

# CHAPTER 10

## QUALITY ASSURANCE AND QUALITY CONTROL

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This chapter outlines basic QA requirements. It is not meant to be a single source for all QA information related to the SWQM programs. Detailed QA requirements are outlined in project QAPPs.

### Quality Assurance

Quality assurance (QA) is an integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure a process is of the type and quality needed and expected by the customer. Systematic project planning is central to an integrated QA approach and is fundamental to the success of water quality monitoring projects. Quality-assurance documents are required by TCEQ to plan, organize, and define the QA process in order for data to be collected with the level of reliability needed for decision-making. The QA process considers:

- project objectives
- measurement performance specifications
- appropriate methods
- field and laboratory quality control
- data management
- verification and validation of data
- project oversight
- corrective action

### *Quality-Assurance Documents*

The generation, acquisition, and use of environmental data are planned through the development of quality-assurance-project plans (QAPPs), project plans, quality-assurance plans (QAPs) or other planning documents. These documents are developed by project managers, quality assurance staff, technical staff, management, and contractors using a systematic planning process, such as developing data-quality objectives as defined in the *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4. Program specific guidance for the development of QA documents can be found on the Web (see Appendix A).

### Technical and Monitoring Systems Audits

Technical systems audits are conducted on monitoring staff to detect deviations from QAPP and procedural requirements, so that corrective action can be taken. For TCEQ Regional programs, TSAs are conducted every other year unless there was a deficiency the previous year or there are new personnel in the program. A TSA involves an on-site qualitative audit of activities related to monitoring and data management, during which facilities, equipment, and records are reviewed for conformance to program QAPPs. The TSA visit is conducted by personnel from the TCEQ central office.

**Note:** The TSA process is outlined in the SWQM QAPP, Section C1 (see Appendix A). The CRP refers to TSAs as *monitoring systems audits* (MSAs). The requirements of a TSA are similar to those for a CRP MSA. Detailed MSA requirements can be found in Task 2 of the CRP guidance (see Appendix A).

The following is a general summary of the TSA process. Please refer to the SWQM QAPP for details on audit requirements.

## ***Records Review***

A TSA visit includes a review of the following records:

- ***Field data.*** Keep SWQM field data on file as a permanent record for all monitoring trips. These records serve as a permanent file of observations and field measurements made during every sampling event.
- ***Calibration records.*** Keep copies of the *SWQM Multiprobe Calibration Logbook* on file at each office. Keep a separate logbook for each multiprobe instrument. The logbook contains calibration and post-calibration-check data, as well as maintenance and troubleshooting notes.
- ***Flow data.*** Keep flow data, including raw velocity data and calculated flow (discharge), from each field measurement on file at each office.

Since only final values, expressed in standard units of measurement, are reported to the TCEQ central office, the raw data used to produce these values serve as evidence of the collection method and calculation of reported values. This information must be recorded and maintained with other field data.

- ***Data management portion of TSA.*** Prior to each audit visit TCEQ Data Management staff complete a portion of the audit checklist related to data management activities. This portion of the audit serves to ensure timely and accurate data reporting as well as to identify any areas where data management training may be needed by field staff. The assigned auditor will review this information with the regional programs during the audit visit.

## **Procedures for Instrument Calibration**

SWQM personnel must be prepared to demonstrate the proper calibration procedure for the primary instruments used for measuring dissolved oxygen, pH, temperature, and specific conductance. Where two or more personnel share SWQM responsibilities, they may each be required to demonstrate proper calibration procedures that are outlined in Chapter 8.

Instrument calibration, maintenance, and repairs performed by monitoring personnel must be recorded in an *SWQM Multiprobe Calibration Logbook*. If calibration checks or maintenance is carried out in the field, this information may be included in the field data record, in addition to the instrument-calibration logbook. Serious malfunctions must be noted in the logbook on return from the field.

## **Data and Sample Collection Procedures**

At least one person from each region must demonstrate the proper procedures for data and sample collection at one or more SWQM stations. Collection procedures evaluated may include, but are not limited to, the following:

- field measurement protocols (dissolved oxygen [including 24-hour deployment], pH, specific conductance, temperature, Secchi-disk transparency, total depth, and flow)
- collection, preservation, and shipping of water quality samples (including samples of routine water chemistry, metals in water, and organics in water) and bacteriological samples
- collection of sediment samples
- calculation of flow from raw data
- biological-sample collection, sample analysis, and data management
- protocols for sample handling and analysis

### ***TSA Review Follow-Up***

Each TSA review is followed by a verbal and written review of its findings. Central-office personnel conduct the verbal review at the conclusion of the TSA, before leaving the office at which the review was conducted. If possible, the review will be conducted in the presence of the person's immediate supervisor.

The following topics are discussed during the verbal review:

- materials and procedures checked during the TSA
- a summary of any deficiencies
- necessary or suggested changes in sampling procedures, and necessary action to correct any deficiencies

Corrective actions will be laid out in a subsequent memorandum, but they are effective immediately.

The memorandum is directed from the auditor to the appropriate TCEQ regional-office director or CRP planning agency. Copies are also sent to the TCEQ Water Section manager, to all the regional SWQM staff members evaluated, and to the participating data manager.

According to the TCEQ Quality Management Plan, the Water Section manager is required to respond to all deficiencies in writing within 30 days from the date of the follow-up memo. In the response, the manager should describe any corrective actions that will mitigate the deficiency in the future.

The next scheduled TSA includes a review to ensure that required corrective actions were initiated and continued. Until corrective actions are completed, the TCEQ may stop accepting SWQM data, effective from the date of the TSA. If the TCEQ staff determines that data quality has been compromised, central-office data-management personnel will conduct a thorough review and will flag any questionable data in the database as not having passed QC requirements.

### ***Annual Workshop on Surface Water Quality Monitoring***

Each year, water quality monitoring personnel from around the state who contribute data to the SWQM Program participate in a three-day workshop to review existing policies and to learn new procedures relevant to the monitoring program.

Additional training workshops may be conducted several times a year to enable professionals in water quality monitoring who contribute data to the TCEQ to improve

their skills in monitoring, hydraulic measurements and biological assessment, data reporting, and analysis.

## Quality-Control Samples

Periodic testing of field-sample collection and handling skills is included in a field QC program through the use of QC samples including field splits, field blanks, and equipment blanks. For more information on samples of metals and volatile organics in water—which require the collection of laboratory-equipment blanks and trip blanks, respectively—refer to Chapter 5. See Table 10.1 for a summary of QC sampling. Submit QC-sample results to the TCEQ for storage in SWQMIS using the appropriate *monitoring type code* (FS, FB, TB, EB)—for details, see Chapter 4 of the *DMRG*.

### *QC Sample Results*

Submit QC sample results to the TCEQ for storage in SWQMIS.

### *Field Split (Required)*

A field split is a single sample subdivided by field staff immediately following collection and submitted to the laboratory as two separate, identified samples. Split samples are preserved, handled, shipped, and analyzed identically and are used to assess variability in all of these processes. Field splits are required for **all routine conventional water quality parameters**. Split samples are sealed, handled, stored, shipped, and analyzed in the same manner. **Field splits do not apply to any other parameters** (unless needed for a special project).

A field split is collected by dividing an ambient water sample from a single container (for example, a 5-gallon bucket or 2.5-gallon cubitainer) between two sets of containers. A field split mimics preservation, handling, and shipping.

Submit field splits with every 10th sample. If fewer than 10 samples are collected in a month, submit one set of splits for that month.

### *Equipment Blank (Required for Metals in Water)*

Equipment blanks are samples of reagent water poured into or over a sampling device or pumped through a sampling device. Blanks are collected in the same type of container as the environmental sample, preserved in the same manner, and analyzed for the same parameter. This procedure always applies to dissolved-metals-in-water samples and occasionally to total-metals-in-water samples (when a sampling device is needed).

Submit an equipment blank for metals in water with each batch of samples. If fewer than 10 samples are collected during a sample run, submit one blank. If more than 10 samples are collected during a sample run, submit one blank for each 10 samples. See Table 10.1.

**Note:** For those using the TCEQ metals-in-water kits, the standard frequency noted above does not apply. Collect and submit an equipment blank with each sample.

**Table 10.1.** Summary of quality-control sampling.

QA Sample Type	Parameter (Group)	Minimum Frequency	Purpose	Required	Submit to SWQMIS
Field splits (FS)	Routine water chemistry	1 per 10 samples or 1 per month (< 10 samples)	Check for consistency of preservation, handling, shipping	Yes	Yes
Equipment blank (EB)	Metals in water (dissolved)	1 per sample run or 1 per 10 samples if > 10 samples collected in one run; <b>Houston metals kits—collect 1 per sample</b>	Check for contamination from sampling equipment, supplies	Yes	Yes
Field blank (FB)	Total metals in water (collected directly from a water body)	1 per sample run or 1 per 10 samples if > 10 samples collected in one run; <b>Houston metals kits—collect 1 per sample</b>	Check for contamination from sample collection, preservation, handling, shipping	Yes	Yes
Trip blank (TB)	Volatile organics in water	One per ice chest containing VOA samples	Check for sample contamination	Yes	Yes
Field (environmental) duplicate	Water (organics, routine chemistry)	1 per 10 samples or 1 per month (< 10 samples)	Environmental variability	Optional	Optional
Field splits (FS)	Organics, metals	1 per 10 samples or 1 per month (< 10 samples)	Check for consistency of preservation, handling, shipping	Optional	Optional
Equipment blank (EB)	Water (organics, routine water chemistry)	1 per sample run or 1 per 10 (> 10 samples collected in one run)	Check for contamination from sampling equipment, supplies	Optional	Optional
Field blank (FB)	Water (organics, metals, routine chemistry)	1 per 10 samples or 1 per month (< 10 samples)	Check for contamination from sample collection, preservation, handling, shipping	Optional	Optional
Replicate	Sediment	Determined by project needs	Environmental variability	Project specific	Optional

If collecting both dissolved and total metals, using tubing, an in-line filter, and a peristaltic pump, the same tubing and filter may be used for collecting equipment blanks and ambient water samples. Collect in the following sequence:

1. Collect the total-metals blank.
2. Add the filter; collect the dissolved-metal blank.

3. Flush tubing with ambient water and collect the dissolved-metals sample.
4. Remove the filter and collect the total-metals sample.

If there is a delay between collecting the blanks and the ambient samples, place a bag over the filter, without removing it from the tubing, to avoid contamination.

**Note:** If contamination is detected in equipment blanks, blanks are required for **every** metals-in-water sample until the problem is resolved.

### ***Field Blank (Required for Total Metals in Water)***

Field blanks are required for total metals-in-water samples when collected without sample equipment (for example, as grab samples). A field blank consists of deionized water that is taken to the field and poured into the sample container. Field blanks are used to assess the contamination from field sources, such as airborne materials, containers, and preservatives. The frequency for total-metals field blanks is one per day or per sample run. If more than 10 samples are collected, submit one blank for every 10 samples.

**Note:** For those using the TCEQ metals-in-water kits, the standard frequency noted above does not apply. Collect and submit a field blank with each sample.

### ***VOA Trip Blank (Required)***

Trip blanks are required for volatile-organics analysis only. VOA trip blanks are samples prepared in the laboratory with purged laboratory water and preserved, as required. They are transported to the sampling site, handled in the same way as an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. They are used to check contamination of the sample through leaching of the septum. Submit a trip blank for VOA samples with each ice chest full of VOA samples shipped to the lab.

### ***Laboratory Equipment Blank for Metals-in-Water Supplies***

Laboratory-equipment blanks are run by the laboratory where collection materials are cleaned and distributed. An equipment blank documents that materials supplied by the laboratory are free of contamination. When each batch of tubes, filters, bottles, acid, and deionized water is prepared, about 10 percent of the materials are chosen for QC checks—analyses of metals-free water that has been pumped through the filter and tube, collected in a sample container, and preserved.

### ***Optional QC Samples***

#### **Equipment Blank—Other than Metals**

All other types of equipment blanks are not required as part of the routine SWQM Program, but may be inserted into the sample regime, if needed for a specific reason.

For samples, other than metals in water, the recommended minimum frequency is one with every 10th sample. If fewer than 10 samples are collected in a month, submit one set of field blanks for that month.

#### **Field Blanks—Other than Total Metals**

Field blanks are optional for all sample types, with the exception of total metals in water. Field blanks, not required as part of the routine SWQM Program, may be inserted into the

sample regime, if needed for a specific reason. The frequency is determined by the needs of the project or special study.

If the needs of a sampling project are met with field blanks, the recommended minimum frequency is one in 10. If fewer than 10 samples are collected in a month, submit one field blank for that month.

### **Field (Environmental) Duplicates**

A field or environmental duplicate a second sample from the same location, collected in immediate succession, using identical techniques. Duplicate samples are sealed, handled, stored, shipped, and analyzed in the same manner as the primary sample.

Field duplicates are not required as part of the routine SWQM Program, but may be inserted into the sample regime, if needed for a specific reason.

If the needs of a sampling project are met with field blanks, the recommended minimum frequency is one with every 10th sample. If fewer than 10 samples are collected in a month, submit one set of field blanks for that month.

### **Sediment and Tissue Samples**

QC samples are not required for sediment or tissue. Replicate sediment samples are not required as part of the routine SWQM Program, but may be inserted into the sample regime, if needed for a specific reason. The frequency is determined by the needs of the project or special study.

### ***Tracking QC Data***

Submit blank, field split, and duplicate results to the SWQMIS. Specific uses of QC data are defined by the TCEQ SWQM Program, the CRP, and other water program QAPPs. QC data are used in the review of ambient data as specified by each program area.

