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**Los Alamos  
National Laboratory**

Risk Reduction and Environmental Stewardship Division

Meteorology and Air Quality Group (MAQ)

**Quality  
Assurance  
Project  
Plan**

for the

**Non-Radiological  
Air Sampling  
Network  
(NonRadNET)**

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### Appendices

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## **Distribution List (A3)**

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**List of  
document  
recipients**

This document will be controlled under the organization's document control system (MAQ-030, "Document Distribution") to ensure that those performing work for the system will receive a controlled copy and all revisions. Those who will receive or have nearby access to a controlled copy include:

- MAQ Group Leader
- MAQ QA Officer
- MAQ Air Monitoring Project Leader
- MAQ NonRadNET Staff Members
- MAQ NonRadNET System Technicians
- Assistant Area Manager, Office of Environment and Projects

## Introduction

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### History of revision

This table lists the revision history of this plan.

Revision	Date	Description Of Changes
0	9/19/02	New document.

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### Purpose of this plan

This QA project plan describes in detail the objectives and design of Los Alamos National Laboratory's (LANL) Non-Radiological Air Sampling Network (NonRadNET).

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### Structure of the quality program

This project plan is a second-tier document to the MAQ Quality Management Plan (MAQ-QMP). The following documents ensure that the NonRadNET system is operated in accordance with the requirements in the applicable QA project plan:

- MAQ Quality Management Plan
  - QA Project Plan for the NonRadNET Project (this document)
  - Implementing procedures
- 

### Revising this plan

This plan will be controlled through the MAQ document control program (MAQ-030, "Document Distribution"). The project leaders, at least one reviewer, and the group leader will approve all revisions to this plan.

## Project Organization (A4)

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### Group organization

The Meteorology and Air Quality Group (MAQ) of the Risk Reduction and Environmental Stewardship (RRES) Division is responsible for the NonRadNET at Los Alamos National Laboratory (LANL). See the MAQ Quality Management Plan (MAQ-QMP) for a description of the group organization, level of authorities, and lines of communication. The group is organized by project teams under the line management direction of the group leader. Project teams are cross-functional and focus on specific LANL air quality responsibilities, deliverables, or products. Project teams are guided by team leaders who have the responsibility to assure the project is completed.

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### Project organization

The MAQ Air Monitoring Project Leader manages the operation of the NonRadNET. The project leader reports to the MAQ Group Leader. A Technical Staff Member is responsible for operation of the network, data validation, and data interpretation. A group QA specialist is assigned to work for the project leaders to provide quality assurance assistance, advice, and review. The Meteorology Monitoring Project provides some meteorological data parameters.

The group analytical chemist provides support to the project leader in interfacing with analytical laboratories, uploads electronic data deliverables, and reviews chemistry data packages. Technicians assigned to the project are responsible for collecting and shipping samples, maintaining sampling equipment, uploading field data, and conducting verification and validation of field data. Other group members work for the project leaders to manage databases and maintain records. In addition, representatives from other groups may participate and contribute to this team.

## Project Organization (A4), continued

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### Other supporting organizations

Other groups in LANL and subcontracting organizations provide support to MAQ for the NonRadNET.

Grand Junction Office Analytical Laboratory (formerly Wastren-Grand Junction) of Grand Junction, Colorado currently provides services for the analysis of metals collected on air filters.

Severn-Trent Laboratories of Austin, Texas provides services for the analysis of volatile organic compounds.

In the future, other or additional laboratories or organizations may be contracted to provide analytical support. Subcontract analytical laboratories report to and are responsible to the MAQ analytical chemist.

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### Approval of final products and deliverables

Final products and deliverables resulting from the NonRadNET, listed below, will be approved by the indicated personnel:

Product	Approvers
Analytical data packages	NonRadNet Staff Member(s)
Data Quality Review & Air Concentration Report	NonRadNet Staff Member(s)
Final technical review of project data	NonRadNet Staff Member(s)

## **Problem Definition and Background (A5)**

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**Background** During the spring of 2000, the Cerro Grande fire reached LANL and ignited both above-ground vegetation and disposed material in landfills. There was concern at the time about the potential human health impacts from chemicals emitted by the fire; therefore, short-term intensive air monitoring studies were performed. LANL did not have an adequate database of airborne non-radiological constituents under baseline conditions with which to compare data collected during the fire. LANL has decided to develop a non-radiological air quality-monitoring program.

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**Project objectives** The primary objectives for this monitoring program are as follows:

- Develop the capability to collect non-radiological air monitoring data in case of any future forest fires or other emergency releases.
- Conduct monitoring to develop a database of typical background levels of selected non-radiological constituents in the communities near the Laboratory.
- Measure LANL's contribution to non-radiological air pollution in the surrounding communities.

Note that there are no regulatory drivers or requirements for this program.

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**Applicable regulatory quality criteria** This plan is prepared to follow the EPA standard for quality plans (EPA QA/R-5, "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations").

## Project Description (A6)

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<b>NonRadNET Summary</b>	<p>The NonRadNET is designed to sample environmental levels of non-radiological air constituents at LANL and in communities near the laboratory. Species or parameters to be monitored include: total suspended particulate (TSP), particles with diameters of 10 micrometers or less (PM-10) (if sufficient equipment is available to measure both PM-10 and PM-2.5), particles with diameters of 2.5 micrometers or less (PM-2.5), 160 volatile organic compounds (VOCs are listed in Appendix B), and 20 metals (Ag, As, Ba, Be, Cd, Ce, Cr, Co, Cu, Fe, Mn, Nd, Ni, Pb, Sb, Se, Sr, Tl, V, and Zn). [NOTE: Analytes are subject to change. See the latest SOW for the analytical work for the current analytes.] Simultaneous monitoring will take place at three different locations – two in Los Alamos and one in White Rock, New Mexico.</p> <p>A description of the locations is given in Appendix A.</p>
<b>Meteorological data</b>	<p>Meteorological data will be collected through LANL's existing meteorological monitoring network. For more information about this network, see MAQ-MET ("QA Project Plan for the Meteorology Monitoring Project").</p>
<b>Database of constituent concentrations</b>	<p>The MAQ AIRNET database will be used to maintain both field and analytical data from all particulate measurements and VOC sampling.</p>
<b>Schedule for implementation</b>	<p>Sampling commenced on September 22, 2001 and will continue to be performed on a continuous and on-going basis. Additional monitoring sites may be added in the future as needed.</p>
<b>Emergency response actions</b>	<p>MAQ may be asked by the Laboratory Emergency Management Office to respond to a suspected release. In such cases, air filters and VOC canisters will be collected as soon as possible and analyzed on a priority basis. Results will be forwarded to the responsible Laboratory management for appropriate use in decision making.</p>



## Quality Objectives and Criteria (A7)

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**Quality objectives**

Quality objectives ensure that environmental data are of sufficient quantity and quality to support the data's intended use. The EPA has developed a Data Quality Objective (DQO) process for use in the planning of environmental measurement projects. This seven-step process was used for guidance during the preparation of this QAPP and during the planning of this project.

Specific quality criteria are discussed in the section *Quality Control (B5)*.

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**Problem statement**

The Meteorology and Air Quality group wishes to establish a baseline for certain non-radiological species and contaminants in the air surrounding LANL.

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**Decision**

No regulatory requirements exist for this program, so no "decision" will normally be made except in exceptional cases, when professional judgement (depending upon the analyte and its level) will be used to recommend actions to LANL management.

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**Inputs to decision**

Inputs to the decision will be the detected levels of measured analytes, as reported by the analytical laboratories.

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**Action levels**

The project has chosen action levels ("investigation levels") to be 1/1000<sup>th</sup> of the OSHA occupational exposure levels (OSHA 29 CFR 1910.1000, Table Z-1, "Limits for Air Contaminants").

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**Analytical laboratory performance criteria**

The project has chosen regulatory criteria in EPA Compendium Method TO-15 for VOC analyses and criteria in EPA Compendium Methods IO-3.4 and IO-3.5 for metals analyses.

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**Method detection limit**

The procedure chosen to define the method detection limit for VOCs and metals is that given in the Code of Federal Regulations (40 CFR 136 Appendix B).

## Quality Objectives and Criteria (A7), continued

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### Precision

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed conditions, expressed generally in terms of the standard deviation. It refers to the variability that occurs if the same analysis were performed again on the same sample with no change in conditions, or the degree to which repeated measurements on the same sample agree.

The measure of replicate precision used for this program is the absolute value of the difference between replicate measurements of the sample divided by the average value and expressed as a percentage as follows:

$$\text{Relative percent difference (RPD)} = |(x1 - x2) / (x1 + x2)/2| * 100$$

where: x1 = First measurement value

x2 = Second measurement value

Several factors may affect the precision of the measurement. The nature of the compound of interest itself such as molecular weight, water solubility, polarizability, etc., each have some effect on the precision, for a given sampling and analytical system. A primary influence on precision is the concentration level of the compound of interest in the sample, i.e., the precision degrades as the concentration approaches the detection limit.

Analysis of field duplicates together with laboratory replicates precision will provide a measure of laboratory and sampling precision. Precision goals are given in the section *Quality Control (B5)*.

## Quality Objectives and Criteria (A7), continued

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**Accuracy** Accuracy is the degree of agreement of a measured value with the true or expected value of the quantity of concern. Any bias (known inaccuracy) will be corrected for if it is known or estimated. Unknown bias will be presumed to be zero because this is the most likely value. To reduce bias, a nationally recognized standard will be used whenever available.

A measure of analytical accuracy is the degree of agreement with spike standards. Accuracy is defined as the difference between the nominal concentration of the spike compound and the measured value divided by the spike value and expressed as a percentage, as illustrated in the following equation:

$$\text{Accuracy, \%} = \frac{\text{Spiked Value} - \text{Observed Value}}{\text{Spiked Value}} \times 100$$

Laboratory and field spikes will provide a measure of accuracy. Accuracy goals are given in the section *Quality Control (B5)*.

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**Representativeness** Representativeness is a measure of the degree to which the data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

The air samplers will be operated throughout the year; consequently, there will be complete sampling of temporal variations. Air samplers are located in or near sites occupied by the public and on Laboratory property near buildings. These locations were chosen to obtain samples representative of the concentrations they are intended to measure and will be evaluated against the siting criteria presented later in the section *Sampling Process Design (B1)*.

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**Comparability** Comparability is a measure of the confidence with which one data set can be compared to another. Comparability of the sampler data is ensured because of the use of the same equipment, processes, and analytical methods at all sampler locations.

## Quality Objectives and Criteria (A7), continued

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**Sample collection completeness**

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions.

Data may be lost due to equipment malfunction, power failure, sample destruction, human error, loss in shipping or analysis, analytical error, failure to collect an adequate volume of air during the sampling period, inability to gain access to the site, or unacceptable data uncertainty.

The samplers should achieve the performance objective of 90% run-time over a calendar year. This objective means that the time during which a sampler is not operating satisfactorily due to malfunctions, sampler changes, maintenance, calibration, and similar conditions should not exceed 10% per calendar year.

Given the 12-day sampling schedule, individual samplers should not be down for more than 3 sampling periods per year.

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**Analytical completeness**

Completeness criteria for analytical laboratory results will be 90% for a calendar year.

## Special Training and Certification (A8)

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### **Required personnel education**

Personnel working for the NonRadNET must understand the basics of air sampling and understand the general operation of the NonRadNET.

Individuals performing data review and interpretation must have additional education and/or experience as environmental engineers or analytical chemists.

Documentation of education qualification is maintained by the LANL personnel division.

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### **Training of personnel**

All personnel performing NonRadNET-related work are required to obtain appropriate training prior to performing work governed by a procedure.

Training for MAQ personnel will be performed and documented according to the MAQ procedures for training (MAQ-024) and orienting new employees (MAQ-032). Training of personnel in other groups will be performed and documented according to each group's training procedure.

Contractor analytical laboratories are required to have a quality management system in place.

## Documents and Records (A9)

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### Distribution of this plan

This document will be issued and controlled according to MAQ-030, "Document Distribution." The list of required recipients for this document is given in the section *Distribution List (A3)*.

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### Records

The number, type, and detail of all records to be kept will provide sufficient information to allow an individual with equivalent education and training to verify or reconstruct the results. Implementing procedures specify the records, forms, logbook entries, or other information to be kept as documentation of the performance of the procedure.

Records to be kept in the MAQ records system (MAQ-025, "Records Management") include the following:

- Chain of custody forms for each sampling event
- Logbook entries to record sample collection and chain of custody including equipment and instrument calibration and maintenance records; logbooks should be copied every six months
- Full hard-copy data package that meets EPA Level IV criteria
- Data quality review and air concentration results for each sampling event
- Station siting evaluations
- Quarterly data analyses (may be performed on a seasonal quarter instead of calendar quarter)
- Independent technical review of overall program data

Per the Statement of Work, analytical laboratories retain and manage all documentation related to analyses. These records include statements of work, laboratory data, corrective action reports, logbooks, bench worksheets, training documents, etc.

A field sampling and laboratory "case narrative" analysis of problems or special cases will not be required; instead, the deficiency procedure (MAQ-026, "Deficiency Reporting and Correcting") will be used to document quality-affecting problems encountered in the field [see the section Assessments and Response Actions (C1)].

## **Documents and Records (A9), continued**

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**Reporting of  
final results**

Results for each sampling event will be provided in the internal memoranda for Data Quality Review and Air Concentration Data. An annual report presenting a summary of the resultant air concentrations in support of the Annual LANL Environmental Surveillance Report will be prepared. Quarterly data analysis and trending will be prepared.

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**Records final  
disposition  
and retention  
period**

All records will be maintained and available for auditing in the records center at the MAQ group office (MAQ-025, "Records Management"). Records will be archived in compliance with Laboratory requirements for records retention, storage, and management.

## Sampling Process Design (B1)

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### Sampling system design rationale

The primary design objective for the NonRadNET is to provide accurate measurements of background levels of non-radiological constituents in and around LANL.

The specific constituents collected and measured were identified as being the species of greatest concern based upon a review of literature pertaining to air emissions from fires and a review of data collected by LANL during the Cerro Grande fire. The selected analytical methods provide information on other compounds as well.

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### Measurement parameters of interest

The following parameters will be measured at each location:

- Total suspended particulate matter (TSP) concentration through periodic monitoring
  - Selected metals concentration through periodic monitoring
  - Concentration of 160 VOCs through periodic monitoring
  - PM-10 and PM-2.5 through continuous monitoring
  - Sample collection time and date
  - Air flow rate through filter media for TSP
  - Hours of operation for PM-10 and PM-2.5
  - Beginning and ending canister pressures for VOC
- 

### Sampling location rationale

Sampling locations (listed in Appendix A, *NonRadNET Sampler Locations*) were considered based on EPA and LANL siting criteria. Monitoring stations were designed to collect samples in the breathing zone (five to six feet [2 meters] above the ground).



## Sampling Process Design (B1), continued

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**Sampler siting evaluation criteria** The following siting criteria (based on guidance document 40 CFR Part 58) were considered when selecting sampler sites.

1. **Favorable surface characteristics:** To reduce the passive loading of filters by particles, ideal sites will have minimal extraneous material prone to air suspension in the immediate area.
2. **Trees acceptable:** According to guidance from 40 CFR Part 58, samplers “must be 10 m from the drip-line when the tree(s) act as an obstruction.”
3. **Distance to obstructions (primarily buildings):** The distance between the sampler and the obstruction must be at least twice the height difference between the sampler and the obstruction (equivalent to a rise angle from the sampler to the top of the potential obstruction of approximately  $27^\circ$ ).
4. **Unrestricted airflow in  $270^\circ$  arc containing source direction:** The object (excluding trees, which are addressed under criterion #2) must not fall within the  $270^\circ$  arc, relative to the sampler, that contains the specific source that is being monitored (40 CFR Part 58).
5. **Good topographic location:** The area surrounding a site should be as level and flat as possible.

Uniform application of these criteria is important to ensure consistency and adequacy among air sampler locations. Good scientific judgment will be used to select the optimal location based on site-specific criteria and on specific sampling needs.

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### Sampling frequencies

PM-10 and PM-2.5 concentrations will be measured continuously, and averaged over 30-minute and 24-hour time periods. VOC and TSP/Metals samples will be collected every 12<sup>th</sup> day to coincide with EPA’s national ambient air monitoring schedule and each sampling period will last 24 hours.

## Sampling Methods (B2)

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### TSP/Metals sampling

Samples for 24-hour time-integrated TSP will be collected on filters using Tisch Environmental TE-5170V volumetric flow controlled units. Filters will be placed in the sampler within 1 working day of the start of a sampling run, and will be recovered within 1 working day of the end of a sampling period. When filters are placed and collected, data pertaining to the sampling run will be recorded on pre-printed field forms or recorded electronically.

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### Selection of filter material

Several types of filter material were evaluated before choosing Whatman 41 cellulose. Filter material was selected based upon the guidance obtained from EPA/625/R-96/010a, Table 2, page 3.1-17, overall handling characteristics, and the filter blank inorganic elemental concentrations shown below. The following table contains a summary of the approximate elemental concentrations observed in multiple analyses of 8" x 10" filter blanks during the initial filter evaluation studies.

Element	Cellulose (ng/filter)	Quartz (ng/filter)	Polypropylene (ng/filter)
Ag	30	120	70
As	< 75	900	100
Ba	300	546,000	320
Be	6	65	15
Cd	25	100	< 40
Co	66	180	100
Cr	1200	12,400	200
Cu	350	1400	1000
Ni	550	5100	400
Pb	100	3000	300
Sb	42	< 20	< 20
Se	< 140	100	< 140
Tl	18	< 55	19
V	35	480	20
Zn	1800	31,500	3000

## Sampling Methods (B2), continued

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### Filter weighing

The filters will be weighed (following moisture equilibration) before and after sampling to determine the net weight gain. The total volume of air that is sampled will be determined from the measured sampler flow rate and the sampling duration. Once the filters have been weighed, the filters will be sent in glassine envelopes to an analytical laboratory to be analyzed for selected metals.

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### PM-2.5 and PM-10 sampling

Continuous PM-10 or PM-2.5 data will be collected using a Rupprecht & Patashnick TEOM (tapered element oscillating microbalance) Series 1400a ambient particulate monitor fitted with a PM-10 or PM-2.5 sample inlet.

Data collected from the TEOM will be recorded electronically by the internal microprocessor computer electronics and periodically transferred to the MAQ databases.

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### Canister/VOC sampling

A ThermoAnderson AVOCS (Ambient Volatile Organic Collection System) will be used to collect samples of ambient air in a 15-liter SUMMA canister.

When the canisters are placed and collected by field personnel, data pertaining to the sampling run will be recorded on pre-printed field forms or recorded electronically.

Canisters will then be sent to an analytical laboratory where samples will be analyzed according to EPA Method TO-15 (discussed further in the section *Analytical Methods (B4)*) in order to determine VOC concentrations.

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### Corrective actions on sampling equipment

Operation and maintenance of the field sampling equipment (the AVOCS sampler, the TSP sampler, and the TEOM unit) is the responsibility of personnel assigned to perform this work by the Air Monitoring Project Leader.

The samplers will be checked for proper operation and flow each time the samples are collected. If the sampler is defective, the individual collecting the samples will immediately notify the technician responsible for sampler maintenance.

A record of the defect will document the sampler condition.

## Sample Handling and Custody (B3)

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### Sample custody

A documented chain of custody will be maintained for all samples collected from the air sampler stations. The possession, handling, and transfer of custody of samples will be documented on the chain of custody form according to the appropriate procedure for the sample equipment.

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### Sample tracking

Samples are tracked within the MAQ database by NonRadNet Project personnel. Samples received by analytical laboratories will be considered physical evidence, handled according to procedures established to meet EPA chain-of-custody requirements, and tracked according to requirements described in the respective laboratory's quality management plans.

## Analytical Methods (B4)

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### Sample analyses

#### Filter Weighing

Filter weighing will be done by NonRadNet personnel at the Cave (TA-54-1001) using a calibrated microbalance, according to procedure MAQ-224 (“Air Sampling For Particulate Mass Using The Volumetric Air Samplers”).

#### Metals Analysis

Filters will be analyzed by inductively coupled plasma emissions spectrometry (ICPES) following EPA SW-846 Method 6010 and by inductively coupled plasma - mass spectrometry (ICPMS) following EPA SW-846 Method 6020.

#### VOC Analysis

Air samples will be analyzed following EPA Compendium Method TO-15, using a gas chromatograph and a mass spectrometry detector.

## Quality Control (B5)

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**PM sampling** The TEOM has an expected minimum detection limit of  $0.01 \mu\text{g}/\text{m}^3$ . The precision of the TEOM is  $\pm 1.5 \mu\text{g}/\text{m}^3$ .

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**TSP analysis** Air filters will be weighed at the laboratory. Check weights will be used on the balance before each use to ensure proper operation. The balance used has a precision of  $\pm 0.0001 \text{ g}$ , though the accuracy of the measurements is affected by the humidity of the filter, material loss from the filter, and other factors.

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**Metals analysis** Filter blanks will be submitted with every analytical batch. The filter blank will not be placed in the air sampler, nor will it be taken out in the field.

Two additional unnumbered filters will be included with each shipment for use as matrix spikes and blanks.

The required general quality control requirements for metals analysis are discussed in EPA SW-846 Methods 6010 and 6020.

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**Method detection limit** The required VOC MDL determination is documented in the individual EPA methods.

See Appendix B for detection limit requirements.

## Quality Control (B5), continued

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**VOC analysis** Expected minimum detection limits for all VOCs are given in Appendix B. Duplicate analyses should be routinely performed for a minimum of one per analytical batch. In addition, we will request one replicate run of one sample per quarter.

The relative percent difference should be within 25% for the four largest target analytes present, excluding alcohols, aldehydes, and ketones. If the results from duplicate analysis do not meet this criteria, the analysis will be repeated (if sufficient sample remains to allow a repeat).

Five surrogate compounds will be added to each sample, standard, and blank at 2 ppbV. Measured surrogate concentrations must meet the laboratory's accuracy criteria (surrogate compounds and corresponding expected recovery ranges are given in Appendix B).

A laboratory control sample (LCS) and a laboratory control sample duplicate (LCSD) will be analyzed once daily for each analytical batch. In this analysis procedure, two aliquots of laboratory ultra-high purity nitrogen will be spiked with a second source standard and analyzed together along with field samples using the same method, reagents, and apparatus. The LCS and paired LCSD should meet the laboratory's criteria expected recovery, also given in Appendix B.

Every empty canister leaving the laboratory will be analyzed to ensure that it has a total carbon concentration of 3 ppbv or less.

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**Analytical  
laboratory  
instrument  
checks and  
calibration**

Analytical laboratories must perform appropriate quality control checks on their equipment, so that data generated meets requirements. Each laboratory will be responsible for maintaining appropriate records of checks and supplying quality control information in the data packages, as required by the contract. Each analytical laboratory is responsible for corrective actions for their equipment.

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**Use of  
negative  
values**

Negative values will be used in averages and other calculations of air concentrations when the data are known to be acceptable. It is not appropriate to arbitrarily delete negative data from calculations. See discussion on the use of negative numbers in data calculations in the section *Data Review, Validation, and Verification (D1)*.

## Quality Control (B5), continued

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**Use of data less than MDL** All acceptable data will be used in calculating accuracy, precision, and completeness. See discussion on the use of less-than values in data calculations in the section *Data Review, Validation, and Verification (D1)*.



## **Instrumentation and Equipment Testing, Inspection, and Maintenance (B6)**

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**Preventive  
maintenance  
of air  
monitors**

Maintenance of the field sampling equipment is the responsibility of personnel assigned to perform this work by the Air Monitoring Project Leader and will be performed according to the appropriate procedure (e.g., MAQ-224, -237, or -249).

## Instrument Calibration and Frequency (B7)

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### Calibration of samplers

#### Rupprecht and Patashnick TEOM air flow calibration

The TEOM will be calibrated in accordance with MAQ-237, "Maintenance, Repair, and Calibration of the TEOM."

#### Tisch Environmental Sampler air flow calibration

The Tisch Environmental TE-5170V TSP Volumetric Flow Controlled High Volume Air Sampler will be calibrated in accordance with calibration information specified within MAQ-240, "Air Sampling Using the High Volume Samplers."

#### Thermo Anderson AVOCS air flow calibration

The AVOCS will be calibrated in accordance with MAQ-249, "Collecting Ambient VOC Samples."

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### Laboratory instrument calibrations

The laboratory instrument calibration intervals have been set to an appropriate frequency so data generated meets the accuracy and precision requirements given in the section *Quality Objectives and Criteria (A7)*.

LANL's balance will be used to weigh filters before and after sampling. This balance will be calibrated at least annually by the Standards and Calibration Group in accordance with their procedures and the Laboratory Calibration Program. In addition, calibrated check weights will be used to verify proper operation of the balance before each use.

Each laboratory will be responsible for maintaining appropriate records of calibration and supplying calibration information in the data packages. Information regarding instrument calibration protocol can be found in Appendix C.

## Inspection and Acceptance for Supplies and Consumables (B8)

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### **Field equipment and supplies**

Inspection and maintenance of the field sampling equipment and supplies are the responsibility of NonRadNET air sampling technicians. A visual inspection of most consumables is sufficient to detect problems that may cause loss of data.

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### **Laboratory supplies**

Inspection and maintenance of laboratory supplies is the responsibility of the individual laboratories. Supplies will be accepted based on information included in quality certification documents shipped with the materials. Subcontract laboratories will appropriately inspect and accept supplies based on the risk to the analytical results.

## Non-direct Measurements (B9)

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**Non-  
measurement  
data sources**

No data from databases or other sources will be used in decisions.

## Data Management (B10)

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**Data transfer  
and  
management**

Data from the field are entered into a database within four weeks after sample collection.

Most analytical data will be transferred electronically from the analytical laboratories to the MAQ databases. Some data will be manually entered into a database. Data will be electronically managed and stored according to MAQ-252 (“Analytical Chemistry Data Management And Review For NonRadNet”). MAQ personnel have been assigned responsibility for the establishment and management of the databases and electronic transfer network.

## **Assessments and Response Actions (C1)**

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**Assessments** Internal management assessments will be conducted in accordance with the MAQ QMP and procedure MAQ-029 (“Management Assessments”). This procedure requires periodic assessments by the group leader of the effectiveness of programs or projects. These assessments are documented and filed as records. Internal management assessments may apply to any program or project in MAQ.

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**Corrective actions** Corrective actions are addressed with the group’s deficiency system, described in the QMP and procedure MAQ-026.

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**Interlaboratory comparisons** No interlaboratory comparisons are required at this time.

## Reports to Management (C2)

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### Reports

Data reports will be prepared and distributed to project team members. Reports to management will be issued periodically.

## Data Review, Validation, and Verification (D1)

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**Criteria used to accept, reject, or qualify data** All data should be evaluated for one of three outcomes: accept, qualify, or reject. Data evaluation criteria will include:

- Ensure within expected range of values
- Use of proper laboratory methods
- Review of blanks, spikes, and/or surrogates.

The limits for acceptability and the methods used are explained in the next two sections [*Validation and Verification Methods (D2)* and *Reconciliation with User Requirements (D3)*].

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**Data types to be evaluated** The data needed for determining air concentrations can be categorized into two areas: field data and analytical data. Each data category is made up of various data elements, as listed below.

Field data:

- collection date and time
- sampler number
- sampler run time
- sampler volume
- canister number
- comments
- canister pressures
- filter weights

Analytical data:

Analytical data packages are generated by the subcontractor laboratories. Data packages will be reviewed according to a formal procedure within 3 weeks for items including:

- presence of narrative letter
- presence of summary data table
- properly completed chain-of-custody forms
- analytical completeness
- proper holding times and analytical time sequences
- required detection limits on analytical methods
- expected blank sample values
- evidence of cross-contamination
- numbers that appear inconsistent
- complete calibration documentation
- traceability of standards

## Data Review, Validation, and Verification (D1), continued

The analytical data to be provided in the EDD includes:

- analyte
  - date of analysis
  - result
  - units
  - MDL
- 

### Calculation of air concentration data

Air concentration records are generated for analytes at each sampler using field and analytical laboratory data. Analyte concentration records will also be reviewed according to a formal procedure for acceptance, rejection, or qualification within thirty days of the completion of the field data record and analytical result record. The data used to calculate concentration values consist of:

- air volume through filter during sample period
  - analyte concentration in the sample
  - analyte concentration units for the sample
  - fraction of filter analyzed
- 

### Handling of outliers

During the data evaluation process, steps may be taken to identify and test for individual concentration values that would be considered outliers by applying various statistical techniques. In some cases, it is not appropriate to include known outliers in the calculation of the summary statistics for a sampler. Professional judgment will be exercised in these decisions.

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### Calculation of summary statistics

Summary statistics for each sampler will be calculated periodically. The elements of the summary record consist of:

- daily and annual mean constituent concentrations at each station
  - percent sampling completeness
  - range of measured concentrations
  - percent analytical completeness
  - standard deviation of air concentrations at each station for each analyte
- 

### Use of negative values and less than MDL

Environmental data with negative values or values “less than” the MDL will be used in calculations in order to obtain the best estimate of the true value.



## Validation and Verification Methods (D2)

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**Evaluation of field data** The group continues to automate most of the checks described in this section in a computer database program and will be described in a formal procedure (RRES-MAQ-251, "Evaluation of Non-RadNet Data").

- 1) Completeness. Each field element should have a value. If a value is missing, an explanation should be provided. If a datum is missing without an acceptable explanation, the record should be considered "qualified."
- 2) Expected range of values. Each element has a nominal value with a range of possible values. If the element is outside its range of normal values, the record should be identified as "qualified."

If the field record is not "qualified" or "rejected," it will be accepted. If the field record is "qualified," further validation and verification will be performed. Best professional judgment will be applied to "qualified" data. Amended field records will be considered acceptable but will be flagged as "qualified."

---

**Evaluation of analytical data** The analytical data packages will be evaluated to verify that the data package is acceptable according the criteria given in the previous section [*Data Review, Validation, and Verification (D1)*]. After this review, the data will be evaluated for completeness and expected range of values:

- 1) Completeness. If a value is missing, the record should be rejected. An explanation should be provided.
- 2) Expected range of values. The analytical data should be within an expected range of possible values. If the value is outside its range of normal values, the record will be investigated and qualified if determined to be in error.

If the analytical data are not "qualified" or "rejected," they will be accepted. If the data are "qualified," further validation and verification will be performed. Amended analytical records will be considered acceptable but will be flagged as "qualified." No datum will be rejected unless it can be clearly shown that it is incorrect or non-representative.

## Validation and Verification Methods (D2), continued

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**Calculation of air concentrations** If any source datum used to calculate an air concentration value is “qualified,” then the air concentration value is considered “qualified.” Air concentration values that do not have a “qualified” status are considered accepted values, having satisfied all the data review, validation, and verification requirements.

---

**Evaluation of qualified data** An evaluation will be performed to estimate or otherwise complete data labeled as “qualified.” After this evaluation, the data will be either rejected or accepted for use in calculating the air concentration values. If the value remains qualified, it will be used in concentration calculations. All rejected data will be maintained in the database with the explanation for their rejection.

---

**Calculating data completeness** For all stations, data completeness should be calculated on at least an annual basis for each sampling location. Completeness will be calculated as follows:

- Run time of each station: the total operating hours of each sampler (from the timer readings) divided by the hours in the time-period being evaluated.
- Sample completeness: number of verified and validated sample results obtained at a sampler divided by the total number of possible samples (adjusting for stations that were established for only part of the year) in a calendar year.

These data will be compared to the completeness criteria of 90%.

## Reconciliation with User Requirements (D3)

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**Quality control**

The data quality control summary reports will be generated as part of the EDD uploading process. Any failures of the analytical laboratory to meet control requirements will be addressed with the lab and remedied.

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**Comparison to action levels**

All data will be compared to the action levels given in the section *Quality Objectives and Criteria (A7)*, “Action levels,” page 9.

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**Action to be taken when levels exceeded**

No regulatory requirements exist for this program, so normally no actions will be taken. However, when a level is exceeded, an investigation will be made to attempt to determine and understand the result and possible source.

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**Failure to meet specified DQOs**

When differences are identified between specified evaluation or performance criteria above [see the sections *Quality Objectives and Criteria (A7)* and *Validation and Verification Methods (D2)*] and measured values, assignable causes will be determined and documented in the report to management.

[Click here to record “self-study” training to this procedure.](#)



## ***APPENDIX A***

### **NonRadNET Sampler Locations**

The following samplers are in place on the date of this plan. For a current list, contact the Air Monitoring Project Leader.

<b>Station number</b>	<b>Station Name</b>	<b>Location</b>
81	Intersection of Diamond Dr. and East Jemez Road	On the southeast corner of intersection.
61	Los Alamos Hospital	On the east side of the Hospital east parking lot.
15	White Rock Fire Station	On north side of White Rock Fire Station on Rover Blvd.



## APPENDIX B

### Performance Goals for Analytical VOC Measurements

Analyte	Expected Minimum Detection Limit (ppbV)	Expected Recovery <sup>a</sup>	Expected Relative Percent Difference <sup>a</sup>
Acetaldehyde	3	--	--
Acetone	3	--	--
Acetonitrile	3	--	--
Acetylene	0.2	--	--
Acrylonitrile	2	--	--
Benzaldehyde	4	--	--
Benzene	0.2	69% - 146%	10%
Benzyl chloride	0.5	26% - 366%	32%
Bromochloromethane	0.2	--	--
Bromodichloromethane	0.2	--	--
Bromoform	0.2	--	--
Bromomethane	0.2	50% - 143%	12%
1,3-Butadiene	0.2	--	--
n-Butane	0.2	43% - 162%	11%
1-Butanol	2	--	--
2-Butanone	3	--	--
1-Butene/isobutene	0.5	--	--
cis-2-Butene	0.2	--	--
trans-2-Butene	0.2	--	--
Butyl acrylate	0.4	--	--
tert-Butylbenzene	1	--	--
n-Butylbenzene	2	--	--
Butyraldehyde	3	--	--
Carbon tetrachloride	0.2	35% - 181%	32%
Chlorobenzene	0.2	61% - 127%	32%
Chlorodifluoromethane	0.5	--	--
Chloroethane	0.2	32% - 157%	12%
Chloroform	0.2	62% - 126%	12%
Chloromethane	0.2	37% - 151%	14%
Chloroprene	0.2	--	--
o/m-Chlorotoluene	0.5	--	--
p-Chlorotoluene	0.4	--	--
Cyclohexane	0.2	--	--
Cyclohexene	0.5	--	--
Cyclopentane	0.3	--	--
Cyclopentene	0.3	--	--
n-Decane	0.2	40% - 195%	33%
1-Decene	2	--	--
Dibromochloromethane	0.2	--	--

Analyte	Expected Minimum Detection Limit (ppbV)	Expected Recovery <sup>a</sup>	Expected Relative Percent Difference <sup>a</sup>
1,2-Dibromoethane	0.2	58% - 128%	34%
m-Dichlorobenzene	0.5	34% - 148%	33%
o-Dichlorobenzene	0.5	32% - 151%	33%
p-Dichlorobenzene	0.5	35% - 147%	33%
Dichlorodifluoromethane	0.2	67% - 121%	12%
1,1-Dichloroethane	0.2	41% - 145%	37%
1,2-Dichloroethane	0.2	65% - 127%	11%
cis-1,2-Dichloroethene	0.2	58% - 130%	12%
trans-1,2-Dichloroethene	0.2	--	--
1,1-Dichloroethene	0.2	48% - 154%	7%
Dichlorofluoromethane	0.5	--	--
1,2-Dichloropropane	0.2	48% - 151%	32%
cis-1,3-Dichloropropene	0.3	65% - 215%	33%
trans-1,3-Dichloropropene	0.3	43% - 138%	34%
Diethyl ether	2	--	--
m-Diethylbenzene	0.4	--	--
p-Diethylbenzene	0.4	--	--
2,3-Dimethylbutane	0.3	--	--
2,5-Dimethylhexane	0.5	--	--
2,3-Dimethylpentane	0.2	--	--
2,4-Dimethylpentane	0.2	--	--
1,4-Dioxane	2	--	--
Ethane	0.2	>0% - 240%	113%
Ethanol	2	--	--
2-Ethyl-1-butene	0.5	--	--
Ethylbenzene	0.2	59% - 137%	9%
Ethylene	0.2	--	--
m-Ethyltoluene	0.3	--	--
o-Ethyltoluene	0.3	--	--
p-Ethyltoluene	0.3	46% - 126%	34%
Halocarbon 113	0.3	39% - 149%	13%
Halocarbon 114	0.2	47% - 111%	14%
Halocarbon 134a	0.5	--	--
Heptanal	4	--	--
n-Heptane	0.2	73% - 153%	32%
1-Heptene	0.5	--	--
cis-3-Heptene	0.3	--	--
trans-2-Heptene	0.3	--	--
trans-3-Heptene	0.3	--	--
Hexachloro-1,3-butadiene	1	0% - 196%	39%
Hexanal	4	--	--
n-Hexane	0.2	48% - 148%	11%
1-Hexene	0.5	--	--



Analyte	Expected Minimum Detection Limit (ppbV)	Expected Recovery <sup>a</sup>	Expected Relative Percent Difference <sup>a</sup>
cis-2-Hexene	0.3	--	--
cis-3-Hexene	0.5	--	--
trans-2-Hexene	0.3	--	--
Indan	2	--	--
Indene	0.4	--	--
Isobutane	0.2	22% - 174%	14%
Isobutylbenzene	1	--	--
Isoheptane	0.2	--	--
Isohexane	0.2	--	--
Isopentane	0.2	38% - 142%	15%
Isoprene	0.2	--	--
Isopropylbenzene	0.3	--	--
p-Isopropyltoluene	2	--	--
Limonene	0.3	--	--
Methanol	2	--	--
2-Methyl-2-butene	0.3	--	--
3-Methyl-1-butene	0.2	--	--
2-Methyl-1-pentene	0.3	--	--
2-Methyl-2-pentene	0.2	--	--
4-Methyl-1-pentene	0.3	--	--
cis-3-Methyl-2-pentene	0.4	--	--
cis/trans-4-Methyl-2-pentene	1	--	--
Methyl tert-butyl ether	1	--	--
Methylcyclohexane	0.2	--	--
1-Methylcyclohexene	0.5	--	--
Methylcyclopentane	0.2	--	--
Methylcyclopentene	0.5	--	--
Methylene chloride	0.4	41% - 159%	20%
2-Methylheptane	0.3	--	--
3-Methylheptane	0.3	--	--
3-Methylhexane	0.2	--	--
Methylisobutylketone	3	--	--
3-Methylpentane	0.2	--	--
Naphthalene	8	--	--
Neohexane	0.3	--	--
Neopentane	0.5	--	--
1-Nonene	1	--	--
4-Nonene	0.3	--	--
n-Nonane	0.3	46% - 178%	33%
n-Octane	0.3	56% - 170%	32%
1-Octene	0.5	--	--
cis-2-Octene	0.5	--	--
n-Pentane	0.2	36% - 164%	22%

Analyte	Expected Minimum Detection Limit (ppbV)	Expected Recovery <sup>a</sup>	Expected Relative Percent Difference <sup>a</sup>
1-Pentene	0.2	--	--
cis-2-Pentene	0.3	--	--
trans-2-Pentene	0.2	--	--
alpha-Pinene	0.3	--	--
beta-Pinene	0.3	--	--
Propane	0.5	30% - 186%	17%
1-Propanol	3	--	--
2-Propanol	3	--	--
n-Propylbenzene	0.2	--	--
Propylene	0.2	--	--
Styrene	0.3	57% - 146%	33%
1,1,2,2-Tetrachloroethane	0.3	41% - 158%	34%
Tetrachloroethene	0.2	58% - 140%	33%
Toluene	0.2	66% - 139%	9%
1,2,4-Trichlorobenzene	1	0% - 204%	46%
1,1,1-Trichloroethane	0.2	64% - 120%	10%
1,1,2-Trichloroethane	0.2	61% - 131%	34%
Trichloroethene	0.2	72% - 128%	31%
Trichlorofluoromethane	0.2	69% - 121%	10%
2,4,4-Trimethyl-1-pentene	0.5	--	--
2,4,4-Trimethyl-2-pentene	0.5	--	--
1,2,3-Trimethylbenzene	0.4	--	--
1,2,4-Trimethylbenzene	0.4	43% - 133%	34%
1,3,5-Trimethylbenzene	0.3	51% - 146%	33%
2,2,5-Trimethylhexane	0.5	--	--
2,2,3-Trimethylpentane	0.4	--	--
2,2,4-Trimethylpentane	0.2	--	--
2,3,4-Trimethylpentane	0.2	--	--
1-Undecene	3	--	--
n-Undecane	3	--	--
Vinyl acetate	0.2	--	--
Vinyl bromide	0.5	--	--
Vinyl chloride	0.2	42% - 148%	17%
m/p-Xylene	0.3	56% - 142%	10%
o-Xylene	0.3	54% - 152%	10%

Surrogate	Expected Minimum Detection Limit (ppbV)	Expected Recovery	Expected Relative Percent Difference
2-Bromo-1,1,1-trifluoroethane	--	77% -111%	--
Fluorobenzene	--	49% -115%	--
1,4-Dichlorobutane	--	41% - 137%	--
4-Bromofluorobenzene	--	55% - 131%	--

<b>Analyte</b>	<b>Expected Minimum Detection Limit (ppbV)</b>	<b>Expected Recovery<sup>a</sup></b>	<b>Expected Relative Percent Difference<sup>a</sup></b>
Toluene-d8	--	87% - 114%	--

<sup>a</sup> *expected recovery and expected relative percent difference apply only to VOCs in the laboratory control samples*



## APPENDIX C

### Summary of VOC Calibration Analyses

Calibration and QC Analyses	Description	Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	Calibration at 1.0, 2.5, 5.0, 7.5, and 10 ppbV.	Biannually or when daily calibration check fails to meet acceptance criteria	Relative Standard Deviation (RSD) for target compounds indicated (X) in table below <30%. All other analytes in table <50%. Linear regression for analytes outside RSD criteria, $R \geq 0.995$ , and the intercept (b) must be between 0 and detection limit.	<ol style="list-style-type: none"> <li>1. Reanalyze load volume not meeting criteria.</li> <li>2. Troubleshoot.</li> <li>3. Repeat calibration.</li> <li>4. Issue QCER and notify Lab Manager.</li> </ol>
Calibration Verification	Midrange calibration standard containing analytes indicated (X) in table below.	Daily prior to sample analysis	Recovery: 70-130% for all compounds, except: Ethane: 50-150% 1,2,4-Trichlorobenzene: 50-150% Hexachloro-1,3-butadiene: 50-150%	<ol style="list-style-type: none"> <li>1. Repeat analysis.</li> <li>2. Perform instrument maintenance.</li> <li>3. Recalibrate.</li> <li>4. Write QCER (Level 2) and notify Lab Manager.</li> </ol>

### Calibration Standard Concentration Levels (ppbV)<sup>a</sup>

Analytes	Calibration Verification <sup>b</sup>	Quantitation Ion <sup>c</sup>	Level 1 <sup>c</sup>	Level 2 <sup>c</sup>	Level 3 <sup>c</sup>	Level 4 <sup>c</sup>	Level 5 <sup>c</sup>
Acetaldehyde		44	1.0	2.5	5.0	7.5	10.0
Acetone		43	1.0	2.5	5.0	7.5	10.0
Acetonitrile		41	1.0	2.5	5.0	7.5	10.0
Acetylene	X	26	1.0	2.5	5.0	7.5	10.0
Acrylonitrile		52	1.0	2.5	5.0	7.5	10.0
Benzaldehyde		77	1.0	2.5	5.0	7.5	10.0
Benzene	X	78	1.0	2.5	5.0	7.5	10.0
Benzyl chloride	X	91	1.0	2.5	5.0	7.5	10.0
Bromochloromethane	X	130	1.0	2.5	5.0	7.5	10.0
Bromodichloromethane	X	83	1.0	2.5	5.0	7.5	10.0
Bromoform	X	173	1.0	2.5	5.0	7.5	10.0
Bromomethane	X	94	1.0	2.5	5.0	7.5	10.0
1,3-Butadiene	X	39	1.0	2.5	5.0	7.5	10.0
n-Butane	X	43	1.0	2.5	5.0	7.5	10.0

Analytes	Calibration Verification <sup>b</sup>	Quantitation Ion <sup>c</sup>	Level 1 <sup>c</sup>	Level 2 <sup>c</sup>	Level 3 <sup>c</sup>	Level 4 <sup>c</sup>	Level 5 <sup>c</sup>
1-Butanol		56	1.0	2.5	5.0	7.5	10.0
2-Butanone		43	1.0	2.5	5.0	7.5	10.0
1-Butene/isobutene <sup>d</sup>	X	41	1.0	2.5	5.0	7.5	10.0
cis-2-Butene	X	41	1.0	2.5	5.0	7.5	10.0
trans-2-Butene	X	41	1.0	2.5	5.0	7.5	10.0
Butyl acrylate		55	1.0	2.5	5.0	7.5	10.0
tert-Butylbenzene		119	1.0	2.5	5.0	7.5	10.0
n-Butylbenzene		91	1.0	2.5	5.0	7.5	10.0
Butyraldehyde		72	1.0	2.5	5.0	7.5	10.0
Carbon tetrachloride	X	117	1.0	2.5	5.0	7.5	10.0
Chlorobenzene	X	112	1.0	2.5	5.0	7.5	10.0
Chlorodifluoromethane		51	1.0	2.5	5.0	7.5	10.0
Chloroethane	X	64	1.0	2.5	5.0	7.5	10.0
Chloroform	X	83	1.0	2.5	5.0	7.5	10.0
Chloromethane	X	50	1.0	2.5	5.0	7.5	10.0
Chloroprene	X	53	1.0	2.5	5.0	7.5	10.0
o/m-Chlorotoluene		91	1.0	2.5	5.0	7.5	10.0
p-Chlorotoluene		91	1.0	2.5	5.0	7.5	10.0
Cyclohexane	X	56	1.0	2.5	5.0	7.5	10.0
Cyclohexene		67	1.0	2.5	5.0	7.5	10.0
Cyclopentane	X	42	1.0	2.5	5.0	7.5	10.0
Cyclopentene	X	67	1.0	2.5	5.0	7.5	10.0
n-Decane	X	57	1.0	2.5	5.0	7.5	10.0
1-Decene		56	1.0	2.5	5.0	7.5	10.0
Dibromochloromethane	X	129	1.0	2.5	5.0	7.5	10.0
1,2-Dibromoethane	X	107	1.0	2.5	5.0	7.5	10.0
m-Dichlorobenzene	X	146	1.0	2.5	5.0	7.5	10.0
o-Dichlorobenzene	X	146	1.0	2.5	5.0	7.5	10.0
p-Dichlorobenzene	X	146	1.0	2.5	5.0	7.5	10.0
Dichlorodifluoromethane	X	85	1.0	2.5	5.0	7.5	10.0
1,1-Dichloroethane	X	63	1.0	2.5	5.0	7.5	10.0
1,2-Dichloroethane	X	62	1.0	2.5	5.0	7.5	10.0

Analytes	Calibration Verification <sup>b</sup>	Quantitation Ion <sup>c</sup>	Level 1 <sup>c</sup>	Level 2 <sup>c</sup>	Level 3 <sup>c</sup>	Level 4 <sup>c</sup>	Level 5 <sup>c</sup>
cis-1,2-Dichloroethene	X	61	1.0	2.5	5.0	7.5	10.0
trans-1,2-Dichloroethene	X	61	1.0	2.5	5.0	7.5	10.0
1,1-Dichloroethene	X	61	1.0	2.5	5.0	7.5	10.0
Dichlorofluoromethane		67	1.0	2.5	5.0	7.5	10.0
1,2-Dichloropropane	X	63	1.0	2.5	5.0	7.5	10.0
cis-1,3-Dichloropropene	X	75	1.0	2.5	5.0	7.5	10.0
trans-1,3-Dichloropropene	X	75	1.0	2.5	5.0	7.5	10.0
Diethyl ether		74	1.0	2.5	5.0	7.5	10.0
m-Diethylbenzene	X	105	1.0	2.5	5.0	7.5	10.0
p-Diethylbenzene	X	119	1.0	2.5	5.0	7.5	10.0
2,3-Dimethylbutane	X	43	1.0	2.5	5.0	7.5	10.0
2,5-Dimethylhexane		57	1.0	2.5	5.0	7.5	10.0
2,3-Dimethylpentane	X	56	1.0	2.5	5.0	7.5	10.0
2,4-Dimethylpentane	X	43	1.0	2.5	5.0	7.5	10.0
1,4-Dioxane		88	1.0	2.5	5.0	7.5	10.0
Ethane	X	26	1.0	2.5	5.0	7.5	10.0
Ethanol		45	1.0	2.5	5.0	7.5	10.0
2-Ethyl-1-butene		69	1.0	2.5	5.0	7.5	10.0
Ethylbenzene	X	91	1.0	2.5	5.0	7.5	10.0
Ethylene	X	26	1.0	2.5	5.0	7.5	10.0
m-Ethyltoluene	X	105	1.0	2.5	5.0	7.5	10.0
o-Ethyltoluene	X	105	1.0	2.5	5.0	7.5	10.0
p-Ethyltoluene	X	105	1.0	2.5	5.0	7.5	10.0
Halocarbon 113	X	151	1.0	2.5	5.0	7.5	10.0
Halocarbon 114	X	85	1.0	2.5	5.0	7.5	10.0
Halocarbon 134a		69	1.0	2.5	5.0	7.5	10.0
Heptanal		70	1.0	2.5	5.0	7.5	10.0
n-Heptane	X	71	1.0	2.5	5.0	7.5	10.0
1-Heptene		55	1.0	2.5	5.0	7.5	10.0
cis-3-Heptene		41	1.0	2.5	5.0	7.5	10.0
trans-2-Heptene		55	1.0	2.5	5.0	7.5	10.0
trans-3-Heptene		41	1.0	2.5	5.0	7.5	10.0

Analytes	Calibration Verification <sup>b</sup>	Quantitation Ion <sup>c</sup>	Level 1 <sup>c</sup>	Level 2 <sup>c</sup>	Level 3 <sup>c</sup>	Level 4 <sup>c</sup>	Level 5 <sup>c</sup>
Hexachloro-1,3-butadiene	X	225	1.0	2.5	5.0	7.5	10.0
Hexanal		44	1.0	2.5	5.0	7.5	10.0
n-Hexane	X	57	1.0	2.5	5.0	7.5	10.0
1-Hexene	X	41	1.0	2.5	5.0	7.5	10.0
cis-2-Hexene	X	55	1.0	2.5	5.0	7.5	10.0
cis-3-Hexene		55	1.0	2.5	5.0	7.5	10.0
trans-2-Hexene	X	55	1.0	2.5	5.0	7.5	10.0
Indan		117	1.0	2.5	5.0	7.5	10.0
Indene		115	1.0	2.5	5.0	7.5	10.0
Isobutane	X	43	1.0	2.5	5.0	7.5	10.0
Isobutene		41	1.0	2.5	5.0	7.5	10.0
Isobutylbenzene		91	1.0	2.5	5.0	7.5	10.0
Isoheptane	X	43	1.0	2.5	5.0	7.5	10.0
Isohexane	X	42	1.0	2.5	5.0	7.5	10.0
Isopentane	X	41	1.0	2.5	5.0	7.5	10.0
Isoprene	X	67	1.0	2.5	5.0	7.5	10.0
Isopropylbenzene	X	105	1.0	2.5	5.0	7.5	10.0
p-Isopropyltoluene		119	1.0	2.5	5.0	7.5	10.0
Limonene		68	1.0	2.5	5.0	7.5	10.0
Methanol		31	1.0	2.5	5.0	7.5	10.0
2-Methyl-2-butene	X	55	1.0	2.5	5.0	7.5	10.0
3-Methyl-1-butene	X	55	1.0	2.5	5.0	7.5	10.0
2-Methyl-1-pentene	X	56	1.0	2.5	5.0	7.5	10.0
4-Methyl-1-pentene	X	43	1.0	2.5	5.0	7.5	10.0
c-3-Methyl-2-pentene		69	1.0	2.5	5.0	7.5	10.0
cis/trans-4-Methyl-2-pentene		69	2.0	5.0	10.0	15.0	20.0
Methyl tert-butyl ether		73	1.0	2.5	5.0	7.5	10.0
Methylcyclohexane	X	83	1.0	2.5	5.0	7.5	10.0
1-Methylcyclohexene		81	1.0	2.5	5.0	7.5	10.0
Methylcyclopentane	X	56	1.0	2.5	5.0	7.5	10.0
Methylcyclopentene		67	1.0	2.5	5.0	7.5	10.0
Methylene chloride	X	49	1.0	2.5	5.0	7.5	10.0



Analytes	Calibration Verification <sup>b</sup>	Quantitation Ion <sup>c</sup>	Level 1 <sup>c</sup>	Level 2 <sup>c</sup>	Level 3 <sup>c</sup>	Level 4 <sup>c</sup>	Level 5 <sup>c</sup>
2-Methylheptane	X	43	1.0	2.5	5.0	7.5	10.0
3-Methylheptane	X	85	1.0	2.5	5.0	7.5	10.0
3-Methylhexane	X	43	1.0	2.5	5.0	7.5	10.0
Methylisobutylketone		43	1.0	2.5	5.0	7.5	10.0
3-Methylpentane	X	57	1.0	2.5	5.0	7.5	10.0
Naphthalene		128	1.0	2.5	5.0	7.5	10.0
Neohexane	X	43	1.0	2.5	5.0	7.5	10.0
Neopentane		57	1.0	2.5	5.0	7.5	10.0
1-Nonene		56	1.0	2.5	5.0	7.5	10.0
4-Nonene		55	1.0	2.5	5.0	7.5	10.0
n-Nonane	X	43	1.0	2.5	5.0	7.5	10.0
n-Octane	X	43	1.0	2.5	5.0	7.5	10.0
1-Octene		55	1.0	2.5	5.0	7.5	10.0
cis-2-Octene		55	1.0	2.5	5.0	7.5	10.0
n-Pentane	X	43	1.0	2.5	5.0	7.5	10.0
1-Pentene	X	42	1.0	2.5	5.0	7.5	10.0
cis-2-Pentene	X	55	1.0	2.5	5.0	7.5	10.0
trans-2-Pentene	X	55	1.0	2.5	5.0	7.5	10.0
alpha-Pinene	X	93	1.0	2.5	5.0	7.5	10.0
beta-Pinene	X	93	1.0	2.5	5.0	7.5	10.0
Propane	X	44	1.0	2.5	5.0	7.5	10.0
1-Propanol		59	1.0	2.5	5.0	7.5	10.0
2-Propanol		45	1.0	2.5	5.0	7.5	10.0
n-Propylbenzene	X	91	1.0	2.5	5.0	7.5	10.0
Propylene	X	41	1.0	2.5	5.0	7.5	10.0
Styrene	X	104	1.0	2.5	5.0	7.5	10.0
1,1,2,2-Tetrachloroethane	X	83	1.0	2.5	5.0	7.5	10.0
Tetrachloroethene	X	164	1.0	2.5	5.0	7.5	10.0
Toluene	X	91	1.0	2.5	5.0	7.5	10.0
1,2,4-Trichlorobenzene	X	180	1.0	2.5	5.0	7.5	10.0
1,1,1-Trichloroethane	X	97	1.0	2.5	5.0	7.5	10.0
1,1,2-Trichloroethane	X	97	1.0	2.5	5.0	7.5	10.0

Analytes	Calibration Verification <sup>b</sup>	Quantitation Ion <sup>c</sup>	Level 1 <sup>c</sup>	Level 2 <sup>c</sup>	Level 3 <sup>c</sup>	Level 4 <sup>c</sup>	Level 5 <sup>c</sup>
Trichloroethene	X	130	1.0	2.5	5.0	7.5	10.0
Trichlorofluoromethane	X	101	1.0	2.5	5.0	7.5	10.0
2,4,4-Trimethyl-1-pentene		57	1.0	2.5	5.0	7.5	10.0
2,4,4-Trimethyl-2-pentene		55	1.0	2.5	5.0	7.5	10.0
1,2,3-Trimethylbenzene	X	105	1.0	2.5	5.0	7.5	10.0
1,2,4-Trimethylbenzene	X	105	1.0	2.5	5.0	7.5	10.0
1,3,5-Trimethylbenzene	X	105	1.0	2.5	5.0	7.5	10.0
2,2,5-Trimethylhexane		57	1.0	2.5	5.0	7.5	10.0
2,2,3-Trimethylpentane		57	1.0	2.5	5.0	7.5	10.0
2,2,4-Trimethylpentane	X	57	1.0	2.5	5.0	7.5	10.0
2,3,4-Trimethylpentane	X	43	1.0	2.5	5.0	7.5	10.0
1-Undecene		55	1.0	2.5	5.0	7.5	10.0
n-Undecane		57	1.0	2.5	5.0	7.5	10.0
Vinyl acetate		43	1.0	2.5	5.0	7.5	10.0
Vinyl bromide		106	1.0	2.5	5.0	7.5	10.0
Vinyl chloride	X	62	1.0	2.5	5.0	7.5	10.0
m/p-Xylene	X	91	2.0	5.0	10.0	15.0	20.0
o-Xylene	X	91	1.0	2.5	5.0	7.5	10.0

- <sup>a</sup> - Nominal concentrations; actual concentrations used will depend on concentration in stock standards and final dilution factor.
- <sup>b</sup> - The acceptance criteria and corrective action found in this section only apply to the analytes indicated (X) in this column.
- <sup>c</sup> - Levels are based on variable load volumes of the calibration verification standard; Level 1 = 0.1 liters, Level 2 = 0.25 liters, Level 3 = 0.5 liters, Level 4 = 0.75 liters, and Level 5 = 1.0 liters. The number of levels may vary for specific analytes.
- <sup>d</sup> - Only 1-Butene is present in the calibration standard

## ***APPENDIX D***

### **References**

Requirements and guidance documents:

- EPA QA/R-5, "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations," Interim Final, January 1994
- EPA Compendium Method IO-3.1, "Selection, Preparation, And Extraction Of Filter Material," Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, Second Edition, EPA/625/R-96/010b
- EPA Compendium Method IO-3.4, "Determination Of Metals In Ambient Particulate Matter Using Inductively Coupled Plasma (ICP) Spectroscopy", Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, EPA/625/R-96/010b
- EPA Compendium Method IO-3.5, "Determination Of Metals In Ambient Particulate Matter Using Inductively Coupled Plasma/ Mass Spectrometry (ICP/MS)", Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, EPA/625/R-96/010b
- EPA Compendium Method TO-15, "Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/ Mass Spectrometry (GC/MS)", Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, EPA/625/R-96/010b
- EPA SW-846 Methods 6010 and 6020, "Test Methods of Evaluating Solid Waste," 3<sup>rd</sup> ed., 2<sup>nd</sup> update; US EPA. Office of Solid Waste and Emergency Response, Sept. 1994; Vol. 1A.
- LPR308-00-00, "Integrating Quality Management," Laboratory Performance Requirement, Los Alamos National Laboratory, December 13, 2001
- "Laboratory Calibration Program," Los Alamos National Laboratory, February 18, 2000
- Title 29 Code of Federal Regulations Part 1910.1000, Table Z-1, OSHA, "Limits for Air Contaminants"
- Title 40 Code of Federal Regulations Part 58, "Ambient Air Quality Surveillance," Appendix E

Title 40 Code of Federal Regulations Part 136, Appendix B, “Definition And Procedure For The Determination Of The Method Detection Limit—Revision 1.11”

MAQ Group documents:

RRES-MAQ-QMP, “Quality Management Plan for the Air Quality Group”

RRES-MAQ-MET, “Quality Assurance Project Plan for the Meteorology Monitoring Project”

RRES-MAQ-022, “Preparation, Review, and Approval of Procedures”

RRES-MAQ-024, “Personnel Training”

RRES-MAQ-025, “Records Management”

RRES-MAQ-026, “Deficiency Reporting and Correcting”

RRES-MAQ-029, “Management Assessments”

RRES-MAQ-030, “Document Distribution”

RRES-MAQ-032, “Orienting New Employees”

RRES-MAQ-036, “Preparing Statements of Work for Procuring Analytical Chemistry”

RRES-MAQ-224, “Air Sampling for Particulate Mass Using The Volumetric Air Samplers”

RRES-MAQ-233, “Operation of the TEOM Air Sampling System”

RRES-MAQ-237, “Maintenance, Repair, and Calibration of the TEOM”

RRES-MAQ-240, “Air Sampling Using the High Volume Samplers”

RRES-MAQ-245, “Evaluation of TEOM Data”

RRES-MAQ-249, “Collecting Ambient VOC Samples”

RRES-MAQ-251, “Evaluation of Non-RadNet Data”

RRES-MAQ-252, “Analytical Chemistry Data Management And Review For NonRadNet”