



U.S. Environmental Protection Agency (EPA)
Region III
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US EPA - Region III

BROWNFIELDS

Quality Assurance Project Plan

Template

Interim Final

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DISCLAIMER

This EPA Brownfields Quality Assurance Project Plan (QAPP) Template is a generic format to be used for generating a QAPP for EPA Brownfields pilot projects in Region III. Prior to environmental data collection for a Brownfields pilot project, a site-specific Sampling and Analysis Plan must be submitted to EPA Region III for review and approval. This template is not to be used as a project planning tool for performing Superfund National Priorities List (NPL) investigations.

The technical specifications in this QAPP Template do not supercede state, local and/or site-specific Applicable, Relevant and Appropriate Requirements (ARARs).

This document has been derived from the US EPA Quality Assurance Guidance for Conducting Brownfields Site Assessments, EPA Region 2 Brownfields Project Planning Guidance and US EPA QA/R-5: EPA Requirements for Quality Assurance Project Plans.

Title and Approval Page

Document Title

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PROJECT MANAGEMENT

A.1 PROJECT ORGANIZATION AND RESPONSIBILITY

Develop an organizational chart that identifies the chain of command of each person in the bulleted list. Include titles, responsibilities and organizational affiliation of all project participants. Attach the project's organizational chart. The organizational chart should be labeled Figure 1.1.

The organizational chart provided in Figure 1.1 identifies the individuals responsible for:

- Overall project coordination.
- Overall QA.
- Systems auditing (on-site evaluations).
- Performance auditing.
- Sampling operations.
- Sampling QC.
- Laboratory analyses.
- Laboratory QC.
- Data processing activities.
- Data processing QC.
- Data quality review.

Certain key individuals may be responsible for more than one of the aforementioned project functions. The organizational chart provides sufficient evidence that the lines of authority for all referenced organizations (including contractors and subcontractors) is appropriate to accomplish the QA objectives of this project.

A.2 PROJECT STRATEGY

Describe the purpose of this project. Identify the information that will be needed to make informed, defensible decisions and how this information will be obtained. Also, identify what is the geographical extent and time and budget constraints for the project.

It is recommended that a planning process similar to the Data Quality Objective (DQO) Process found on page ES-2 of the EPA Quality Assurance Guidance for Conducting Brownfields Site Assessments be used for this project.

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A.3 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Data collected from this project will be used to:

Select the appropriate objective(s) from the following list. Additional objectives may be added.

- Ascertain if there is a threat to public health or the environment.
- Locate and identify potential sources of contamination. Sampling data will be used to formulate remediation strategies, and estimate remediation costs.
- Determine treatment and disposal options. Characterize soil for on-site or off-site treatment.
- Verify attainment of clean-up goals. Ascertain if additional remediation is required.

When conducting this Brownfields investigation, all measurements will be made so that results are reflective of the medium and conditions being measured. Prior to all environmental measurement activities, site-specific Data Quality Objectives and measurement performance criteria will be determined. Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the Brownfields environmental monitoring data required to support decisions. DQOs are predicated in accordance with the anticipated end uses of the data which are to be collected. DQOs are applicable to phases and aspects of the data collection process including site investigation, design, construction, and remedy operations. It is important to note that the level of detail and data quality needed will vary with the intended use of the data.

Data Quality Objectives are typically assessed by evaluating PARCC (Precision, Accuracy, Representativeness, Completeness, and Comparability) of all aspects of the data collection process. PARCC is defined as:

- Precision; a measure of the reproducibility of analyses under a given set of conditions.
- Accuracy; a measure of the bias that exists in a measurement system.
- Representativeness; the degree sampling data accurately and precisely depict selected characteristics.
- Completeness; the measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under “normal” conditions.
- Comparability; the degree of confidence with which one data set can be compared to another.

To assess if environmental monitoring measurements are of an appropriate quality, the general PARCC requirements found in Section D.3 of this document and site-specific Measurement Quality Objectives (MQOs) for precision, accuracy and completeness will be compared to the site-specific quality objectives and measurement performance criteria.

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Prior to the initiation of any data collection activity, a site-specific Sampling and Analysis Plan (SAP) will be prepared. This SAP shall:

- Logically evaluate available site information.
- Specify site-specific Measurement Quality Objectives for precision, accuracy and completeness for each parameter being measured.
- Select an appropriate sampling design.
- Select and utilize suitable geophysical, analytical screening, and sampling techniques.
- Employ proper sample collection and preservation techniques.
- Collect and analyze appropriate quality assurance/quality control (QA/QC) samples.
- Logically present and interpret analytical and geophysical data.
- Define data usability criteria.

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MEASUREMENT/DATA ACQUISITION

B1 SAMPLING METHODS REQUIREMENTS

The purpose of performing this Brownfields investigation is to determine the presence and identity of contaminants along with the extent to which they have become integrated into the surrounding environment. The objective of this effort is to collect and analyze a sample which is representative of the media under investigation. The methods and equipment used for sampling environmental matrices vary with the associated physical and chemical properties.

For each anticipated sampling media (i.e., surface water, sediment, soil, groundwater, surface geophysics, ecological sampling, etc.), describe the sampling procedures to be used. Describe the sampling equipment, equipment decontamination procedures, sample collection, sample preservation procedures. If samples are to be composited, please include these procedures. Please be advised, samples for volatile organic analyses can not be composited in the field. If samples are to be filtered, please describe field filtration procedures. Also describe any field analytical procedures that may be used during sampling, such as the collection of pH, conductivity, turbidity during the purging of groundwater wells.

If SOPs for these activities exist, reference them in the text and place a copy of the SOP in an Appendix.

Specific requirements for sampling may be found in the following guidance documents:

- *US EPA Office of Solid Waste and Emergency Response. January 1991. Compendium of ERT Surface Water and Sediment Sampling Procedures. EPA/540/P-91/005.*
- *US EPA Office of Solid Waste and Emergency Response. January 1991. Compendium of ERT Groundwater Sampling Procedures. EPA/540/P-91-007.*
- *US EPA Office of Solid Waste and Emergency Response. January 1991. Compendium of ERT Soil Sampling and Surface Geophysics Procedures. EPA/540/P-91/006.*
- *US EPA Office of Emergency and Remedial Response. December 1995. U.S. EPA Superfund Program Representative Sampling Guidance, Volume 1: Soil. OSWER Directive 9360.4-10, Interim Final, EPA/540/R-95/141.*
- *US EPA Office of Emergency and Remedial Response. December 1995. Superfund Program Representative Sampling Guidance, Volume 5: Water and Sediment, Part I - Surface Water and Sediment. OSWER Directive 9360.4-16, Interim Final.*
- *US EPA Office of Emergency and Remedial Response. December 1995. Superfund Program Representative Sampling Guidance, Volume 5: Water and Sediment, Part II - Ground Water. OSWER Directive 9360.4-16, Interim Final.*

To ensure that uniform and acceptable sampling protocols for each project are being used, the sampling requirements found in Table 1.0 will be used for all site-specific projects.

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B.2 SAMPLING HANDLING AND CUSTODY REQUIREMENTS

Sample labels will be securely affixed to each sample container. Sample labels will clearly identify the particular sample, and delineate the following information:

- Site name and designated project number.
- Sample identification number.
- Date and time the sample was collected.
- Sample preservation method.
- Sample pH.
- Analysis requested.
- Sampling location.

All samples will be maintained in accordance with the following chain of custody procedures. A sample is under custody when it is:

- In a person's physical possession
- In view of that person after he/she has taken possession
- Secured by that person so that no one can tamper with the sample
- Secured by that person in an area which is restricted to authorized personnel.

A chain-of-custody record must always be maintained from the time of sample collection until final deposition. An example of a chain of custody form is found in *Figure 1*. (*Attach a copy of a blank chain of custody form and label as Figure 1*). Every transfer of custody will be noted and signed for with a copy of the record being kept for each individual which endorsed it. At a minimum, the chain-of-custody record will include the following information:

- Contractor name and address.
- Sample identification number.
- Sample location.
- Sample collection date and time.
- Sample information, i.e., matrix, number of bottles collected, container type, etc.
- Names and signatures of samplers.
- Signatures of all individuals who have had custody of the samples.

When preparing sample containers for shipment they will be securely sealed. Samples will then be put in an appropriate transport container and packed with an appropriate absorbent material. Samples placed in the transport container (e.g., coolers) will be packed in a manner which will prevent breakage. All sample containers will be packed to maintain a temperature of 4°C. A temperature blank will be added to each transport container. This container of blank water will be used to verify that the temperature within the transport container was maintained at 4°C.

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All sample documentation will be affixed to the underside of each transport container lid. The transport container lid will then be closed and affixed with a custody seal accordingly. Samplers will transport environmental samples directly to the laboratory within 24 hours of sample collection, or utilize an overnight delivery service within 24 hours of sample collection.

Custody seals on the transport container will be used to demonstrate that the transport container has not been opened or tampered with. The individual who has sample custody shall always sign, date, and affix the custody seal to the container in such a manner that it cannot be opened unless it is broken. When samples are not under direct control of the individual responsible for them, they will be stored in a container which will be affixed with a custody seal. When the transport container is received in the laboratory, the laboratory sample custodian will the temperature blank to measure the temperature within the transport container.

All of the appropriate U.S. Department of Transportation (U.S. DOT) regulations for packaging, marking/labeling, and shipping hazardous materials and wastes will be followed. Air carriers which transport hazardous materials, in particular Federal Express, will comply with the current edition of the International Air Transport Association (IATA) Dangerous Goods Regulations. The IATA regulations detail the procedures to be used to enable the proper shipment and transportation of hazardous materials by a common air carrier. Following all of the current IATA regulations will ensure compliance with U.S. DOT.

B3 ANALYTICAL METHODS REQUIREMENTS

Analytical methods will be selected that will achieve project objectives. Each site-specific SAP will identify analytical method numbers, extraction and/or digestion method numbers, method detection limits and quantitation limits for each parameter. This SAP will also identify method numbers with detection limits for each field parameter. The Appendix of the site-specific SAP will include Standard Operating Procedures (SOPs) for all field screening methods and for non-EPA approved methods. *EPA considers most methods developed by ASTM, NIOSH and the APHA/AWWA/WEF (Standard Methods for the Examination of Water and Wastewater) EPA approved methods. SOPs for all analytical and field methods may be included in the Appendix of the site-specific SAP.*

B4 QUALITY CONTROL REQUIREMENTS

The field quality control requirements found in Table 2 will be followed during this Brownfields investigation. The site-specific SAP will include quality control requirements for the laboratory.

B5 INSTRUMENT/EQUIPMENT MAINTENANCE REQUIREMENTS

All field equipment will be maintained in accordance with each respective instrument manufacturer's operating instructions. All maintenance activities will be recorded in a log book.

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For field equipment, the preventive maintenance information found in Table 3 will be used. When the acceptance criteria is not met, the corrective action found in Table 3 will be implemented. Analytical equipment will be maintained in accordance with procedures found in the site-specific SAP.

Describe the availability of spare parts identified in the manufacturer's operating instructions. If SOPs exist, include them in an Appendix to this document.

B6 INSTRUMENT CALIBRATION AND FREQUENCY

All field equipment will be calibrated following the procedures found in Table 4. When the acceptance criteria is not met, the corrective actions found in Table 4 will be implemented. Analytical equipment will be calibrated in accordance with procedures found in the site-specific SAP.

B7 DATA MANAGEMENT

1.0 Sample Documentation

All sample documents will always be legibly written in ink. Any corrections or revisions to sample documentation shall be made by lining through the original entry and initialing any changes. To reiterate these requirements the following sub-sections are provided to outline sample documentation procedures which will be employed when conducting this Brownfields investigation.

1.1 Field Logbook

The field logbook is a descriptive notebook detailing site activities and observations so that an accurate and factual account of field procedures may be reconstructed. All entries will be signed by the individuals who are making them. All field logbook entries will document the following specifics:

- Site name and project number.
- Contractor name and address.
- Names of personnel on site.
- Dates and times of all entries.
- Descriptions of all site activities, including site entry and exit times.
- Noteworthy events and discussions.
- Weather conditions.
- Site observations.
- Identification and description of samples and locations.
- Subcontractor information and names of on-site personnel.
- Dates and times of sample collections and chain of custody information.
- Records of photographs.

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- Site sketches.
- All relevant and appropriate information delineated in field data sheets and sample labels.

1.3 Standard Operating Procedures

Often many laboratory and field operations are arranged to form Standard Operating procedures (SOPs). Whenever SOPs are applicable and available, they will be incorporated into the data collection activities pursuant to a Brownfields investigation. To ensure environmental sample collection efforts are comparable, procedures found in sampling SOPs will be followed. The sampling SOPs are found in Appendix A. Site-specific SAPs will include SOPs for all field screening methods and for non-EPA approved methods.

1.4 Field Data Records

All real-time measurements and observations must always be recorded in project log books, field data records, or in similar types of record keeping books. Field data records will be organized into standard formats whenever possible, and retained in permanent files.

1.5 Analytical Data Deliverable Requirements

At a minimum, analytical data deliverable package for screening and definitive data will include the following:

- Sample documentation (location, date and time of collection and analysis, etc.)
- Chain of custody
- Initial and continuing calibration
- Determination and documentation of detection limits
- Analyte(s) identification (include chromatograms)
- Analyte(s) quantitation
- QC blanks
- Matrix spike recoveries
- Quality Control sample results
- Duplicate results

The laboratory will produce a CLP-type analytical deliverable package. Prior to the submission of laboratory data, the laboratory's Quality Assurance Officer will review the data for accuracy, precision and completeness.

1.6 Data Management

*Describe the project data management scheme, tracing the path of the data from their generation in the field or laboratory to their final use or storage. A **flowchart may be used**. Describe the record keeping procedures and the approach used for data storage and/or retrieval on electronic media. Discuss the control mechanism for detecting and*

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correcting errors and for preventing loss of data during data reduction, data reporting and data entry. Identify and describe all data handling equipment and procedures to process, compile and analyze data. Describe the procedures that will be followed to demonstrate acceptability of hardware/software configurations required.

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ASSESSMENT AND OVERSIGHT

C1 PERFORMANCE AND SYSTEMS AUDITS

During this Brownfields investigation, internal and external performance and systems audits will be undertaken to evaluate the capability and performance of the total measurement system. Audits will be utilized to ensure that field and laboratory activities will provide data reflective of the site and its conditions.

A performance audit is performed to evaluate the accuracy of the total measurement system or component thereof. A systems audit focuses on evaluating the principal components of a measurement system to determine proper selection and use. In regard to field sampling operations, this oversight activity is performed to critique the quality control procedures which are to be employed. Systems audits of this nature are to be performed periodically prior to or shortly after field operations commence and until the project is completed.

Identify the title of the person who will conduct audits for field and laboratory activities. Describe the protocol that will be used for audits. Define the acceptance criteria for these audits.

C2 REPORTS TO MANAGEMENT

Identify the frequency and distribution of reports issued to inform management of the following:

- *Status of the project*
- *Results of Performance Evaluations and Systems Audits*
- *Results of periodic data quality assessments*
- *Significant quality assurance problems and recommended solutions*
- *Changes in the QAPP or site-specific SAP*

Identify the preparer and the recipients of the reports.

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DATA VALIDATION AND USABILITY

D1 REVIEW OF FIELD DATA

Describe the criteria to be used to review field data (i.e., calibration results, site location information, etc.) for accuracy and precision.

D2 DATA VALIDATION

To ensure that measurement data generated when performing this Brownfields investigation are of an appropriate quality, all data will be validated. Data validation is a systematic procedure of reviewing a body of data against a set of established criteria to provide a specified level of assurance of its validity prior to its intended use. It requires that the techniques utilized are applied to the body of the data in a systematic and uniform manner. The process of data validation must be close to the origin of the data, independent of the data production, and objective in its approach.

All data from this project will be validated in accordance with the IM1 and M2 level of data validation found in the Region III Innovative Approaches to Data Review Guidance Document. (June 95) *A copy of this guidance document can be obtained from OASQA - Quality Assurance Team. Contact May Edwards at (410) 305-2736.*

D3 RECONCILIATION WITH USER REQUIREMENTS

1.0 Accuracy

Accuracy will be assessed through the analysis of quality control samples. The analytical accuracy will be expressed as the percent recovery (%R) of an analyte which has been added to the environmental sample at a known concentration before analysis and is calculated according to the following equation.

$$\% R = \left(\frac{S - U}{C_{sa}} \right) \times 100$$

where: %R = percent recovery

S = measured concentration in spiked aliquot

U = measured concentration in unspiked aliquot

C_{sa} = actual concentration of spike added

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The following formula should be used to for measurements where a standard reference material is used:

$$\% R = \frac{C_m}{C_m} \times 100$$

Where: %R = percent recovery
 C_m = measured concentration of standard reference material
 C_m = actual concentration of standard reference material

1.1 Precision

Precision will be determined through the use of field duplicates, matrix spike/matrix spike duplicates and duplicate quality control samples. The Relative Percent Difference (RPD) between the two results will be calculated and used as an indication of the precision of the analyses performed.

The following formula should be used to calculate precision:

$$RPD = \frac{(C_1 - C_2)}{(C_1 + C_2)/2} \times 100$$

Where: RPD = relative percent difference
 C_1 = larger of the two observed values
 C_2 = smaller of the two observed values

1.2 Completeness

Completeness is defined as the measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Data completeness will be expressed as the percentage of valid data obtained from the measurement system. For data to be considered valid, it must meet all the acceptable criteria including accuracy and precision, as well as any other criteria required by the prescribed analytical method.

The following formula should be used to calculate completeness:

$$\% C = \frac{V}{n} \times 100$$

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Where: %C = percent completeness

V = number of measurements judged valid

n = total number of measurements necessary to achieve a specified statistical level of confidence in decision making.

TABLES

TABLE 1
Sample Containers, Preservation, Holding Times

Matrix	Sampling SOP No.	Parameter/Fraction	Minimum Sample Volume ¹	Sample Container ²	Sample Preservation	Technical Holding Time
Soil		Volatile Organics (VOCs) - Medium /High Concentration	4 oz.	2 oz. clear wide-mouth glass with Teflon lined septum.	Cool to 4°C	14 days
		Volatile Organics (VOCs) - Low Concentration	5g ³	varied ³	Sodium bisulfate ³	varied ³
		Acid Extractable Organics Base & Neutral Organics (BNAs)	4 oz.	4 oz. amber wide-mouth glass with Teflon lined cap.	Cool to 4°C	7 days extract; 40 days analyze
		Pesticides/Aroclors (PCBs)	4 oz.	4 oz. amber wide-mouth glass with Teflon lined cap.	Cool to 4°C	7 days extract; 40 days analyze
		Total Metals	6 oz.	8 oz. clear wide-mouth glass with Teflon lined cap.	Cool to 4°C	180 days; (28 days Hg)
		Cyanide	6 oz.	8 oz. clear wide-mouth glass with Teflon lined cap.	Cool to 4°C	14 days
		<i>Add information for other parameters to be measured</i>				

Legend:

¹ Triple volume is required for matrix spike/matrix spike duplicate (MS/MSD) analysis.

² *In the legend of the table include the source of contaminant-free sample containers. All sample bottles must comply with the standards outlined in the following reference:*

U.S. EPA (Environmental Protection Agency). December 1992. *Specifications and Guidance for Contaminant-Free Sample Containers*. OSWER Directive #9240.0-05A, EPA 540/R-93/051. Office of Solid Waste and Emergency Response, Washington, DC.

³ *In the legend of the table include in the option that will be used and preservation information for that option. The CLP Statement of Work (OLM04.2a) provides three options for sample containers, preservatives and storage procedures. Sample containers can be pre-weighed, closed-system, purge-and-trap vials, Encore (or equivalent) sample containers or 40ml, 60mL or 4oz widemouth glass containers. Samples may also be frozen (-12 °C). Refer to Exhibit D - Volatiles Appendix B in OLM04.2a for more specific descriptions. If CLP is not being used refer to SW-846 Method 5035.*

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TABLE 1
Sample Containers, Preservation, Holding Times

Matrix	Sampling SOP No.	Parameter/Fraction	Minimum Sample Volume ¹	Sample Container ²	Sample Preservation	Technical Holding Time
Aqueous		Volatile Organics (VOCs)	80 ml	40 ml VOC vial with Teflon lined septum.	1:1 HCl to pH<2; Cool to 4°C; 25 mg Ascorbic Acid ³	14 days
		Acid Extractable Organics Base & Neutral Organics (BNAs)	2 Liters	1 Liter amber glass with Teflon lined cap.	Cool to 4°C; 80 mg Na ₂ S ₂ O ₃ (sodium thiosulfate) ⁴	7 days extract; 40 days analyze
		Pesticides/Aroclors (PCBs)	2 Liters	1 Liter amber glass with Teflon lined cap.	Cool to 4°C	7 days extract; 40 days analyze
		Total Metals	1 Liter	1 Liter HDPE bottle with Teflon lined cap.	1N HNO ₃ to pH<2; Cool to 4°C	180 days (28 days Hg)
		Cyanide	1 Liter	1 Liter HDPE bottle with Teflon lined cap.	NaOH to pH>12; Cool to 4°C; 25 mg Ascorbic Acid ³	14 days ⁵
		<i>Add information for other parameters to be measured</i>				

Legend:

- ¹ Triple volume is required for matrix spike/matrix spike duplicate (MS/MSD) analysis.
- ² *In the legend of the table include the source of contaminant-free sample containers. All sample bottles must comply with the standards outlined in the following reference:*
U.S. EPA (Environmental Protection Agency). December 1992. *Specifications and Guidance for Contaminant-Free Sample Containers*. OSWER Directive #9240.0-05A, EPA 540/R-93/051. Office of Solid Waste and Emergency Response, Washington, DC.
- ³ Ascorbic Acid should only be used in the presence of residual Chlorine.
- ⁴ Sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) should only be used in the presence of residual Chlorine.
- ⁵ Maximum holding time is 24 hours when sulfide is present.

TABLE 2
Field Quality Control Requirements

QC Sample	Frequency	Acceptance Criteria	Corrective Action
Field Duplicate	One per twenty samples per matrix or one per day, whichever is more frequent.		
Split Sample	10% of field screening data will be confirmed with data from a fixed laboratory. ¹		
MS/MSD ²	One per twenty samples per matrix or one per day, whichever is more frequent.		
Equipment Rinsate Blank	One per twenty samples per matrix per equipment type per decontamination event or one per day, whichever is more frequent.		
Field Blank	One per twenty samples per matrix or one per day, whichever is more frequent.		
VOA Trip Blank	One for each cooler which contains samples for VOA analyses.		
Cooler Temperature Blank	One per cooler.		
Other (<i>Specify</i>)			

Legend:

¹ Per Superfund Data Quality Objectives Process for Superfund

² Sufficient sample will be collected to allow the laboratory to perform this analysis.

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Table 4
Calibration and Corrective Action - Field Equipment

Identify all tools, gauges, instruments, and other equipment used for data collection activities that must be calibrated to maintain performance within specified limits.

Instrument	Calibration Standards	Frequency Initial & Continuing Calibration	Acceptance Criteria	Corrective Action

APPENDIX A
Standard Operating Procedures