5 ANALYTICAL PROCEDURES

5.1 BACKGROUND

The analytical methods, both qualitative and quantitative, implemented in the field and at the laboratory will comply with EPA and Ecology-approved guidelines (Table 3-1) and will be incorporated into the SAP (by reference). The analytical laboratory will be selected from a list of pre-qualified laboratories developed by the QC Manager. Criteria for qualification will consider capabilities (including equipment and personnel); certifications; associated performance on evaluation samples, audits and Method Detection Limit (MDL) studies on similar matrices; experience; references; and pricing. Field measurements will be conducted by Foster Wheeler or its subcontractors, under the supervision of Foster Wheeler personnel (FOL or designee).

5.2 SPECIFIC ANALYTICAL CHEMICAL PROCEDURES

Standard EPA, Puget Sound Estuary Program (PSEP), and Ecology methods will be referenced as appropriate in Tables 3-1 to 3-5 and in the SAP. Other methods will be submitted in a format that will describe in detail the exact procedures and materials required to analyze the samples. The following items shall be included, at a minimum, in the procedure:

- Medium of application (i.e., water, soil, air)
- Principle of method
- Sample size requirements
- Detection limits and/or Practical Quantitation Limits (PQL)
- Interferences and corrective measures
- Apparatus (including instrumental parameters)
- Reagents
- Calibration procedure
- Sample preparation (i.e., extraction, digestion)
- Diagrams or tables that describe the method
- Step-by-step analytical procedure
- Details of calculation
- QC requirements (i.e., blanks, spikes, duplicates)
- Report requirements
- References

Data will be included, if appropriate, to support the limitations and the applicability of the method.

If at any time a change in the documented laboratory SOP is required, the QC Manager will examine and evaluate the significance of the change. If the change/modification is determined to be significant, the QC Manager will require additional precision, accuracy, and detection limit data either to demonstrate that the previous estimates of the limitations remain valid, or to develop the necessary data for accuracy describing the new methods. EPA or state agency guidelines, as appropriate, will be followed for acceptance of alternative methods. Any substantive changes to the QAPP (requiring a revision) must be approved by the signatories of the QAPP.

The QC Manager may use these SOPs as the basis for performing audits of laboratory practices and reviewing laboratory results.

Field measurements will be taken following procedures as described in the SAP Appendices (Volume II).

5.3 TEST METHODS

The methods for conducting the tests of samples will follow either standard EPA, the American Society for Testing and materials (ASTM), Water Environment Federation (WEF), PSEP, National Council of the Paper Industry for Air and Stream Improvement (NCASI), or Ecology procedures. Field measurements will be taken following the above methods, where applicable, as implemented by the SOPs.

5.4 CONTROL OF TESTING

The laboratory program for controlling the testing of project samples is described in the approved Laboratory QA Plan. Field measurements will follow the SOPs in the SAP Appendices (Volume II).

5.5 LIMITS OF DETECTION

The basis for limits of detection for the analytical laboratory will be described in the Laboratory QA Plan or associated laboratory SOPs, and calculated as required by 40 CFR Part 136, Appendix B. Thus, actual MDLs are laboratory-specific and a function of the equipment operating conditions and sample matrices. Typical MDLs or PQLs, as published by EPA and specified as estimated quantitation limits, are presented in Tables 3-2 through 3-5. These will be considered as the objectives for this project, recognizing that they may not always be achievable for a given operating or sample condition. Field detection limits will follow the manufacturer's specifications for the individual instruments.

5.6 EQUIPMENT CONTROL AND CALIBRATION

This section describes the requirements for control, calibration, adjustment, and maintenance of field and analytical measuring and testing devices used for performing tests. Devices will be calibrated and adjusted at specified, predetermined intervals using equipment and material (i.e., calibration gases) having known valid relationships to National Institute of Standards and Testing (NIST) or other certified standards.

Calibration activities will be performed as described in SOP 4, Field Instrument Calibration in Volume II.

5.6.1 RESPONSIBILITY AND CONTROLS

The FOLs are responsible for ensuring implementation of the following procedures for field-calibrated equipment:

- A procedure is established to include the measuring and testing devices to be calibrated and the frequency of calibration of these devices. This procedure will be appended to the SAP as individual instrument SOPs. The method and interval of calibration will be based on the type of device, stability characteristics, required accuracy, and other conditions affecting measurement control. Calibration information also will be maintained in the site logbooks.
- The measuring and testing devices used are of the proper range, type, and accuracy for the test being performed.
- An instrument logbook is maintained for each measuring and testing device, including, at a minimum, the following information:
  - Name of device
  - Device serial and/or identification number
  - Frequency of calibration
  - Date of last calibration
  - Name of party performing last calibration
  - Due date for next calibration
- Measuring and testing devices are marked with calibration due dates when possible. When this marking is not possible, alternative methods of tracing the device to its calibration date (such as serialization) will be employed.
- Measuring and testing devices are calibrated in accordance with the requirements of this section. Before use in the field, each instrument is calibrated and documentation is made in the instrument logbook.
- A system for issuance, collection, and return of all measuring and testing devices is developed, maintained, and presented in the SAPs. This system will include a means to identify the personnel withdrawing devices, methods for issuing devices, and methods for collecting and/or returning of devices at prescribed times or as otherwise required.

- Methods are employed to ensure proper handling, storage, and care of the test equipment in order to maintain its required accuracy. To this end, SOPs for each kind/type of field test equipment will be appended to the SAP. Typically, these will consist of the manufacturer's recommended SOPs, including specifications for accuracy, precision, etc. In addition, these specifications will be added to the DQO tables, if available.

5.6.2 CALIBRATION FREQUENCY FOR FIELD EQUIPMENT

Field equipment used for on-site measurements will be calibrated before and after daily use. A list of equipment to be used during the field sampling program, including the respective calibration technique, will be included in the Calibration SOP in the SAP. If any measuring or test device requiring calibration cannot immediately be removed from service, the FOLs can extend the calibration cycle is a review of the equipment's history warrants the issuance of an extension. No equipment will be extended more than twice a calibration cycle, nor will the extension exceed one-half the prescribed calibration cycle.

5.6.3 LABORATORY CALIBRATION AND CONTROL PRACTICES

The calibration procedures and frequency followed by the laboratory will be conducted in accordance with standard EPA or Ecology protocols and the Laboratory QA Plan. These plans will be provided to the Foster Wheeler QC Manager upon request. The laboratory QA Plan will be approved or certified by Ecology. Calibration and QA procedures will indicate instrument stability and sensitivity, and will verify and document instrument conditions before and during testing.

5.6.4 EQUIPMENT REPAIR AND ACTIONS

- Field and laboratory test equipment that does not meet specified QA requirements will be recalibrated in accordance with method specifications and manufacturer requirements in accordance with the SOPs. When field test equipment is found to be out of calibration, damaged, lost or stolen, an evaluation will be made to ascertain the validity of previous measurements and the acceptability of these results since the last calibration check. If measurements are suspected to be inaccurate or invalid, the original measurements and testing will be repeated using properly calibrated equipment, or the associated previous data will be flagged as suspect. Suspect measurements will be listed in a nonconformance report or a deficiency notice, as applicable.
- Test equipment consistently found to be out of calibration will be repaired or replaced.
- Inspection and test reports will include identification of the test equipment used to perform the inspection and/or tests. A corrective action report will be completed for any instrument found to be defective, inoperable, or faulty. This report will include the identification of the instrument, date and time of the test, a description of the test or evaluation, corrective action taken, and name and initials of responsible party. This information will be noted in the instrument logbook.