Combined work/quality assurance project plan *for* combined sewer overflow receiving water monitoring and nutrient effects monitoring *in* Alewife Brook/Upper Mystic River, 1999

Massachusetts Water Resources Authority
Environmental Quality Department
Report ENQUAD 1-ms-054

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Combined Work/Quality Assurance Project Plan

for

Combined Sewer Overflow Receiving Water Monitoring
and
Nutrient Effects Monitoring

In Alewife Brook /Upper Mystic River
1999

prepared by

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Massachusetts Water Resources Authority
Boston, Massachusetts

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Environmental Quality Department
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1.0 PROJECT NAME

Combined Sewer Overflow Receiving Water Monitoring and
Nutrient Effects Monitoring in Alewife Brook /Upper Mystic River

2.0 PROJECT REQUESTED BY

Massachusetts Department of Environmental Protection

3.0 DATE OF REQUEST

March 5, 1999

4.0 DATE OF PROJECT INITIATION

April 1, 1999

5.0 PROJECT MANAGEMENT

Dr. Andrea Rex, Program Manager, Environmental Quality Department
Dr. David Taylor, Biologist
Dr. Michael Delaney, Acting Director, Environmental Quality Department
Ms. Lisa Wong, Supervisor Microbiology Laboratory
Ms. Nicole O'Neill, Microbiology Laboratory
Ms. Lise Marx, Program Manager, CSO Program

6.0 QUALITY ASSURANCE MANAGEMENT

Dr. William Andruchow, Quality Assurance Manager, Central Laboratory
Ms. Wendy Leo, Project Manager EM and MS Database

7.0. PROJECT DESCRIPTION

7.1 Objectives and Scope

Combined sewer overflows (CSOs) have been a significant source of wet weather pollution to Alewife Brook and the Mystic River. Over the next decade, both small scale projects and major construction efforts by MWRA and the CSO communities will eliminate virtually all untreated CSO discharges (MWRA 1994). This report describes planned MWRA water quality monitoring efforts for 1999 in Alewife Brook and the Mystic River. The purpose of this monitoring is to measure water quality and assess CSO impacts on these water bodies; the plan is written to comply with the Final Variance for CSO Discharges to the Alewife/Upper Mystic Basin. MWRA anticipates that the Variance will be incorporated into the NPDES/MA Permit, and requires MWRA to continue to actively participate in EOEA/Basin activities by performing water quality monitoring in the Alewife/Upper Mystic Basin to assess the impacts of CSO discharges.

The water quality monitoring will also enable MWRA to track the environmental effects of pollution abatement projects, that is, to measure the environmental changes before and after the projects are implemented.

Alewife Brook/ Mystic River monitoring is one component of a larger monitoring program that MWRA began in 1989 (Rex 1991, 1993). Data have been gathered over the past 10 years to measure the effect of CSOs on Boston Harbor and its tributary rivers, to satisfy MWRA's NPDES permit requirements, to relate bacteria counts in the water to rainfall, and to measure changes in water quality over time as CSO remediation plans are effected. Related monitoring focuses on other waterbodies affected by CSOs: the Inner Harbor, Northern and Southern Dorchester Bay, the Charles River, and the Neponset River. The most damaging effect of untreated CSOs is pollution of the receiving waters with disease-causing microorganisms found in sewage--a threat to the health of recreational users of the waterway. Therefore, the CSO monitoring program focuses on measuring bacterial pollution in the water column, with intensive monitoring of *Enterococcus* and fecal coliform bacterial indicators. Sampling stations are located near and distant from CSOs, with an attempt to "bracket" active CSOs. Samples are collected during both wet and dry weather.

7.2 Data Usage

Data from the Harbor-wide water quality monitoring are presented monthly and quarterly in MWRA=s report on performance measures, are presented in the annual State of the Harbor report (Pawlowski et al. 1995, Rex and Connor 1997, Rex (in prep.1999), and ultimately will be available on MWRA=s web site (http://www.mwra.state.ma.us). The data will be used to track the recovery of the Harbor after the Boston Harbor Project and CSO Program are completed. Beyond these local uses, the data are of general scientific interest as an invaluable record of the effects of a major pollution abatement effort in an important urban river and estuary system.

Data from the CSO receiving water monitoring are provided to state and federal regulatory agencies, and the Boston Water and Sewer Commission (BWSC 1995, 1996) as part of required monitoring to measure the effects of these wet-weather discharges on the receiving waters. These data will also used by MWRA to track the progress of CSO remediation efforts, and to detect sources of sewage pollution. Past monitoring data from this program have been used in CSO Facilities Planning efforts (Leo et al.. 1994) particularly in calibrating models predicting bacteria counts in the Harbor. The data will continue to be used for similar purposes by MWRA and its consultants. The data are also used by MWRA in advanced statistical analyses (Gong, et al. 1996, 1998) to determine if the relationship between rainfall and bacteria pollution in the Harbor and rivers is changing as a result of pollution abatement projects.

7.3 Rationale and Design

7.3.1 Combined Sewer Overflow Receiving Water Monitoring

There are six active CSOs in Alewife Brook and one active CSO in the Upper Mystic River which are hydraulically connected to the MWRA wastewater system. The water quality sampling described in this plan is relatively intensive both spatially and temporally. Samples are collected for CSO receiving water monitoring for three consecutive days per week, on an every-fifth-week cycle from May through December, unless the river is impassable because of freezing. Samples are collected at two locations weekly for nutrient effects monitoring, January through December.

7.3.1.1 Criteria for Selection of Sampling Locations

Figure 1 shows the location of CSOs and sampling stations in Alewife Brook and the Upper Mystic River. In Alewife Brook, three sampling locations were chosen to assess water quality upstream of CSOs, near active CSOs, and downstream of Alewife CSOs, just before the confluence with the Mystic River. Sites in the Mystic River were chosen upstream of the confluence with the Alewife, at the confluence, at a site well-removed from CSOs, and then "bracketing" SOM007A. The sites near CSOs are located close to the outfalls, not midstream. Table 1 lists the sampling locations.

7.3.1.2 Sampling Locations

The sampling locations for Alewife Mystic CSO Receiving Water monitoring are shown in Figure 1. Table 1 gives the location descriptions for these stations.

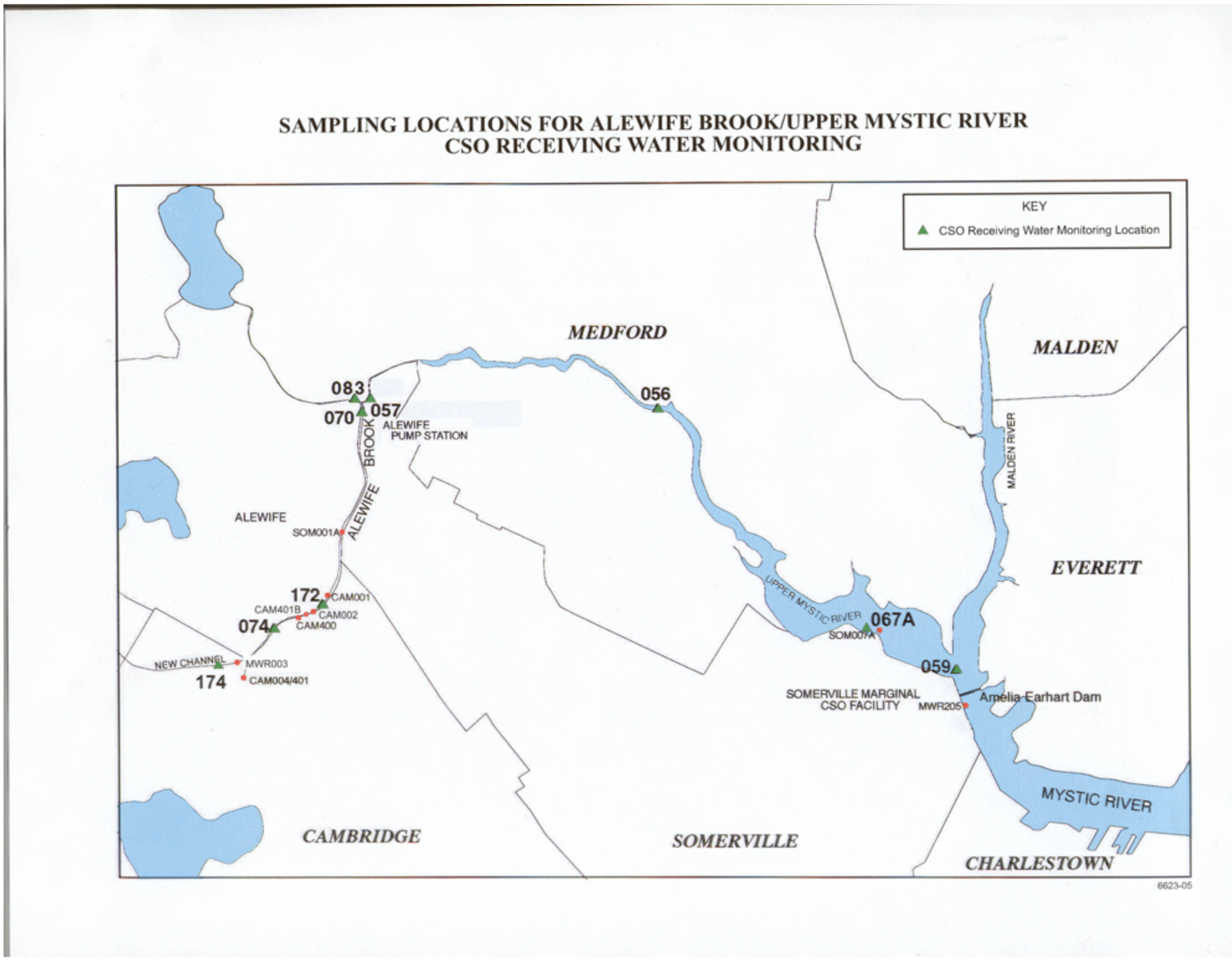

Figure 1. Map of Locations of Combined Sewer Overflows and MWRA CSO Receiving Water Sampling Locations in Alewife Brook and the Upper Mystic River (not shown on map: an additional outfall near CAM002 has been newly identified and tentatively designated CAM401B.)

Table 1. List of Sampling Locations for Alewife Brook/Upper Mystic CSO Receiving Water Monitoring

Site No.	Description (nearest CSO influence)	Latitude (N)	Longitude (W)	Depth Sampled S = Surface B = Bottom
074	Alewife Brook from bridge near off-ramp at Alewife T station, mid channel	42° 23.84'	71° 08.66	S
172	Alewife Brook Route 2A (Massachusetts Ave) Bridge from upstream side	To be determined	To be determined	S
070	Alewife Brook near Mystic confluence (MWR017)	42° 24.86	71° 07.99	S
083	Mystic River upstream of Alewife (Upstream of CSOs)	42° 24.92	71° 08.10	S
057	Confluence of Mystic River and Alewife Brook	42° 24.92	71° 07.99	S
056	Mystic R. near Rt. 93 bridge	42° 24.88	71° 06.25	S
067	Immediately downstream of Route 28 Bridge (upstream of SOM007A)	42° 23.98	71° 05.00	S
059	Confluence of Mystic and Malden Rivers (SOM007A)	42° 23.80	71° 04.62	S

7.3.1.3 Sample Collection and Parameters Measured

Standard water quality measurements are made in the field with portable instruments; water samples for bacteria analysis are collect into sterile sample containers, stored on ice and transported to the laboratory for analysis as rapidly as possible. Tables 2, 3 and 4 describe the monitoring parameters and sampling schedule for the Alewife/Upper Mystic. The sampling schedule is random with respect to weather; because there will be approximately 20 surveys conducted, the chances are very likely that both wet and dry weather samples will be collected.

Table 2. Monitoring Parameters for CSO Receiving Water Monitoring: Field Measurements

Parameter	Instrument	Units
Temperature	Hydrolab probe with Datasonde 4 sonde and Surveyor 4 logger	^{o} C
Dissolved Oxygen		mg/l, % saturation
Salinity		ppt
Conductivity		millisiemens/cm
Turbidity		NTU
pH		pH units
Secchi depth	White 10≅ diam. oceanographic disk	meters
Transmissivity	WetLab C-Star transmissometer	percent transmittance

Table 3. Monitoring Parameters for CSO Receiving Water Monitoring: Laboratory Measurements

Parameter LIMS TEST CODE	Sample Container	Preservation	Analysis Method	Holding Time	Units
Fecal coliform FCOLSWMFL	Sterile 250-ml LDPE bottle	Cooler <10°C	SM 9222D	6 hours	#/100 ml
Enterococcus ECOCAQMFL			EPA1600		

Table 4. Frequency and Number of Samples Collected for Alewife Brook/Upper Mystic CSO Receiving Water Quality

Study LIMS Code	Survey Frequency	Sites per Survey	No. of Surveys	Total Planned Samples 1999
CSO Receiving Water Quality CSO-RW	3 surveys/week, every fifth week, April-December	8	20	160

7.3.2 Nutrient Effects Monitoring

This program focuses on eutrophication (nutrient enrichment) parameters. Boston Harbor receives estimated total N and P loadings from combined terrestrial sources of 130 $g/m^2/y$ plus atmospheric sources of 20 $g/m^2/y$ (Alber and Chan 1994)Xhigh compared to other bays and estuaries in the US. Almost all of these nutrientsX90% of N and 95% of P are from MWRA wastewater treatment facilities. These discharges are of sufficient magnitude to significantly elevate concentrations of dissolved inorganic nitrogen and chlorophyll *a* in the Harbor=s water column, and to lower the dissolved oxygen concentrations in the bottom waters of the Harbor (Adams et al. 1992, Hydroqual 1995). Wastewater loadings of nutrient and solids to the Harbor have been decreasing since 1991, when MWRA stopped sludge discharges to the Harbor. From January 1995 through July 1996, a new more efficient primary treatment facility was phased in, and in August 1997 MWRA began phasing in secondary treatment. In July 1998, the Nut Island (South System) treatment plant was decommissioned, and that flow diverted to Deer Island. In the fall of 1999, secondary treated effluent is currently scheduled to be diverted from the Harbor to Massachusetts Bay through a 9.5-mile outfall tunnel.

After 1998, the total loading of nutrients to Boston Harbor will decrease to about 10% of the present amount. It is expected that rivers will contribute most of the remaining nutrient loadings to the Harbor. The water quality monitoring described here will provide data to measure the present state of eutrophication in the Mystic River, and help provide data to measure the present state of the Mystic River, Boston Harbor and ultimately Massachusetts Bay. The purpose is to measure the eutrophication status of the major rivers tributary to the Harbor (the Charles and the Neponset will also be sampled) and to improve the estimates of loadings of nutrients and solids to the Harbor. Sampling takes place year round.

7.3.2.1 Criteria for Selection of Sampling Locations

Very few measurements of eutrophication parameters have previously been recorded in the rivers tributary to the Harbor. Two sites will be monitored in the Mystic: one just upstream of the Amelia Earhart Dam located at the river's mouth represents the loads to the Harbor. A site just downstream of the Alewife confluence will help assess the effects of Alewife Brook, and "bracket" CSO area in the Mystic. These sites were chosen because they are accessible by foot in winter, when access by boat is limited.

7.3.2.2 Sampling Locations

The sampling locations for Alewife Mystic nutrient effects monitoring are shown in Figure 2. Table 5 gives the location descriptions for these stations.

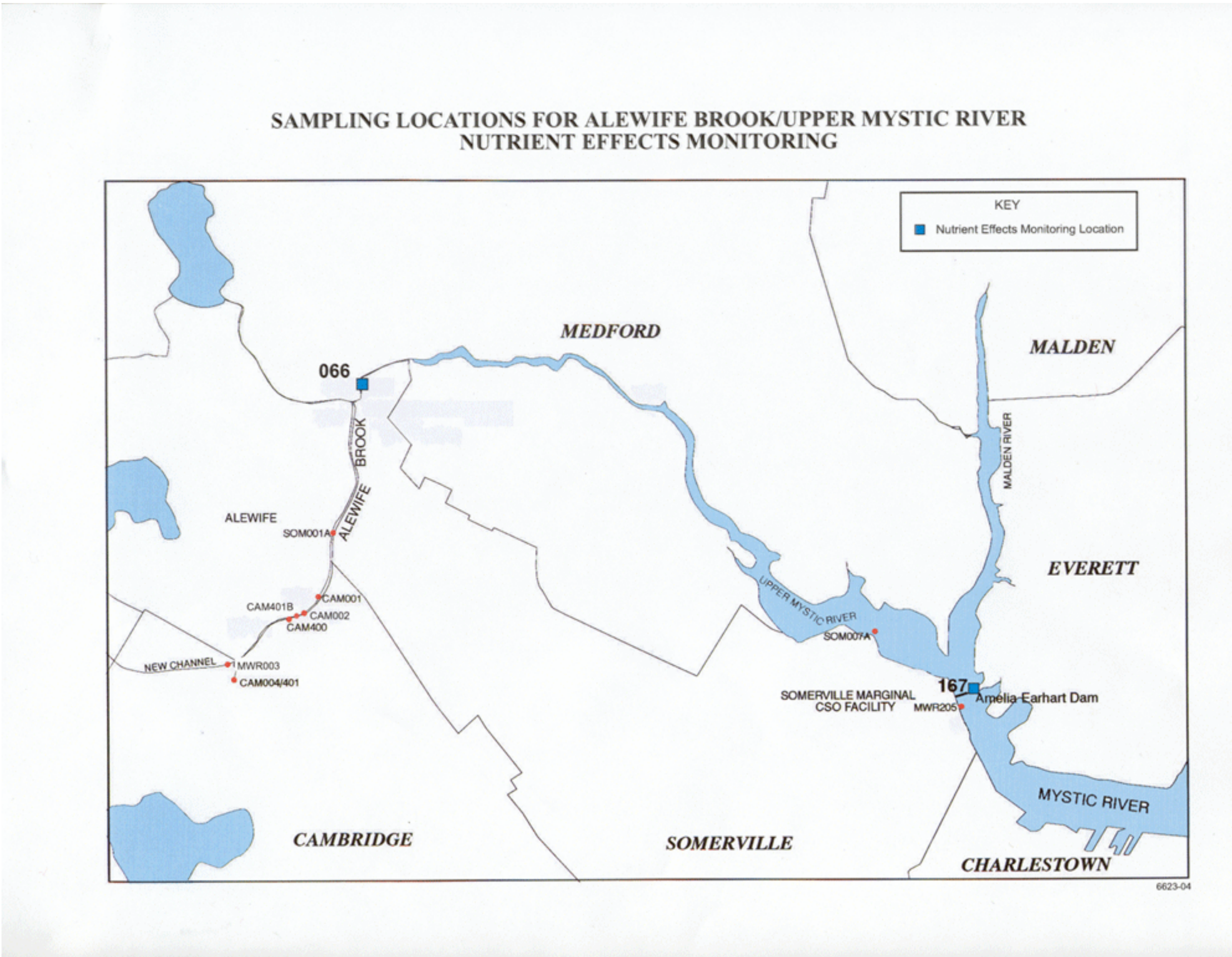

Figure 2. Map of Locations of Combined Sewer Overflows and MWRA Nutrient Effects Monitoring in Alewife Brook and the /Upper Mystic River

Table 5. Sampling Locations for Alewife Brook/Upper Mystic Nutrient Effects Monitoring○

Site No.	Description	Latitude (N)	Longitude (W)	Sample Depth
167	Mystic River at Earhart Dam	42^{o} 23.41	71 ^{o} 04.28.24	Surface
066	Mystic River, Upstream side of Boston Ave Bridge	42^{o} 25.03'	71 ^{o} 07.87'	Surface

7.3.2.3 Sample Collection and Parameters Measured

Both sites are accessed by foot, so they can be sampled even when the rivers are not navigable due to ice. A Kemmerer sampler is used to collect water sample; the water is then dispensed into the appropriate sample containers and transported back to the laboratory. Table 6 lists parameters measured in the field, Table 7 lists parameters measured in the laboratory.

Table 6. Monitoring Parameters for Alewife Brook/Upper Mystic Nutrient Effects Monitoring: Field Measurements

Parameter	Instrument	Units
Temperature	Hydrolab probe with Datasonde 4 sonde and Surveyor 4 logger	$^{\circ}$ C
Dissolved Oxygen		mg/l, % saturation
Salinity		ppt
Conductivity		millisiemens/cm
Turbidity		NTU
pH		pH units
Transmissivity	WetLab C-Star Transmissometer	Percent Transmittance (pct)

Table 7. Monitoring Parameters for Alewife/Upper Mystic Nutrient Effects : Laboratory Analyses

<table>
<tr><th>Parameter
LIMS code</th><th>Sample Container</th><th>Preservation</th><th>Analysis Method</th><th>Holding Time</th><th>Units</th></tr>
<tr><td>Fecal coliform
FCOLSWMFL</td><td rowspan="2">Sterile 250-ml LDPE bottle</td><td rowspan="2">Cooler
<101C</td><td>SM 9222D</td><td rowspan="2">6 hours</td><td rowspan="2">#/100 ml</td></tr>
<tr><td>Enterococcus
ECOCAQMFL</td><td>EPA1600</td></tr>
<tr><td>Total Suspended Solids
TSS-SWGRV</td><td>1-L wide-mouth translucent LDPE bottles.</td><td></td><td>EPA 160.2</td><td>7 days</td><td>mg/l</td></tr>
<tr><td>Total Nitrogen
TN--SWAAN</td><td rowspan="3">1-L amber wide-mouth HDPE bottle</td><td rowspan="3"></td><td>Valderama, 1981 unfiltered</td><td rowspan="3">6 hours</td><td rowspan="3">µmol/l</td></tr>
<tr><td>Nitrate/Nitrite
NO32SWAAN</td><td>EPA 353.2</td></tr>
<tr><td>Ammonium
NH3--SWAAN</td><td>EPA 350.2</td></tr>
<tr><td>Total Phosphorous
TP--SWAAN</td><td rowspan="2">1-L amber wide-mouth HDPE bottle</td><td rowspan="2">Cooler
<101C</td><td>Valderama, 1981 unfiltered</td><td rowspan="2">6 hours</td><td rowspan="2">µmol/l</td></tr>
<tr><td>Orthophosphate</td><td>EPA 365.1</td></tr>
<tr><td>Chlorophyll a
CHLASWFLU</td><td rowspan="2">1-L amber wide-mouth HDPE bottle</td><td rowspan="2">Cooler
<101C</td><td rowspan="2">Modified EPA 445.0</td><td rowspan="2">6 hours</td><td rowspan="2">µg/l</td></tr>
<tr><td>Phaeophytin
PHAESWFLU</td></tr>
</table>

Table 8. Frequency and Number of Samples Collected for Alewife/Upper Mystic Nutrient Effects Monitoring

Survey Frequency	Sites per Survey	Total Samples per Study, 1999
Weekly	2	104

8.0 PROJECT FISCAL INFORMATION

This project is funded through MWRA=s FY99 and FY00 Current Expense Budget.

9.0 SCHEDULE

January 1-December 31, 1999 Nutrient effects samples: collect samples weekly. Perform laboratory analysis, load into Oracle database.

April-December 31, 1999 CSO receiving samples: Sample collection, laboratory analysis, load into Oracle database.

<u>1999 Planned Sampling schedule</u>:
Three surveys per week on consecutive days during the following weeks:
March 21
April 25
June 6
July 11
August 15
Sept 26
October 24
November 28
The schedule is subject to change depending on weather and other extenuating circumstances; however a minimum of 20 surveys will be conducted.

April 1999. Transfer 1998 CSO receiving water data to Metcalf and Eddy for analysis and report preparation (report on 1998 data due July 1, 1999).

January-April 1, 2000. Analyze and report on data to DEP. Report due April 1, 2000.

10.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Dr. Andrea Rex, (617) 788-4741, is Program Manager for Water Quality Monitoring, is the Principal Investigator for the CSO and Harbor Outfall Monitoring activities.

Dr. David Taylor , (617) 788-4748, is the Principle Investigator for the Nutrient Effects monitoring.

Dr. Michael Delaney, (617) 539-4302, is Acting Director of Environmental Quality and Laboratory Superintendent, and has overall responsibility for managing laboratory operations.

Dr. William Andruchow (617) 539-4303, is the Quality Assurance manager for the Central Laboratory and is responsible for the development of SOPs for laboratory analyses.

Ms. Wendy Leo (617) 788-4743, is the Quality Assurance manager for the Environmental Monitoring and Management Oracle database.

Ms. Lisa Wong (617) 539-4331, is Supervisor of the Microbiology Laboratory at the Central Laboratory and has overall responsibility for overseeing sample collection and the analyses samples for fecal coliform and *Enterococcus*.

Ms. Nicole Parilla O=Neill (617) 539-4341, of the Central Laboratory has responsibility for managing the field work.

Ms. Lise Marx (617) 788-4390 is CSO Program Manager, coordinating MWRA's CSO Variance reporting activities.

11.0 DATA QUALITY REQUIREMENTS AND ASSESSMENTS

11.1 Data Management QA/QC

MWRA will own, process, and manage the field and laboratory data. MWRA will store the data in its Oracle database.

11.2 Key Personnel

Table 9. Key personnel in data management and data processing

Department	Function	Name
Central Lab	Approves and enters Central Lab results into LIMS	Lisa Wong Nicole O'Neill
ENQUAD	Checks and uploads all data to Oracle Database	Doug Hersh Wendy Leo
Infiltration and Inflow	Collects rainfall data	Carl Leone Doug Hersh

11.3 Data Management

The MWRA Central Laboratory will analyze samples it collects, enter the data into the Laboratory Information Management System (LIMS) for validation and QA/QC. MWRA ENQUAD will also upload the data from LIMS into its Environmental Monitoring and Management System (EM&MS) database for warehousing and subsequent distribution to data analysts. EM&MS is an Oracle relational database available to MWRA users on a DEC Alpha server via the MWRA internal network. Data are stored in Oracle in normalized relational tables that allow users to retrieve data using such tools as Oracle Browser, Microsoft Access, ArcView and Arc/Info GIS.

MWRA rainfall data will be downloaded from the gages, checked, and placed on an internal MWRA network drive by MWRA's Infiltration and Inflow Dept. ENQUAD will upload the data to the EM&MS Oracle database for warehousing and subsequent distribution to ENQUAD data analysts and other users.

11.4 Measures to Ensure Data Quality; Procedures for Identifying and Correcting Data Errors

The MWRA Central Laboratory will enter data into the LIMS system using existing detailed QA/QC procedures specified by the Laboratory Quality Assurance Management Plan. MWRA ENQUAD will transfer only checked and validated LIMS data into the EM&MS Oracle database. Data quality for rainfall information will be maintained by the MWRA Infiltration and Inflow Department, which will provide calibration and maintenance of the rain gauges, and will check the data to ensure reliability of measurements.

11.5 Information Security

The security of MWRA Central Laboratory data in LIMS is maintained through the Data Anomaly Investigation Request (DAIR) process, which requires all potential changes to data (*e.g.*, error correction, entry of missing data) to go through a process of step-by-step review and approval by the Laboratory Quality Assurance Manager, and documentation of all changes. Users of LIMS data access the data through views, and cannot modify data in the database.

The EM&MS version of the data will be a copy of the approved LIMS data and will not be modified without approval from the Principal Investigators and the Central Laboratory's Quality Assurance Manager. Data integrity in the EM&MS database will be maintained through the use of established database constraints. Any changes made in the EM&MS database will be recorded in database documentation and data notebooks. Data users will access the EM&MS Database through Oracle Browser views, which do not enable users to modify the data in the database.

Rain gauge data will be maintained by I&I in a read-only format that cannot be modified. Any changes to this data in EM&MS will be checked with the I&I data manager.

11.6 Documentation of the Data Set, Data Elements, and Methodologies Residing in the Proposed Information Management System

Sampling data will be documented in the LIMS audit trail and the DAIR process. Data entered into the EM&MS system will be documented in the Oracle database structure. When ENQUAD distributes data to users from EM&MS, it will provide documentation stored in the database structure, such as: collection procedures, laboratory method reference, sample handling, sample analysis, measurement accuracy and precision, appropriate uses of data, potential and known problems with the data.

11.7 Frequency of the Data Collection as Added to the Information System

Data will be entered into EM&MS after they have been approved in the LIMS system. MWRA rain gauge data will be entered into EM&MS after they are posted on the MWRA internal network (approximately once a week).

11.8 Information Comparisons

MWRA performs replicate field samples on 10% of the samples collected, to measure sampling error. The MWRA EM&MS Oracle database was planned to facilitate data comparison by using established information management and relational database design principles. Because of this design, the data can be linked to the MWRA geographic information system, exported in a variety of standard spreadsheet and text formats for use by others, and accessed with a range of standard data query software. Currently, field, laboratory and rainfall data in the EM&MS database are used by MWRA and outside users (e.g., researchers, agencies, consultants, students, watershed associations, communities) to assess the health of Massachusetts coastal waters and compare data from other studies.

12.0 SAMPLING AND LABORATORY PROCEDURES

Sampling and laboratory procedures will be carried out as documented in MWRA's Standard Operating Procedures, listed in the Appendix "List of Approved SOPs." The MWRA Central Laboratory is a Massachusetts Department of Environmental Protection Certified Laboratory.

13.0 SAMPLE CUSTODY PROCEDURES

Internal chain of custody forms and sample bottle labels are generated by the Central Laboratory, according to procedures in the Standard Operating Procedure. Samples are collected by MWRA Laboratory personnel, and logged in upon return to the Laboratory.

14.0 CALIBRATION PROCEDURES AND PREVENTIVE MAINTENANCE

Field and laboratory instruments are calibrated and maintained according to the Central Laboratory Standard Operating Procedure.

15.0 DOCUMENTATION, DATA REDUCTION AND REPORTING

All data, including rainfall and tide data will be loaded into MWRA's Oracle database. The database structure for these data already exists, and contains 10 years of monitoring data. An algorithm will be developed to calculate rain antecedant to the date and time the samples are collected. This will be a refinement of the present algorithm, which calculates antecedant rainfall based on the date of sample collection.

Data analysis will include, as appropriate, measures of central tendency (e.g. geometric means of bacteria indicators, means of dissolved oxygen concentration, etc.) of different variables under varying weather conditions, and an appropriate representation of the frequency distribution of the data, such as percentile box plots. Regression analyses and/or non-parametric analyses will be used to develop simple models that predict when and how much rainfall results in violations of water quality standards, and how long the effects on water quality persist.

16.0 DATA VALIDATION

The Central Laboratory's data reduction, validation, and reporting procedures are documented in section 7.0 of its Quality Assurance Management Plan. Data validation consists of a three level review process: **Level 1** - the Analyst Review, **Level 2** - Validation, **Level 3** - Approval. The Review, Validation, and Approval processes are employed to ensure conformity with the requirements of the QAMP, and with client data quality requirements. Reported results must be traceable. Traceability is the characteristic of data that allows a final result to be verified by review of its associated documentation. All laboratory results for a given sample must be traceable throughout the entire analytical process applied to the sample. Traceability is maintained through LIMS (which stores all of the pertinent data associated with the sample) and by the utilization of various logbooks (preparation, analytical, and instrumental), instrument raw data printouts, electronic files, and spreadsheets.

17.0 PERFORMANCE AND SYSTEMS AUDITS

The Central Laboratory's audit procedures are documented in section 9.0 of its Quality Assurance Management Plan. A **performance audit** provides a quantitative assessment of the analytical measurement process. It provides a direct and independent, point-in-time evaluation of the accuracy of the various measurement systems and methods. This is accomplished by challenging each analytical system (method/procedure) with an accepted reference standard for the analyte(s) of interest. The Central Laboratory annually participates in Discharge Monitoring Report (DMR) Performance Efficiency (PE) studies and bi-annually in the Water Pollution (WP) Performance Efficiency studies. Acceptable performance on these PE samples is required for NPDES self-monitoring analyses and Massachusetts DEP Certification, respectively. In addition, internally administered performance evaluation samples may be submitted to the laboratory sections on a random, as required, basis and for those analytes not present in the WP samples.

A **systems audit** is a review of laboratory operations to verify that the laboratory has the necessary facilities, equipment, staff and procedures in place to generate acceptable data. It represents a subjective evaluation of the strengths and weaknesses of the Central Laboratory and identifies areas that need improvement. Systems audits are performed quarterly by the QA Specialist.

18.0 CORRECTIVE ACTION

The Central Laboratory's corrective action procedures are documented in section 11.0 of its Quality Assurance Management Plan (QAMP). The occurrence of a practice or incident that is inconsistent with the established quality assurance and quality control procedures of the laboratory must be formally addressed with a corrective action response. Any laboratory employee may, and is encouraged to, request corrective actions when necessary.

Section 11.0 of the QAMP details the situations that require corrective action, and how corrective actions are initiated, investigated, resolved and documented to ensure a complete and systematic response to each corrective action request.

19.0 REPORTS

Results of 1999 CSO Receiving Water Monitoring will be analyzed and interpreted with respect to CSO activations and rainfall in a report by April 1, 2000. Nutrient effects monitoring data from Alewife Brook/Upper Mystic River will be included in ENQUAD reports with data from Boston Harbor and the other tributary rivers.

20.0 REFERENCES

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