description

Facility Code	Site Abbreviation	Site Description
2676	EF1	Electrofishing Transect 1
2677	EF2	Electrofishing Transect 2
2678	EF3	Electrofishing Transect 3
2679	EF4	Electrofishing Transect 4
2680	EF5	Electrofishing Transect 5
2681	EF6	Electrofishing Transect 6
2682	EF7	Electrofishing Transect 7
2683	EF8	Electrofishing Transect 8
2684	EF9	Electrofishing Transect 9
2685	EF10	Electrofishing Transect 10
2686	EF11	Electrofishing Transect 11
2687	EF12	Electrofishing Transect 12
2688	EF13	Electrofishing Transect 13
2689	EF14	Electrofishing Transect 14
2690	EF15	Electrofishing Transect 15
2691	EF16	Electrofishing Transect 16
2692	EF17	Electrofishing Transect 17
2693	EF18	Electrofishing Transect 18
2694	EF19	Electrofishing Transect 19
2695	EF20	Electrofishing Transect 20
2696	EF21	Electrofishing Transect 21
2697	EF22	Electrofishing Transect 22
2698	EF23	Electrofishing Transect 23
2699	EF24	Electrofishing Transect 24

Table 12. Station Data Sheet Littoral Adults – Boat Electrofishing.

Onondaga County Department of Water Environment Protection
Onondaga Lake Fish Monitoring Program

Page 1 of ______

LITTORAL ADULTS -- BOAT ELECTROFISHER

Date: ______ **Transect:** ______
Crew: ______ **Facility Code:** ______

Start
Time : ______
GPS: North: 43° ______ West: 76° ______

End
Time: ______
GPS: North: 43° ______ West: 76° ______

Field Observations - Only Enter One (1) Option

Weather: ______
OVercast PartlyCloudy HaZy CLear RAining SNowing

Waves: *Calm / Swells / Whitecaps*

Water Clarity: *Poor / Moderate / Good*

Wind: ______ **from:** ______
0-5mph 5-10 10-15 >15 *N,S,E,W,SE,SW,NE,NW.*

Significant Rainfall in the Last 48 Hours?
Yes / No

Water Quality:

Depth(m)	*Temp('C)*	*DO(mg/l)*	*DO(%Sat)*	*Cond*	*pH*	*Redox*

Comments: *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

______
______

BULK CATCH DATA -- Include Individual fish > initial 30 count, & non-boarded estimates and/or counts)

Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?
		Total Catch:				

EF Settings:

Sec. Start:		**Sec End:**		**Total # Seconds:**	**(UnitEffort)**
Pct Range:		**Amps:**		**Avg. Speed:**	
Frequency:		**Volts:**		**Avg. Depth:**	

Data Validity Classification: *Good / Conditional / Invalid*

# of Attached Data Sheets: Bulk Fish ______ Indiv. Fish ______

QAPP Signoffs (Initital and Date):

Field: ______ Office: ______ Data Entry: ______

Original Prepared for OCDWEP by Ichthyological Associates, Inc. *Revised by OCDWEP 2/2006*

Table 13. Individual Fish Data Sheet for Littoral Adult Fish Boat Electrofisher Sampling.

Onondaga County Department of Water Environment Protection
Onondaga Lake Fisheries Assessment Program

Page _____ of __________

INDIVIDUAL FISH DATA SHEET

Date: __________ **Program/GearType:** __________
Facility Code: __________ **Location/Site:** __________
(Include Facility Codes for all samples on data sheet)

Facility Code	Species Code	Common Name	Stage *(A,J,Y)*	Length *(mm)*	Weight *(grams)*	Scale #	Tag #	*Is fish Dead?*	DELTFM *Codes*	Comments

QAPP Signoffs (Initital and Date):
Field: __________ Office: __________ Data Entry: __________

Original Prepared for OCDWEP by Ichthyological Associates, Inc. *Revised by OCDWEP 2/2006*

Table 14. Bulk Fish Data Sheet For Littoral Adult Fish Boat Electrofisher Sampling.

Onondaga County Department of Water Environment Protection
Onondaga Lake Fisheries Assessment Program

Page _______ **of** _______

BULK CATCH DATA SHEET

(Record Individual Fish > Initial 30 Count, and Non-Boarded Estimates and/or Counts)

Date: ______________ **Program/GearType:** ____________________

Facility Code: ______________________________ **Location/Site:** ____________________

(Include Facility Codes for all samples on data sheet) ____________________

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?

Total Fish: ________

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?

Total Fish: ________

Facility Code	Species Code	Common Name	Stage *(A/J/Y)*	Total #Fish	Total Wt (g)	#Fish Dead	Count or Est?

Total Fish: ________

QAPP Signoffs (Initital and Date):

Field: ______________ Office: ____________________ Data Entry: ____________________

______________ ____________________ ____________________

*** All fish with obvious DELTFM parameters must be listed on the individual fish data form.**

Revised by OCDWEP 2/2006

APPENDIX A5:

Game Fish List

Onondaga Lake Fisheries Assessment
Game Fish List

Largemouth bass	Smallmouth bass
Walleye	Black Crappie
White Crappie	Brown Bullhead
Yellow Bullhead	Channel catfish
Bluegill	All esocids (pike family)
Pumpkinseed	All salmonids (trout)
Yellow Perch	Rock bass