



California's Surface Water Ambient Monitoring Program

Quality Control and Sample Handling Guidelines

December 12, 2013

Quality Assurance Help Desk

Quality Assurance Research Group
Moss Landing Marine Laboratories
Moss Landing, California



Introduction



- *SWAMP Quality Assurance Program Plan*
- Guideline revision process
- Table details
- Web demo



SWAMP Quality Assurance Program Plan

- Template required by EPA Region 9
- Used to create a QA guidance document for reference by program participants
- 24 chapters with strict content requirements
- **Quality Control Information**
 - *Quality Objectives and Criteria* (Chapter A7)
 - *Quality Control* (Chapter B5)
- **Sample Handling Information**
 - *Sampling Methods* (Chapter B2)
 - *Sample Handling and Custody* (Chapter B3)

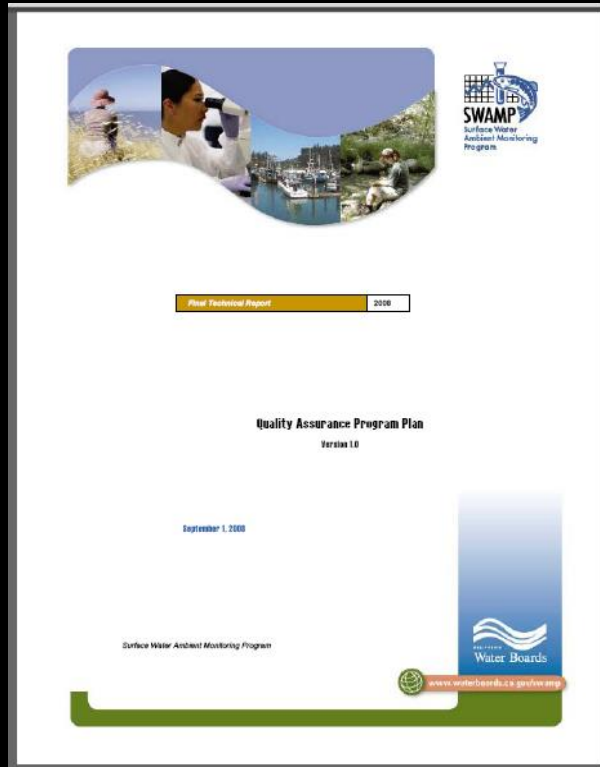


Table Revision Process

- **Creation**
 - Previous SWAMP QC and sample handling guidelines (2008)
 - Research: *Code of Federal Regulations*, *Methods*, and *Journals*
 - Focus Groups
- **Review**
 - SWAMP Quality Assurance and Data Management Teams
 - Numerous Laboratory and Field Entities
 - SWAMP Roundtable
 - Focus Groups
- **Upload (April and August 2013)**



Table Set Components

Nutrients in Fresh and Marine Water

A list of [analytes](#) included in this category may be found in the associated [QAPrTableReference](#).

Terms appearing in the tables are defined in [The Surface Water Ambient Monitoring Program Quality Assurance Program Plan](#), which contains a glossary (Appendix E), as well as a list of abbreviations and acronyms (Appendix F).

Table 1: Quality Control: Nutrients in Fresh and Marine Water

Quality Control	Frequency of Analysis	Measurement Quality Objective

Table 2: Sample Handling: Nutrients in Fresh and Marine Water

Analyte	Recommended Container	Recommended Preservation	Required Holding Time

Table 3: Corrective Action: Nutrients in Fresh and Marine Water

Quality Control	Corrective Action

Category/Matrix

Analyte/Parameter List

Terminology Help

Quality Control Table

Sample Handling Table

Corrective Action Table (n/a)



Table Set Components

Nutrients in Fresh and Marine Water

A list of [analytes](#) included in this category may be found in the associated [QAPrPTableReference](#).

Terms appearing in the tables are defined in [The Surface Water Ambient Monitoring Program Quality Assurance Program Plan](#), which contains a glossary (Appendix E), as well as a list of abbreviations and acronyms (Appendix F).

Table 1: Quality Control: Nutrients in Fresh and Marine Water

Quality Control	Frequency of Analysis	Measurement Quality Objective

Table 2: Sample Handling: Nutrients in Fresh and Marine Water

Analyte	Recommended Container	Recommended Preservation	Required Holding Time

Table 3: Corrective Action: Nutrients in Fresh and Marine Water

Quality Control	Corrective Action

Category/Matrix

Analyte/Parameter List

Terminology Help

Quality Control Table

Sample Handling Table

Corrective Action Table (n/a)



Category Names

Category	Water	Sediment	Tissue
Ancillary Parameters		X	X
Conventional Parameters	X	X	
Field Measurements	X		
Indicator Bacteria	X		
Inorganic Analytes	X	X	X
Nutrients	X		
Semi-Volatile Organic Compounds	X	X	
Solid Parameters	X		
Synthetic Organic Compounds	X	X	X
Toxicity Testing	X	X	
Volatile Organic Compounds	X	X	



Analyte/Parameter Lists: Location

Nutrients in Fresh and Marine Water

A list of [analytes](#) included in this category may be found in the associated [QA/PtTableReference](#).

Terms appearing in the tables are defined in [The Surface Water Ambient Monitoring Program Quality Assurance Program Plan](#), which contains a glossary (Appendix E), as well as a list of abbreviations and acronyms (Appendix F).

Table 1: Quality Control: Nutrients in Fresh and Marine Water

Quality Control	Frequency of Analysis	Measurement Quality Objective

Table 2: Sample Handling: Nutrients in Fresh and Marine Water

Analyte	Recommended Container	Recommended Preservation	Required Holding Time

Table 3: Corrective Action: Nutrients in Fresh and Marine Water

Quality Control	Corrective Action

Category/Matrix

Analyte/Parameter List

Terminology Help

Quality Control

Sample Handling Table



Analyte/Parameter Lists: Example

Nutrients in Fresh and Marine Water:



AnalyteName	QAPrPTableReferenceAddDate
Ammonia as N	Sep 01 08 12:00AM
Ammonium as N	Sep 01 08 12:00AM
Nitrate + Nitrite as N	Sep 01 08 12:00AM
Nitrate as N	Sep 01 08 12:00AM
Nitrite as N	Sep 01 08 12:00AM
Nitrogen, Total	Sep 01 08 12:00AM
Nitrogen, Total Kjeldahl	Sep 01 08 12:00AM
OrthoPhosphate as P	Sep 01 08 12:00AM
Phosphorus as P	Sep 01 08 12:00AM



Terminology Help: Location

Nutrients in Fresh and Marine Water

A list of [analytes](#) included in this category may be found in the associated [QA/PtTableReference](#).

Terms appearing in the tables are defined in [The Surface Water Ambient Monitoring Program Quality Assurance Program Plan](#), which contains a glossary (Appendix E), as well as a list of abbreviations and acronyms (Appendix F).

Table 1: Quality Control: Nutrients in Fresh and Marine Water

Quality Control	Frequency of Analysis	Measurement Quality Objective

Table 2: Sample Handling: Nutrients in Fresh and Marine Water

Analyte	Recommended Container	Recommended Preservation	Required Holding Time

Table 3: Corrective Action: Nutrients in Fresh and Marine Water

Quality Control	Corrective Action

Category/Matrix

Analyte/Parameter List

Terminology Help

Quality Control Table

Sample Handling Table



Terminology Help: Examples

Appendix E: Glossary

Unless otherwise noted, the following definitions are from the Environmental Protection Agency's *Glossary of Quality-Related Terms*: <http://www.epa.gov/quality/glossary.htm>

Accuracy	The closeness or agreement of the observed value or test response to the true or acceptable reference value or the test response from a reference method. It is influenced by both random error (precision) and systematic error (bias). The terms "bias" and "precision" are often used in lieu of "accuracy".
Analytical Batch <small>SWAMP QA Program Definition</small>	A group of 20 or fewer samples and associated quality control that is processed by the same instrument within a 24-hour period (unless otherwise specified by method). An analytical batch may comprise multiple sample batches.
Analytical Run <small>SWAMP QA Program Definition</small>	The quantification of a single discrete sample or its associated quality control.
Assessment	A general evaluation process used to evaluate the performance, effectiveness and processes of a management and/or technical system.

Appendix E: *Glossary* (60 Terms)

Appendix F: List of Abbreviations and Acronyms

AB	Assembly Bill
ASTM	American Society for Testing and Materials
<u>BDAT</u>	Bay, Delta, and Tributaries Project
<u>BTEX</u>	Benzene, Toluene, Ethylbenzene, and Xylenes
CCV	Continuing Calibration Verification
<u>CEDEN</u>	California Environmental Data Exchange Network
CRM	Certified Reference Material

Appendix F: *List of Abbreviations and Acronyms* (82 Terms)



Quality Control Table: Location

Nutrients in Fresh and Marine Water

A list of [analytes](#) included in this category may be found in the associated [QAPrPTableReference](#).

Terms appearing in the tables are defined in [The Surface Water Ambient Monitoring Program Quality Assurance Program Plan](#), which contains a glossary (Appendix E), as well as a list of abbreviations and acronyms (Appendix F).

Table 1: Quality Control: Nutrients in Fresh and Marine Water

Quality Control	Frequency of Analysis	Measurement Quality Objective

Table 2: Sample Handling: Nutrients in Fresh and Marine Water

Analyte	Recommended Container	Recommended Preservation	Required Holding Time

Table 3: Corrective Action: Nutrients in Fresh and Marine Water

Quality Control	Corrective Action

Category/Matrix

Analyte/Parameter List

Terminology Help

Quality Control Table

Sample Handling Table



Quality Control Table: Content

- **Laboratory/Field Quality Control Sample Type**
 - Examples: *Laboratory Blank, Field Duplicate*
- **Frequency of Analysis**
 - Examples: *Per 20 Samples, Per 10 Analytical Runs*
- **Measurement Quality Objectives**
 - Examples: *80-120% Recovery, RPD<25%*



Quality Control Table: Example

Table 1: Quality Control¹: Nutrients in Fresh and Marine Water

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications
Calibration Verification	Per 10 analytical runs	90-110% recovery
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte
Reference Material	Per 20 samples or per analytical batch, whichever is more frequent	90-110% recovery
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery RPD<25% for duplicates
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25% (n/a if native concentration of either sample<RL)
Field Quality Control	Frequency of Analysis	Measurement Quality Objective
Field Duplicate	5% of total project sample count	RPD<25% (n/a if native concentration of either sample<RL)
Field Blank, Travel Blank, Equipment Blank	Per method	<RL for target analyte

¹ Unless method specifies more stringent requirements



Sample Handling Table: Location

Nutrients in Fresh and Marine Water

A list of [analytes](#) included in this category may be found in the associated [QA/PT Table Reference](#).

Terms appearing in the tables are defined in [The Surface Water Ambient Monitoring Program Quality Assurance Program Plan](#), which contains a glossary (Appendix E), as well as a list of abbreviations and acronyms (Appendix F).

Table 1: Quality Control: Nutrients in Fresh and Marine Water

Quality Control	Frequency of Analysis	Measurement Quality Objective

Table 2: Sample Handling: Nutrients in Fresh and Marine Water

Analyte	Recommended Container	Recommended Preservation	Required Holding Time

Table 3: Corrective Action: Nutrients in Fresh and Marine Water

Quality Control	Corrective Action

Category/Matrix

Analyte/Parameter List

Terminology Help

Quality Control Table

Sample Handling Table



Sample Handling Table: Content

- **Recommended Containers**
 - Examples: *Polyethylene, Glass*
- **Recommended Preservations**
 - Examples: *Cool to $\leq 6^{\circ}\text{C}$, H_2SO_4 to $\text{pH} < 2$*
- **Required Holding Times**
 - Examples: *28 Days, 48 Hours*



Sample Handling Table: Example

Holding Times are REQUIRED

Table 2: Sample Handling: Nutrients in Fresh and Marine Water

Analyte	Recommended Container ¹	Recommended Preservation ²	Required Holding Time ³
Ammonia (as N)	P	Cool to $\leq 6^{\circ}\text{C}$; samples may be preserved with 2 mL of H_2SO_4 per L	48 hours; 28 days if acidified
Kjeldahl Nitrogen (Total)	P	Cool to $\leq 6^{\circ}\text{C}$; H_2SO_4 to $\text{pH} < 2$	7 days; 28 days if acidified
Nitrate (as N)	P	Cool to $\leq 6^{\circ}\text{C}$	48 hours (unless calculated from nitrate + nitrite (as N) and nitrite (as N) analyses)
Nitrate + Nitrite (as N)	P	Cool to $\leq 6^{\circ}\text{C}$; H_2SO_4 to $\text{pH} < 2$	48 hours; 28 days if acidified
Nitrite (as N)	P	Cool to $\leq 6^{\circ}\text{C}$	48 hours



Website Demo



State Board SWAMP Website

SWAMP
Surface Water Ambient Monitoring Program

SOUND SCIENCE FOR INFORMED WATER QUALITY MANAGEMENT

Welcome! **Tools** Reports Webinars Contacts Links

SWAMP is tasked with assessing water quality in all of California's surface waters. The program conducts monitoring partnerships and provides numerous information products, all designed to support water resource management.

New from SWAMP & SWAMP Partners! Now Available from the Healthy Streams Partnership: [California Interim Report on the Status and Vulnerability of Watershed Health in California, 2013](#). Prepared by the Cadmus Group, Inc., for the U.S. Environmental Protection Agency. EPA-841-R-14-003. November 2013. 118 pp.

SWAMP HIGHLIGHTS ...

- Achievements Report
- Reports on Contaminants in Fish
- Stream Pollution Trends (SPoT) Program
- SWAMP Quality Assurance Program (QAPP)
- SWAMP Methods
- Biological Objectives for California
- California Environment Data Exchange Network (CEDEN)

ED WATER QUALITY M

About **Tools** Reports

ked with assessing water qu
and provides numerous infor



Web Page: *Tools*

Quality Assurance

Quality assurance (QA) is an integrated system of management activities (i.e., planning, implementation, as the data or product by ensuring that it is of the type and quality needed and expected by the client.

The key components of the SWAMP QA program are: the Quality Assurance Program Plan (QAPrP), QA Pr (the SWAMP QA team).

SWAMP Quality Assurance Program Plan

→ QAPrP describes SWAMP's quality system including elements such as: responsibilities of management laboratory and field activities.

SWAMP-funded projects, and projects required to be consistent with SWAMP, must follow the guideline

→ [SWAMP Quality Assurance Program Plan \(entire document\)](#)

→ **NEW! SWAMP Quality Control and Sample Handling Guidelines** (clickable links to individual

These guidelines are also known as Measurement Quality Objectives (MQOs) or MQO T

Quality Assurance Project Plans

→ A QAPP is required for certain large, ongoing, or special projects. To streamline the creation of these

→ [SWAMP Advisor](#) - an interactive online tool that compiles user input into a SWAMP-comparable

→ [SWAMP QAPP Review Checklist](#) - a tool for assessing each element of a completed SWAMP-c

→ [Guidance for Quality Assurance Project Plans](#) and [EPA Requirements for Quality Assurance Pr](#) basis for the above QAPP tools.

→ The following resources provide additional assistance with SWAMP comparability:

→ [Quality Webinars](#) - an archive of past presentations intended for those seeking

→ [SWAMP Support Desk](#) - a telephone and email service that provides support and tools for SW

nded projects, and projects required to be consistent with SWAMP, must follow the guideline

MP Quality Assurance Program Plan (entire document)

NEW! SWAMP Quality Control and Sample Handling Guidelines (clickable links to individual

Tables. Posted - April 8, 2013

These guidelines are also known as Measurement Quality Objectives



Web Page: *Quality Control and Sample Handling Guidelines*

Quality Control and Sample Handling Tables

Water

- > [Conventional Parameters in Fresh and Marine Water](#)
- > [Field Measurements in Fresh and Marine Water](#)
- > [Indicator Bacteria in Fresh Water](#)
- > [Inorganic Analytes in Fresh and Marine Water](#)
- > [Nutrients in Fresh and Marine Water](#)
- > [Semi-Volatile Organic Compounds in Fresh and Marine Water](#)
- > [Solid Parameters in Fresh and Marine Water](#)
- > [Synthetic Organic Compounds in Fresh and Marine Water](#)
- > [Volatile Organic Compounds in Fresh and Marine Water](#)

Sediment

- > [Ancillary Parameters in Freshwater Sediment and Marine Sediment](#)
- > [Conventional Parameters in Freshwater Sediment and Marine Sediment](#)
- > [Inorganic Analytes in Freshwater Sediment and Marine Sediment](#)
- > [Synthetic Organic Compounds in Freshwater Sediment and Marine Sediment](#)

Tissue

- > [Ancillary Parameters in Freshwater Tissue and Marine Tissue](#)
- > [Inorganic Analytes in Freshwater Tissue and Marine Tissue](#)
- > [Synthetic Organic Compounds in Freshwater Tissue and Marine Tissue](#)

Toxicity

- > [Acute Freshwater Toxicity Testing](#)
- > [Chronic Freshwater Toxicity Testing](#)
- > [Chronic Marine Water Toxicity Testing](#)

Water

- > [Conventional Parameters in Fresh and Marine Water](#)
- > [Field Measurements in Fresh and Marine Water](#)
- > [Indicator Bacteria in Fresh Water](#)
- > [Inorganic Analytes in Fresh and Marine Water](#)
- > [Nutrients in Fresh and Marine Water](#)
- > [Semi-Volatile Organic Compounds in Fresh and Marine Water](#)
- > [Solid Parameters in Fresh and Marine Water](#)
- > [Synthetic Organic Compounds in Fresh and Marine Water](#)
- > [Volatile Organic Compounds in Fresh and Marine Water](#)



Success!

Nutrients in Fresh and Marine Water

A list of analytes included in this category may be found in the associated [QAPrTableReference](#).

Terms appearing in the tables are defined in the [Surface Water Ambient Monitoring Program Quality Assurance Program Plan](#), which contains a glossary (Appendix E), as well as a list of abbreviations and acronyms (Appendix F).

Table 1: Quality Control¹: Nutrients in Fresh and Marine Water

Laboratory Quality Control	Frequency of Analysis	Measurement Quality Objective
Calibration Standard	Per analytical method or manufacturer's specifications	Per analytical method or manufacturer's specifications
Calibration Verification	Per 10 analytical runs	90-110% recovery
Laboratory Blank	Per 20 samples or per analytical batch, whichever is more frequent	<RL for target analyte
Reference Material	Per 20 samples or per analytical batch, whichever is more frequent	90-110% recovery
Matrix Spike	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery
Matrix Spike Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	80-120% recovery RPD<25% for duplicates
Laboratory Duplicate	Per 20 samples or per analytical batch, whichever is more frequent	RPD<25% (n/a if native concentration of either sample<RL)
Field Quality Control	Frequency of Analysis	Measurement Quality Objective
Field Duplicate	5% of total project sample count	RPD<25% (n/a if native concentration of either sample<RL)
Field Blank, Travel Blank, Equipment Blank	Per method	<RL for target analyte

¹ Unless method specifies more stringent requirements



The Quality Assurance Research Group at The Moss Landing Marine Laboratories



Email:
qahelpdesk@mlml.calstate.edu

QA Help Desk:
(206) 525-0491

