A. PROJECT MANAGEMENT

A.1. Title & Approval

Oregon Department of Environmental Quality

Signature: ____________________________ Date: ___________
Project Manager: Sarah Armitage

Signature: ____________________________ Date: ___________
Air Quality Monitoring Manager: Jeff Smith

Signature: ____________________________ Date: ___________
Quality Assurance Officer: Chris Moore

Lane Regional Air Protection Agency

Signature: ____________________________ Date: ___________
Air Monitoring Manager: Jerry Boyum

Environmental Protection Agency Region X

Signature: ____________________________ Date: ___________
Air Monitoring Officer: Keith Rose

Signature: ____________________________ Date: ___________
Quality Assurance Manager: Gina Grepo-Grove

Signed Copy on File at DEQ
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A.3. Distribution

A hard copy of this Quality Assurance Project Plan (QAPP) has been distributed to the individuals listed in Table A.3-1. The latest version of this QAPP and the associated Standard Operating Procedures (SOPs) will be available as read-only PDF files through the Oregon DEQ Intranet. Only personnel listed in Table A.3-1 shall receive notices of subsequent revisions. The ODEQ Quality Assurance Officers will oversee control and update of the QAPP and the SOP’s.

Table A.3-1 Distribution List

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<th>Name</th>
<th>Position</th>
<th>Division/Section</th>
<th>Phone</th>
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</thead>
<tbody>
<tr>
<td>Scott Hoatson</td>
<td>Quality Assurance Officer</td>
<td>Laboratory Division/QA</td>
<td>(503) 693.5786</td>
</tr>
<tr>
<td>Chris Moore</td>
<td>Quality Assurance Officer</td>
<td>Laboratory Division/QA</td>
<td>(503) 693.5721</td>
</tr>
<tr>
<td>Jeff Smith</td>
<td>Air Monitoring Manager</td>
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<td>(503) 693.5719</td>
</tr>
<tr>
<td>RaeAnn Haynes</td>
<td>Inorganic and Technical Services Section Manager</td>
<td>Laboratory Division/Inorganic Lab</td>
<td>(503) 693.5757</td>
</tr>
<tr>
<td>Brian Boling</td>
<td>Organic Section Manager</td>
<td>Laboratory Division/Organic Lab</td>
<td>(503) 693.5745</td>
</tr>
<tr>
<td>Sarah Armitage</td>
<td>Air Toxics Project Manager</td>
<td>Air Quality Division/Air Quality Planning</td>
<td>(503) 229.5186</td>
</tr>
<tr>
<td>Anthony Barnack</td>
<td>Air Monitoring Coordinator</td>
<td>Air Quality Division/Air Quality Planning</td>
<td>(503) 693.5708</td>
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<tr>
<td>Merlyn Hough</td>
<td>Director</td>
<td>Administration</td>
<td>(541) 736.1056 x216</td>
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<td>Jerry Boyum</td>
<td>Air Monitoring Manager</td>
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<td>Keith Rose</td>
<td>Air Monitoring Officer</td>
<td>Air Quality</td>
<td>(206) 553-1949</td>
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<tr>
<td>Gina Grepo-Grove</td>
<td>Quality Assurance Manager</td>
<td>Quality Assurance</td>
<td>(206) 553-1632</td>
</tr>
</tbody>
</table>

A.4. Project/Task Organization

Federal, state, tribal, and local agencies all have important roles in developing and implementing satisfactory air toxics monitoring programs. As part of the planning effort, EPA is responsible for setting national objectives, establishing methods for data gathering, and defining the quality of the data necessary to meet those objectives. State, tribal, and local organizations are responsible for using this information to implement a quality system that will meet the data quality requirements. It is the responsibility of all the agencies to assess the quality of the data and to take corrective action when appropriate.
A.4.1. Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards (OAQPS)

The OAQPS is charged under the authority of the Clean Air Act (CAA) to protect and enhance the quality of the nation's air resources. OAQPS sets standards for pollutants considered harmful to public health or welfare and, in cooperation with EPA's Regional Offices and the States, enforces compliance with the standards through state implementation plans (SIPs) and regulations controlling emissions from stationary sources. With respect to Hazardous Air Pollutants the OAQPS:

- Evaluates the need to regulate potential air pollutants and develops national standards;
- Monitors national air quality trends and maintains a database of information on air pollution and controls;
- Provides technical guidance and training;
- Ensures that the methods and procedures used in making air pollution measurements are adequate to meet the programs objectives and that the resulting data are of satisfactory quality;
- Renders technical assistance to the EPA Regional Offices and air pollution monitoring community.

A.4.2. EPA Region 10 Office

EPA Regional Offices responsibility is to address environmental issues related to the states within their jurisdiction, and to administer and oversee regulatory and congressionally mandated programs. The major responsibilities of EPA's Region 10 Office, in regards to air toxics monitoring, are the coordination of monitoring projects and quality assurance matters with the state and local agencies. EPA Regional Project Officers are responsible for the technical aspects of the program including:

- Reviewing Project Work Plans and Quality Assurance Project Plans;
- Evaluating quality system performance; and
- Acting as a liaison between EPA Headquarters and the state and local agencies by making available technical and quality assurance information.

A.4.3. Oregon Department of Environmental Quality (ODEQ)

Oregon DEQ is responsible for the operation of an air toxics monitoring program, which must include an appropriate quality assurance program. Ambient air toxics data is used for multiple objectives, including, among others:

- Providing the people of Oregon with information about air toxic contaminants;
- Determining if ambient air toxics standards and benchmarks are being met;
- Assessing the effectiveness of emissions reduction programs; and
- Identifying sources of air toxic pollution having significant impacts on public health and the environment.
- Monitoring the air for toxic contaminants requires that a variety of specialists work together to define and accomplish the objectives specific to this task. The following information lists the responsibilities of individuals and is grouped by functions of the Divisions related to Environmental Data Generation, Quality Assurance, Technical Support, and Program Support.

A.4.3.1. Air Quality Division

The Air Quality Administrator, Andrew Ginsburg, has overall responsibility for managing the Air Quality Division of ODEQ, including setting priorities and ensuring that programs are carried out efficiently and effectively.

The Air Quality Planning Manager, David Collier, is responsible for planning and implementing
air quality improvements through collaboration with local residents and other affected parties. Sarah Armitage, the Project Manager for the Air Toxics Monitoring Project, is responsible for developing the project work plan and budget, and for assuring that the project is carried out as planned. Anthony Barnack acts as a liaison between the Laboratory and Air Quality Divisions and is responsible for reporting the data to AIRS.

A.4.3.2. Laboratory and Environmental Assessment Division (LEAD)

The Laboratory Administrator, Greg Pettit, is responsible for establishing Quality Assurance (QA) policy, and for resolving QA issues identified through the QA program. Major QA related responsibilities of the Laboratory Administrator include:

- Assuring that the Department develops and maintains a current Quality Management Plan (QMP).
- Assuring that the Department develops and implements a QAPP for each data generating project.

A.4.3.2.1. Quality Assurance Section

The Laboratory Administrator delegates the responsibility of QA development and implementation in accordance with Department policy to the Quality Assurance Officers (QAOs). There is a QAO for each DEQ program: Air Quality, Land Quality, and Water Quality. The QAOs report directly to the LEAD Administrator and provide technical assistance in the development and implementation of QA project plans; audits monitoring networks; perform assessments of self-monitoring activities under air, NPDES, and RCRA permits; may participate in Oregon Laboratory Accreditation Program (ORELAP) activities; report to programs documenting project data quality; and ensure corrective action procedures are followed when data quality criteria are not met. The three Quality Assurance Officers (QAOs) are Scott Hoatson, Chris Redman, and Chris Moore.

The main responsibility of the QAOs is oversight of quality assurance activities, and ensuring that all personnel understand the Department's QA policy as well as all pertinent EPA QA policies and regulations. The QAOs provides technical support and reviews and approves QA products. Responsibilities include:

- Reviewing and approving Quality Assurance Project Plans.
- Ensuring that technical personnel follow the QAPP.
- Developing and interpreting Department QA policy and revising it as necessary.
- Assisting staff scientists and project managers in developing QA documentation and in providing answers to technical questions.
- Ensuring that all personnel involved in environmental data operations have access to any training or QA information needed to be knowledgeable in QA requirements, protocols, and technology of that activity.
- Serving as the program’s QA liaison with EPA Regional QA Managers and the Regional Project Officer.
- Ensuring that a management system review occurs every 3 years.

The QAO for air toxics monitoring, Chris Moore, is responsible for:

- Remaining current on Department QA policy and general and specific EPA QA policies and regulations as it relates to air toxics monitoring.
- Reviewing and approving QAPPs and sampling and analysis plans (SAPs) for air toxics monitoring.
- Ensuring that a QAPP and/or SAP is in place for all environmental data operations associated with the project.
- Reviewing and approving standard operating procedures (SOPs)
- Tracking the QA/QC status of the project.
- Ensuring that technical systems audits, audits of data quality, and data quality
assessments occur within the appropriate schedules, and conducting or participating in these audits
• Ensuring timely follow-up and corrective actions resulting from auditing and evaluation activities.
• Performing data quality assessments.
• Reviewing precision and bias data.
• Acting as a conduit for QA information between staff and assisting in solving QA-related problems at the lowest possible organizational level.

The QAOs have the authority to carry out these responsibilities and to bring to the attention of the Laboratory Administrator any issues associated with these responsibilities. Oversight of the QA program as it relates to individual programs is delegated to the Section Managers.

A.4.3.2.2. Technical Sections

The technical sections of the Laboratory are responsible for all routine environmental data operations related to the air toxics monitoring program. Management shall ensure that personnel receive proper training to fulfill the responsibilities listed below.

Air Quality Monitoring (AQM) Manager, Jeff Smith, is the manager of the ambient Air Quality Monitoring Section. The duties of this position include the oversight of the QA/QC activities that are implemented as part of data collection activities. Responsibilities of the AQM Manager include:

• Communication with EPA Project Officers and EPA QA personnel on issues related to routine sampling and QA activities.
• Understanding EPA monitoring and QA regulations and guidance, and ensuring AQM staff understand and follow these regulations and guidance.
• Understanding Department QA policy and ensuring AQM staff understand and follow the policy.
• Understanding and ensuring adherence to the QAPP.
• Facilitating management systems reviews.
• Reviewing contracts, grants, cooperative agreements, and inter-agency agreements to determine the necessary QA requirements.
• Developing air toxic project budgets and work plans.
• Ensuring that all personnel involved in environmental data collection have access to any training or QA information needed to be knowledgeable in QA requirements, protocols, and technology.
• Recommending required management-level corrective actions.

Lead Air Quality Monitoring Specialists, Anthony Barnack and Kathleen Schuckman, are responsible for the operation of the air monitoring and sampling network. Their duties include carrying out required QA/QC tasks and ensuring the quality of the data by adhering to guidance and protocol specified by the QAPP and SOP for the field activities. Responsibilities include:

• Implementation of the QAPP.
• Training and certification activities of AQM staff.
• Development of data quality requirements (overall and field) with the appropriate QA staff.
• Writing and updating SOPs.
• Verifying that all required QA activities are performed and that measurement quality standards are met as required in the QAPP.
• Assessing and reporting data quality.
• Preparing and delivering reports to the Air Monitoring Manager.

Senior AQM field specialist, Robert L. Jones, is responsible for carrying out required
QA/QC tasks and ensuring the air toxics data quality objectives are met by adhering to guidance and protocol specified by the QAPP and SOP for the support of field and calibration activities. Responsibilities include:

- Participating in the development and implementation of the QAPP.
- Oversight of all maintenance and troubleshooting of air toxics sampling equipment.
- Following all manufacturers’ specifications.
- Performing and documenting preventative maintenance.
- Documenting deviations from established procedures and methods.
- Reporting all problems and corrective actions to the Project Officer, AQM Manager, and QAO.
- Flagging suspect data.
- Preparing and delivering reports to the Air Monitoring Manager.

**Inorganic and Organic Laboratory Section Managers**, RaeAnn Haynes and Brian Boling, respectively, are responsible for overseeing the routine lab activities and QA activities of the ambient Air Quality Monitoring Program as it applies to analytical activities. The Laboratory Managers’ responsibilities include:

- Implementing and overseeing the Department’s QA policy within the section.
- Understanding Department QA policy and ensuring analytical staff understand and follow the policy.
- Ensuring that technical personnel follow the QAPP.
- Acting as a conduit for information to section staff.
- Ensuring that all personnel involved in environmental sample analysis have access to any training or QA information needed to be knowledgeable in QA requirements, protocols, and technology.
- Assisting staff scientists and project managers in understanding the laboratory standard operating procedures and appropriate laboratory QA documentation.
- Ensuring that an up-to-date QAPP is in place for all laboratory analytical operations.

**Laboratory personnel** - George Yousif, Ben Jones, Linda McRae, Karen Yates, Lizbeth Garcia, Sara Krepps, Kirk Keyes, James Yates, Amy Nomani, and Nicole Bradt – are responsible for carrying out required QA/QC tasks and ensuring the data quality objectives are met by adhering to guidance and protocol specified by the QAPP and SOP for the lab activities. Responsibilities include:

- Participating in the development and implementation of the QAPP.
- Participating in training and certification activities.
- Participating in the development of data quality requirements (overall and laboratory) with the appropriate QA staff.
- Writing and updating standard operating procedures (SOP) and good laboratory practices (GLPs).
- Using SOP and GLP in the analysis of air samples.
- Verifying that all required QA activities were performed and that measurement quality standards were met as required in the QAPP.
- Following all manufacturers’ specifications.
- Performing and documenting preventative maintenance.
- Documenting deviations from established procedures and methods.
- Reporting all problems and corrective actions to the Laboratory Section Manager and/or the QAO.
- Verifying and reporting data quality.
- Flagging suspect data.
- Preparing and delivering data to their respective Laboratory manager.
The Technical Services manager, RaeAnn Haynes, is responsible for coordinating the information management activities of the Laboratory and Environmental Assessment Division. Responsibilities include:

- Ensuring adherence to the QAPP.
- Ensuring access to data for timely reporting and interpretation processes
- Developing local data management SOP.
- Following good automated data processes.
- Coordinating the development of the information management system with data users.
- Ensuring that all support personnel have access to any training or QA information needed to be knowledgeable in QA requirements, protocols, and technology

A.4.4. Lane Regional Air Protection Agency (LRAPA)

Lane Regional Air Protection Agency’s mission is to protect public health, community well-being and the environment as a leader and advocate for the improvement and maintenance of air quality in Lane County, Oregon. LRAPA is responsible for the operation of an air quality monitoring program within Lane County, which includes an appropriate quality assurance program. LRAPA uses this document, the Oregon DEQ QAPP for Air Toxics Monitoring, as the basis for their quality assurance program for air toxics monitoring.

A.4.4.1. Administration

The Director of LRAPA, Merlyn Hough, has overall responsibility for the operation of LRAPA, including reporting to the Board of Directors, budget development, setting priorities and ensuring that programs are carried out efficiently and effectively.

Finance and Human Resources manager Nassar Mirhosseyni has responsibility for the business, accounting, and human resource functions of LRAPA.

A.4.4.2. Air Monitoring

Jerry Boyum, Air Monitoring Manager, is responsible for the field and data operations associated with the collection of air toxics samples as required by this QAPP. The Air Monitoring Manager is assisted by several field technicians.

A.5. Problem Definition/Background

The citizens of Oregon have expressed their concern about their exposure to hazardous air pollutants (air toxics) and Oregon's Department of Environmental Quality (ODEQ) has developed an air toxics program to address those concerns. A credible scientific basis for understanding the scope and extent of the problem is fundamental to implementing this program. Measurement of ambient air toxics concentrations is a necessary element of that scientific foundation.

There are currently 188 hazardous air pollutants (HAP) regulated under the Clean Air Act (CAA) that have been associated with a wide variety of adverse health effects, including cancer, an increase in neurological, reproductive, and childhood developmental problems, as well as damage to the ecosystem. These and other toxic air contaminants are emitted from multiple sources, including major stationary, area, and mobile sources, resulting in population exposure to these air toxics. While in some cases the public may be exposed to an individual HAP, more typically people experience exposures to multiple HAPs from many sources. Ambient monitoring data of these compounds is needed to determine the concentrations of air toxics in the atmosphere and to understand the impact they have on the environment and the health of the human population.

Oregon DEQ has been collecting and analyzing air toxics samples intermittently and at a variety of sites since the 1980s. In September 1999, with the aid of an EPA grant, an existing PM2.5 site in North Portland on Roselawn became DEQ’s first long-term air toxics site. In 2001, also with EPA funding,
LRAPA began collecting air toxics samples at their Amazon Park site in Eugene. Laboratory analysis of these samples were performed at the DEQ Laboratory in Portland.

An element of the EPA air toxics strategy was the development of the National Air Toxics Trends Stations (NATTS). With funding from EPA, in February 2004 the ODEQ established a NATTS monitoring site in La Grande, Oregon. The location was selected to represent rural communities within EPA Region 10. The measurement of ambient air toxics in La Grande will help to further both national and state objectives.

In 2005 ODEQ was awarded an EPA grant to survey the greater metropolitan area of Portland, including a site in the adjacent city of Vancouver, Wa. Using data from this project ODEQ was able to select one air toxics site intended to represent the entire Portland Metro area. This site was the Roselawn site in North Portland (PNR). The site became a member of the NATTS network in April 2008. Monitoring at this site continues to produce data on the spatial and temporal characteristics of HAPs within Portland metropolitan area.

In 2008 ODEQ expanded its air toxics monitoring by three additional sites to measure the levels of air toxics in other population centers in the state. These state funded air toxics monitoring sites added to our knowledge of air toxics in the state. Two of the new sites were located in the Medford area. The Medford site at Grant and Belmont Streets was established in December 2007 and is located in a residential neighborhood. In March 2008, a second Medford site is located in a rural area to measure background concentrations of air toxics in the air shed. This background site operated for one year and was located on Dodge Road (MDR) in rural Jackson County. The third new air toxics station was in the city of Salem. The station was located on the boundary between a mixed commercial area and residential neighborhood in a large open field near the State Hospital facility. The site name was Salem State Hospital (SSH).

In 2010 the site in Salem was moved to Klamath Falls. A year’s worth of data was collected in that community until the site was discontinued due to budget cuts. The sites in Lane County were also shutdown due to a lack of funding. The Medford site was move to the more industrial north end of town in 2011 to an existing site at Welch & Jackson. The current network consists of three sites: the two NATTS stations (Portland and La Grande) and the Medford station.

In response to the public’s concerns about exposure to air toxics ODEQ has developed an Air Toxics Strategy designed to characterize, prioritize, and equitably address the impacts of HAPs on the public health and the environment. Emissions data, ambient concentration measurements, modeled estimates, and health impact information are all needed to fully assess air toxics impacts and to characterize health and environmental risk. Emissions data are needed to quantify the sources of air toxics impacts, provide inputs to modeling assessments, and aid in the development of control strategies. Ambient monitoring data are needed to understand the behavior of air toxics in the atmosphere after they are emitted, but ambient measurements cannot practically be made everywhere. Modeled estimates are needed to extrapolate our knowledge of air toxics impacts into locations without monitors. Exposure assessments, together with health effects information, are then needed to integrate all of these data into an understanding of the implications of air toxics impacts.

A.6. Project/Task Description

The Air Toxics Monitoring Project is designed to:

- characterize ambient concentrations of air toxics;
- provide data to support and evaluate dispersion models;
- establish trends and evaluate effectiveness of air toxics reduction strategies.

This project will determine ambient air concentrations of toxic air pollutants with the goal of determining the health effects of these pollutants. These health effects result from exposure of the public to air toxics over a long period of time, i.e. chronic rather than acute effects. It is therefore important that our measurement system be designed to capture concentrations representative of these long-term
exposures. Samples will be collected in sufficient numbers to generate valid annual average concentrations. The data will be summarized as annual averages for comparison to Oregon’s Ambient Benchmark Concentrations (ABCs) and for the determination of long-term trends. This trend data will in turn be used to assess the effectiveness of any emissions reduction programs.

The measurement goal of this project is to determine the concentration of air toxic compounds in the gas, semi-volatile, and particulate phases. This is accomplished by five separate sampling systems:

- passivated canisters for volatile organic compounds,
- dinitrophenylhydrazine (DNPH) cartridges for volatile carbonyl compounds,
- polyurethane foam/XAD/polyurethane foam ‘sandwich’ contained in glass cartridges for semi-volatile organics,
- sodium bicarbonate impregnated cellulose filters for TSP hexavalent chromium (Cr₆⁺) and
- quartz filters for metals in PM10 particulates.

A.6.1. List of Pollutants

There are 33 HAPs identified in the federal Integrated Urban Air Toxics Strategy (IUATS). They are a subset of the 188 toxics identified in Section 112 of the Clean Air Act (CAA) which are thought to have the greatest impact on the public and the environment in urban areas. The IUATS list is shown in Table A.6-1 below. In addition, a steering committee consisting of federal, regional, state and local agencies has been working to develop a national air toxics monitoring network. They have identified a core group of pollutants that should be monitored across the country and are working to determine consistent methods for accomplishing that task.

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<tr>
<th>Integrated Urban Air Toxics Strategy List</th>
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<tr>
<td>1,2-dichloropropane (propylene dichloride)</td>
<td>TO-15A</td>
<td>78875</td>
</tr>
<tr>
<td>1,3-dichloropropene</td>
<td>TO-15A</td>
<td>542756</td>
</tr>
<tr>
<td>ethylene dichloride (1,2-dichloroethane)</td>
<td>TO-15A</td>
<td>107062</td>
</tr>
<tr>
<td>ethylene oxide</td>
<td>other</td>
<td>75218</td>
</tr>
<tr>
<td>formaldehyde</td>
<td>TO-11A</td>
<td>50000</td>
</tr>
</tbody>
</table>
integrated 24-hour samples will be collected for gas and particulate analysis. all sampling for both
gas phase and particulate analyses will be done on a one in six day schedule to coincide with the
national particulate network sampling schedule. the ODEQ lab will perform most of the analyses,
with the exception of the CARB 039 method for hexavalent chromium. If this plan is revised or an
SAP is written to include analytes outside the capabilities of the ODEQ laboratory, the ODEQ will
subcontract the analyses with an ORELAP accredited laboratory. The sampling methods are as
follows:

- EPA Method TO-15 will be used to measure volatile organic compounds.
- EPA Method TO-11A will be used to measure the carbonyl group of HAPs.
- Method ASTM D6209-98 will be used for measuring the semi-volatile organic group of
  HAPs. (This method has replaced TO-13).
- Particulate (PM10) trace metals will be analyzed by EPA Method IO-3 using ICP/MS.
- ODEQ shall collect filter samples for Cr6+ and contract for the analysis with an accredited
  lab using method CARB SOP MLD039 with some slight method modifications.

As analytic methods are researched by EPA and other agencies, improvements and modifications
will be reviewed by the analytic staff. Tables A.6-2 through A.6-6 list the HAPs by analytical method
that will be measured in this study.

Table A.6-2 Method TO-15 Compounds

<table>
<thead>
<tr>
<th>Integrated Urban Air Toxics on TO-15A List</th>
<th>Full List of EPA TO-15A Method Compounds</th>
<th>Required for NATTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>acrolein</td>
<td>1,1,1-Trichloroethane</td>
<td>acrolein</td>
</tr>
<tr>
<td>acrylonitrile</td>
<td>1,1,2,2-Tetrachloroethane</td>
<td>perchloroethylene</td>
</tr>
<tr>
<td>benzene</td>
<td>1,1,2-Trichloroethane</td>
<td>(tetrachloroethylene)</td>
</tr>
<tr>
<td>1,3-butadiene</td>
<td>1,1-Dichloroethane</td>
<td>benzene</td>
</tr>
<tr>
<td>carbon tetrachloride</td>
<td>1,1-Dichloroethylene</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------</td>
<td></td>
</tr>
<tr>
<td>chloroform</td>
<td>1,2,4-Trichlorobenzene</td>
<td></td>
</tr>
<tr>
<td>1, 2-dibromoethane</td>
<td>1,2,4-Trimethylbenzene</td>
<td></td>
</tr>
<tr>
<td>1, 2-dichloropropane (propylene dichloride)</td>
<td>1,2-Dibromoethane (EDB)</td>
<td></td>
</tr>
<tr>
<td>1, 3-dichloropropene</td>
<td>1,2-Dichlorobenzene</td>
<td></td>
</tr>
<tr>
<td>ethylene dichloride (1,2-dichloroethane)</td>
<td>1,2-Dichloroethane</td>
<td></td>
</tr>
<tr>
<td>methylene chloride (dichloromethane)</td>
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<td></td>
</tr>
<tr>
<td>1, 1, 2, 2-tetrachlorethane</td>
<td>1,2-Dimethylbenzene</td>
<td></td>
</tr>
<tr>
<td>Tetrachloroethylene (perchloroethylene)</td>
<td>1,3,5-Trimethylbenzene</td>
<td></td>
</tr>
<tr>
<td>trichloroethylene</td>
<td>1,3-Butadiene</td>
<td></td>
</tr>
<tr>
<td>vinyl chloride</td>
<td>1,3-Dichlorobenzene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,4/1,3-Dimethylbenzene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,4-Dichlorobenzene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2,2,4-Trimethylpentane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-Butanone (MEK)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-Hexanone</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-Chloropropene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4-Ethyltoluene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acetone</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acrolein</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acrylonitrile</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Benzene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bromodichloromethane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bromoform</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bromomethane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carbon Disulfide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carbon Tetrachloride</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chlorobenzene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chloroethane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chloroform</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chloromethane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cis-1,2-Dichloroethylene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cis-1,3-Dichloropropene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cyclohexane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dibromochloromethane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dichlorodifluoromethane</td>
<td></td>
</tr>
<tr>
<td>[\text{carbon tetrachloride}]</td>
<td>[\text{chloroform}]</td>
<td></td>
</tr>
<tr>
<td>[\text{trichloroethylene}]</td>
<td>[\text{1,3-butadiene}]</td>
<td></td>
</tr>
<tr>
<td>[\text{dichloromethane}]</td>
<td>[\text{vinyl chloride}]</td>
<td></td>
</tr>
<tr>
<td>Integrated Urban Air Toxics on TO-11A List</td>
<td>Full List of EPA TO-11A Method Compounds</td>
<td>Required for NATTS</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>acetaldehyde</td>
<td>formaldehyde</td>
<td>formaldehyde</td>
</tr>
<tr>
<td>formaldehyde</td>
<td>Acetaldehyde</td>
<td>acetaldehyde</td>
</tr>
<tr>
<td></td>
<td>Acetone</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Propionaldehyde</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crotonaldehyde (2-Butenal, (E))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-Butanone (MEK)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Butyraldehyde</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Benzaldehyde</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Isovaleraldehyde</td>
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<td>Valeraldehyde</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o-Tolualdehyde</td>
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</table>

**Table A.6.3 Method TO-11A Compounds.**
### Table A.6-4  Method IO-3.5 Compounds.

<table>
<thead>
<tr>
<th>Integrated Urban Air Toxics on IO-3.5 List</th>
<th>Full List of EPA IO-3.5 Method Compounds</th>
<th>Required for NATTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>arsenic compounds</td>
<td>arsenic - PM10</td>
<td>nickel - PM10</td>
</tr>
<tr>
<td>beryllium compounds</td>
<td>beryllium - PM10</td>
<td>arsenic - PM10</td>
</tr>
<tr>
<td>cadmium compounds</td>
<td>cadmium - PM10</td>
<td>cadmium - PM10</td>
</tr>
<tr>
<td>chromium compounds</td>
<td>chromium - PM10</td>
<td>manganese - PM10</td>
</tr>
<tr>
<td>lead compounds</td>
<td>cobalt - PM10</td>
<td>beryllium – PM10</td>
</tr>
<tr>
<td>manganese compounds</td>
<td>lead - PM10</td>
<td>lead – PM10</td>
</tr>
<tr>
<td>mercury compounds</td>
<td>manganese - PM10</td>
<td></td>
</tr>
<tr>
<td>nickel compounds</td>
<td>nickel - PM10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>selenium - PM10</td>
<td></td>
</tr>
</tbody>
</table>

### Table A.6-5  Method ASTM 6209-98 (TO-13) Compounds.

<table>
<thead>
<tr>
<th>Integrated Urban Air Toxics on ASTM 6209-98 List</th>
<th>Full List of ASTM 6209-98 Method Compounds</th>
<th>Required for NATTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>polycyclic organic matter (POM)</td>
<td>Naphthalene†</td>
<td>benzo(a)pyrene</td>
</tr>
<tr>
<td></td>
<td>Acenaphthylene</td>
<td>naphthalene</td>
</tr>
<tr>
<td></td>
<td>Acenaphthene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dibenzo[ghi]pene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fluorene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dibenzothiophene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phenanthrene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anthracene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fluoranthene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pyrene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Benzo[a]anthracene†</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chrysene†</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Benzo[b]fluoranthene†</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Benzo[k]fluoranthene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Benzo[e]pyrene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Benzo[a]pyrene†</td>
<td></td>
</tr>
<tr>
<td>Perylene</td>
<td>Indeno[1,2,3-cd]pyrene†</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dibenz[a,h]anthracene†</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Benzo[g,h,i]perylene</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coronene</td>
<td></td>
</tr>
</tbody>
</table>

†Considered part of the 7-PAH group of HAPs

<table>
<thead>
<tr>
<th>Integrated Urban Air Toxics on CARB MLD-039 List</th>
<th>Full List of CARB MLD-039 Method Compounds</th>
<th>Required for NATTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexavalent chromium (TSP)</td>
<td>Hexavalent chromium (TSP)</td>
<td></td>
</tr>
</tbody>
</table>
A.7. Quality Objectives and Criteria

It is the policy of ODEQ that all air toxics data generated for internal and external use meet specific qualitative requirements, referred to as Data Quality Objectives (DQO), that assess precision, bias, and other characteristics of the data. This information is essential in order to produce data of known quality and to reduce the probability of decision errors. This QAPP focuses on the role of ambient measurement data as one key element of the full air toxics assessment process.

Once DQOs are established, the quality of the data must be evaluated and controlled to ensure that it is maintained within the established acceptance criteria. Measurement Quality Objectives (MQO) are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed.

The following terms are defined:

**Precision** - a measure of mutual agreement among individual measurements of the same property usually under prescribed similar conditions. This is the random component of error. To assess precision the difference in analytical variability and the variability of collocated samplers will be evaluated. High variability measured in co-located samples where sampling, preparation, and QC analyses are within control limits indicates heterogeneous samples. Precision is estimated by various statistical techniques using some limit of the standard deviation.

**Bias** - the systematic or persistent distortion of a measurement process which causes error in one direction. Bias will be described by determining the positive and negative deviation from the true value as a percentage of the true value.

**Representativeness** - a measure of the degree which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Sites are selected to provide data representative of the area or problem under study and to meet the goals of the project.

**Completeness** - a measure of the amount of valid data obtained from a measurement system compared to the total possible data set.

**Comparability** – where applicable, the selection of test methods shall be consistent or equivalent with EPA published methods.

**Detectability** - a determination of the lowest concentration value that a method-specific analysis can reliably discern within technical certainty.

Quality Control procedures are used to maintain the measurement systems within prescribed limits of acceptability whereas Quality Assurance procedures assess whether these systems have achieved the desired Data Quality Objectives as measured by precision, bias, completeness, and detection limits.

By coupling the DQOs with knowledge of the measurement system's advantages and limitations a resource-effective data collection system can be designed. Such a design includes when to collect samples, where to collect samples, the tolerable level of decision errors for the study, and how many samples to collect.

A.8. Special Training Requirements/Certification

The education and training of staff are critical to any monitoring program that strives for reliable and comparable data. Training is aimed at increasing the effectiveness of employees and the Department. Personnel assigned to ambient air toxics air monitoring activities and for laboratory analysis activities will meet the educational, work experience, responsibility, personal attributes, and training requirements for their positions. Records on personnel qualifications and training will be maintained in personnel files and will be accessible for review during audit activities.

Any required training will be made available to any staff as required to complete the work. Ongoing performance will be monitored by a Quality Assurance Officer and the Section Manager through data review, periodic audits, annual performance reviews, and regular meetings with staff.
A.9. Documents and Records

The ODEQ Laboratory generates the final analytical reports in PDF format. The ODEQ laboratory shall retain the controlled printed documents onsite. The controlled documents can be identified by the color printing of the title page and the signatures of the QAO and Laboratory Administrator. Only the signed documents will be controlled.

The analytical report shall contain the field forms, original or copied, that accompanied the samples, analytical results, and QC sample results. Copies of the controlled analytical report shall be in black/white and are available upon request. ODEQ shall keep the original paper document on file for a minimum of five years. The Laboratory shall archive the electronic version of the report and its addendums in an electronic (PDF) format on compact disks for an indefinite period of time (at least 5 years).

Documentation of original observations, calibration records, calculations and derived data shall be retained for a minimum of five years. Documentation shall be maintained such that it will allow reconstruction of all laboratory activities that produced the analytical data.

Analyst shall document, maintain and preserve instrument sequence logs of chemical measurements or record measurements directly into the appropriate logbook.

All of the ambient concentration data collected will be provided to the EPA AIRS database. Site information is also critical, as is sampling and measurement method identification.

Table A.9-1  QAPP Document Revisions

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Changes</th>
<th>Editor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>16-Dec-04</td>
<td>Made changes in A5 Problem Definition/Background, A6 Project/Task Description, B1 Sampling Process Design and Table B1-1 Sampler Deployment to reflect the added sites resulting from the 2005 Air Toxics Grant. Also added a Document Revision Table</td>
<td>P. Mckay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>G. Lande</td>
</tr>
<tr>
<td>2.2</td>
<td>14-Apr-10</td>
<td>Made changes to entire document. Updates were made to reflect current methods and practices of the ODEQ laboratory.</td>
<td>P. Mc Kay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>R. L. Jones</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Jeff Smith</td>
</tr>
<tr>
<td>3.0</td>
<td>29-Jun-12</td>
<td>Made changes to entire document. Updates were made to reflect current network design, staff, methods and practices of the ODEQ laboratory</td>
<td>Jeff Smith</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bob Jones</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Chris Moore</td>
</tr>
</tbody>
</table>
B. DATA GENERATION AND ACQUISITION

B.1. Sampling Process Design (Experimental Design)

The purpose of this Section is to describe all of the relevant components of the monitoring network. This includes:

- The network design rationale,
- The locations of the sampling sites,
- The frequency of sampling,
- The types of samplers used at each site,
- The laboratory support provided to sampling and,
- The frequency and scope of sampler performance evaluations.

The purpose of this project is to determine the concentration of air toxics in urban and rural areas of the state and determine their spatial and temporal variability. See table B1-1 for a list of the current monitoring stations. Measurements of all nineteen NATTS "core" pollutants, plus additional HAPs, will be made using sampling and analysis methods as described and approved by EPA in their Technical Assistance Documents (TADs) and employed in other monitoring networks throughout the country. ODEQ will compare these concentrations to state health ambient benchmark concentrations (ABCs) and other national monitoring networks. Sampling on a one in six day frequency will give us confidence in the annual average values so that comparisons to chronic toxicity levels can be made. Since ODEQ has selected sampler locations using the rules in EPA's guidance Network Design and Site Exposure Criteria for Selected Noncriteria Air Pollutants, ODEQ will have confidence that the measured levels will be representative of a typical resident's exposure to these compounds. Sampling sites located in more rural areas will generate data to determine the baseline level of HAPs.

The sampling design is based on the assumption that following the rules and guidance provided in the CFR and Network Design and Site Exposure Criteria for Selected Noncriteria Air Pollutants will result in data that can be compared to toxicity benchmarks and values obtained in other monitored locations. At our discretion is the site of the sampler, and to a degree, sampling frequency. The process of selecting a site assumes homogeneity of air toxics concentrations within the area under study.

B.1.1. Site Selection

The design of the National Air Toxics Trends (NATTS) network is intended to achieve all six of the following basic air monitoring objectives:

- To determine the highest concentrations expected to occur in the area covered by the network.
- To determine representative concentrations in areas of high population density.
- To determine the impact on ambient pollution levels of significant sources or source categories.
- To determine general background concentrations levels.
- To determine the extent of regional pollution transport among populated areas.
- In support of secondary standards, to determine the welfare-related impacts in more rural and remote areas.

The site in Medford is intended to meet the first objective. The Portland NATTS site is intended to meet the second objective in this list and ultimately to provide trend data demonstrating how these concentrations change over time. The site is La Grande is also operated in support of the last objective; impacts in more rural areas. This site is part of the NATTS and was selected to represent these types of communities for all of EPA Region 10.

Table B.1-1 below shows what type of samples that may be collected and analyzed at each monitoring site. This QAPP or Sampling and Analysis Plans (SAPs) shall be written as prescribed by the agency's QMP to describe precisely which parameters will be tested and at which sites.
### Table B.1-1 Sampler Deployment

<table>
<thead>
<tr>
<th>Site</th>
<th>LASAR #</th>
<th>AIRS #</th>
<th>PM 10</th>
<th>VOC</th>
<th>SVOC</th>
<th>Carbonyl</th>
<th>Cr 6+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portland, Oregon</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>North Roselawn</td>
<td>21889</td>
<td>410510246</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>La Grande, Oregon</td>
<td></td>
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<td>X</td>
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<td></td>
</tr>
<tr>
<td>Ash Street</td>
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<td>410610119</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
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<td>Medford, Oregon</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Welch and Jackson Street</td>
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<td>410292129</td>
<td></td>
<td></td>
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</tr>
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</table>

### B.2. Sampling Methods

There are no Federal Reference Methods currently available for the specific organic compounds or elemental analyses used in this project. All of the procedures are taken from EPA's Compendium of Methods for Organic and Inorganic analyses, the EPA NATTS Technical Assistance Document, or the ASTM methods. Only the PM10 particulate sampling follows a Federal Reference Methods or Equivalent procedure.

#### B.2.1. Volatile Organic Compound Sampling

A detailed description of sampling for volatile organic compounds using specially prepared and passivated stainless steel canisters can be found in EPA Method TO-15 and the EPA NATTS TAD. The cleaned and evacuated stainless steel canister is connected to the VOC sampling system. The sampler employs a computer controlled system to begin and end sampling for the duration of the sample event. A steady sampling rate is maintained over the 24-hour event period by a mass flow controller. The older SIS canister sampler with pump, solenoid valve, and an adjustable mechanical vacuum regulator has been phased out of the network. Only sub-atmospheric samples are now collected. **Table B.2-1** provides design and performance specifications for this method.

### Table B.2-1 VOC Canister Sampler – Volatile Organic Compounds

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Frequency</th>
<th>Acceptance Criteria</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOC Collection Canister Design</td>
<td>1 in 6 days</td>
<td>Silicone® lined and electropolished Stainless Steel Canister</td>
<td>Vender Spec. EPA NATTS TAD. Method TO-15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.0 liter and 1.4 liter</td>
<td>EPA NATTS TAD. Method TO-15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Final sample Pressure: sub-atmospheric Max Vacuum: 30.0 “Hg</td>
<td></td>
</tr>
<tr>
<td>Ambient air Sampler Performance</td>
<td>1 in 6 days</td>
<td>One canister out of every cleaned batch of canisters analyzed and meeting requirement</td>
<td>EPA NATTS TAD. Method TO-15</td>
</tr>
<tr>
<td>Specifications</td>
<td></td>
<td>of all pollutants less than MDL.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>All parts and tubing that make contact with the sample ambient air are to be made</td>
<td>EPA NATTS TAD. Method TO-15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>from the following materials: Stainless Steel, Glass, Viton®, CFlex® or Teflon®.</td>
<td>Vender Spec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sample Flow Range: 0.1 ccm to 100 ccm</td>
<td></td>
</tr>
</tbody>
</table>
### B.2.2. Carbonyl Compound Sampling

Sampling for gaseous carbonyl compounds usually occurs concurrently with VOC sample collection. A 2,4-dinitro-phenyl hydrazine cartridge (DNPH) is attached to the sampling line and air is drawn through an ozone scrubber prior to passing through the cartridge. Details of the method are given in EPA Method TO-11 and EPA NATTS TAD. Design and performance specifications are given in Table B.2-2.

#### Table B.2-2. Carbonyl Sampler - Aldehyde and Ketone Compounds

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Frequency</th>
<th>Acceptance Criteria</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter Design Specs.</td>
<td>Minimum 1/yr or after sampler repair</td>
<td>Size: 100 mm cylindrical cartridge coated with sample medium: 2,4-dinitro-phenyl hydrazine</td>
<td>Method TO-11</td>
</tr>
<tr>
<td>Sampler Performance Specifications</td>
<td>1 in 6 days</td>
<td>All parts and tubing that make contact with the sample ambient air are to be made from the following materials: Stainless Steel, Glass, Viton®, CFlex® or Teflon®. The Ozone denuder scrubber is a heated copper coil coated and dried with a saturated solution of potassium iodide (KI). Denuder temperature set at 150° F. Sample Flow Rate: 1.00 Liter/min. Flow Regulation: Mechanical flow valve. Flow Rate Precision: ± 10%</td>
<td>Method TO-11, EPA NATTS TAD</td>
</tr>
</tbody>
</table>
Flow Rate Accuracy: ±15%
External Leakage: With sample inlet plugged and pump running, no flow at cartridge connection.
Clock/Timer: 24 hour ± 2 min accuracy

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Frequency</th>
<th>Acceptance Criteria</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Quartz glass fiber filter  |                 | Size: 101.6 mm filter
Medium: Quartz Glass Fiber Filter.
Pore size: 0.3 µm
Filter thickness: 0.50 mm   | Method ASTM D6209-98  
Method TO-13  
EPA NATTS TAD               |
| Glass Thimble              |                 | Size: 55 mm Diameter X 100 mm Height.
Packing (Plug):
Top: Poly Urethane Foam Size: 60mm Dia. X 37mm Height.
Middle: XAD-2®  15.0 g ±0.5
Bottom: Poly Urethane Foam Size: 60mm Dia. X 37mm Height. | Method ASTM D6209-98  
Method TO-13  
EPA NATTS TAD               |
| Sampler Performance Specs. | 1 in 6 days     | Sample Flow Rate: 8.0 cfm
Flow regulation by computer controller flow controller.
Flow Regulation: ±0.5 cfm
Flow Rate Precision: ± 10%
Flow Rate Accuracy: ±15% | Vendor: Tisch Environmental (PS-1) Model TE-1000  
Method TO-13  
EPA NATTS TAD               |

B.2.3. Semi-Volatile Organic Compound Sampling

EPA Method TO-13/ASTM D6209-98 involves analyzing both particulate and gas for semi-volatile organic compounds. A sampling cartridge is assembled with a quartz glass fiber filter at the air flow inlet. Below the glass fiber filter is a glass thimble filled with a sandwich of polyurethane foam, XAD-2®, and polyurethane foam. The assembled cartridge is attached to the PS-1 high volume sampling system, which uses a high volume vacuum pump to draw ambient air through the prepared sampling cartridge. The sampler is controlled by a time clock. Details of the method are given in ASTM D6209-98, EPA Method TO-13 and EPA NATTS TAD. Design and performance specifications for this sampler are provided in Table B.2-3.
### B.2.4. PM$_{10}$ Metals Particulate Sampling

Sampling for suspended particulate follows the Federal Reference Method (40 CFR 58 Appendix E). High volume PM 10 sampling details are provided in the EPA Method IO-3 and the EPA NATTS TAD. For this project the only special consideration is that the filter media be compatible with the analytical methodology to allow multi-elemental metals analysis. **Table B.2-4** gives the design and performance details for this sampling method.

#### Table B.2-4 HV PM 10 Particulate Sampler – Metals

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Frequency</th>
<th>Acceptance Criteria</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Filter Design Specs.      |           | Size: 203 x 254 mm.  
Medium: Quartz Glass Fiber Filter.  
Pore size: 0.3 µm.  
Filter thickness: 0.50 mm.  
Max. Pressure drop: 600 mm Hg @1.13 m$^3$/min.  
Collection efficiency: 99.95%.  
Alkalinity: 6.5 < pH <7.5 | Method IO-3  
EPA NATTS TAD |
| Sampler Performance Specifications | 1 in 6 days | Sample Flow Rate: 1.13 m$^3$/min.  
Flow regulation by mass flow controller.  
Flow Regulation: ±0.1 m$^3$/min.  
Flow Rate Precision: ±10%  
Flow Rate Accuracy: ±15%  
External Leakage: Vendor specs  
Internal Leakage: Vendor specs  
Clock/Timer: 24 hour ± 2 min accuracy | Method IO-3  
EPA NATTS TAD  
PM-10 High Volume sampler SOP |

### B.2.5. Hexavalent Chromium Particulate Sampling

Hexavalent chromium (Cr$^{6+}$) cannot be detected by EPA Compendium Method IO-3. A procedure for sample preparation and analysis, developed and written by California Air Resources Board (CARB-039), has been modified and adapted by Chester Lab Net, the analytic contracting laboratory. The contracting laboratory provides the prepared filter cartridge to ODEQ for sample deployment. The particulate collected from the ambient air is total suspended particulates (TSP), as there is no size cut at the inlet of the filter cartridge. Details of the sample method are given in the EPA NATTS TAD. Design and performance specifications for this sample method are provided in **Table B.2-5**.
### Table B.2-5  TSP Particulate Sampler – Hexavalent Chromium

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Frequency</th>
<th>Acceptance Criteria</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Filter Design Specs.       |           | Size: 47 mm Dia.  
Medium: Whatman No. 41 47-mm ashless cellulose filters.  
% Ash: 0.007%.  
Filter thickness: 220 µm.  
Prep. & Treatment: Soaked in a 10% Nitric acid bath for a minimum of 2 hours and a maximum of 18 hours.  
Rinsed thoroughly with DI water.  
Nitrogen-purged until dried.  
Soaked in the Sodium Bicarbonate impregnating solution (0.12 M Sodium Bicarbonate) overnight.  
Nitrogen-purged until dried.  
Field filter holder: Mfg. Savillex Corp. part # 4-147-4T or (401-21-47-30-41-1) material: PFA. | Method CARB-039  
EPA NATTS TAD |
| Sampler Performance Specifications | 1 in 6 days | Using R&P Model 2000 FRM sampler with modified inlet  
Sample Flow Rate: 15.0 Liter/min.  
Flow Regulation: ±0.1 Liter/min.  
Flow Rate Precision: ±10%  
Flow Rate Accuracy: ±15%  
External Leakage: Vendor specs  
Internal Leakage: Vendor specs  
Clock/Timer: 24 hour + 2 min accuracy | EPA NATTS TAD |

### B.3. Sample Handling and Custody

Laboratory activities associated with sampling for the air toxics program include preparing the filters, canisters, and cartridges for the field operator prior to sampling and receiving the samples after they have been collected.

#### B.3.1. Sample Preparation and Collection

**Pre-Sampling**

- Receiving filters, canisters or cartridges from the vendors
- Checking sample integrity
- Conditioning filters, storing canisters and cartridges
- Weighing filters
- Storing prior to field use
- Packaging filters, canisters and cartridges for field use
• Associated QA/QC activities

**Post-Sampling**

- Receiving filters, canisters and cartridges from the field
- Checking sampling media integrity
- Logging samples into Laboratory Data System – LIMS/LASAR
- Routing samples to the appropriate analytical section
- Stabilizing/weighing filters
- Storing filters, canisters and cartridges
- Associated QA/QC activities

The details for these activities are included in various sections of this QAPP, as well as the references.

**B.3.2. Sample Contamination Prevention**

There are rigid requirements for preventing sample contamination throughout the pre-sampling, sampling and analysis process.

**DNPH cartridges.** The cartridges are to be held in storage containers (static resistant zip lock bags) as provided by the sample media manufacturer. These containers are used during transport to the sample site and for return to laboratory after the sample has been collected. Powder free gloves are always worn when handling DNPH cartridges in the lab or the field. DNPH cartridges will not be taken out of their shipping packets until they are loaded into the sampler in the field. To load the cartridges into the Carbonyl sampler, the DNPH cartridges are removed from their package and immediately installed. Upon retrieval, the cartridges are replaced in the vendor provided retrieval pouch, sealed, and placed in a transport cooler with a temperature record logger. The exposed cartridge is kept at 1 - 5°C during transport to the lab. Upon return to the lab the samples will be logged in and immediately stored in a refrigerator in their sealed package.

**PM10 filters.** The particulate filters are equilibrated/conditioned and stored in the same room where they are weighed. Upon determination of its pre-sampling weight, the filter is loaded in a filter cassette and placed in a plastic bag. These containers are used during transport to sample site and for return to laboratory after the sample is collected.

**PM10 filters for shipping.** Additional requirements apply to particulate filters that are sent by commercial freight carriers to remote sites. These steps are required to eliminate filter damage caused during shipping. The filter is not loaded into the filter cassette. The filters are sent in clean glassine envelopes with a prefolded retrieval page. The remote site operator loads the filter into the cassette which is then placed onto the HV PM 10 samplers. After the sample event the cassette is retrieved. The site operator then uses the prefolded glassine page to carefully fold the sample filter, which is then placed into the shipping glassine envelope. The cassette and the exposed filter is then packed with the other air toxics samples and returned to lab.

**VOC sampling canisters** are evacuated to -29 to -30”Hg. The field technician verifies this negative pressure before deployment. At the site the canister is connected to the sample apparatus and the negative pressure is re-verified. At sample retrieval the technician records the final positive vacuum (sample is sub-atmospheric) in the canister, closes the canister valve, installs canister cap and returns sample to laboratory. Technicians are aware that minimizing skin contact with the inlet is the best way to avoid contamination.

**SVOC sample.** The polyurethane foam/ XAD® (PUF/XAD®) cylinder is loaded into the sample canister and sealed with aluminum foil by the Organic laboratory. Laboratory personnel will wear powder free gloves when handling the canister. The canister is refrigerated until use in the field. The canisters are installed in the PS-1 samplers at sample setup. The start flow is taken but the time of taking start flow is kept to a minimum (a minute or two to stabilize flow). Once the start flow has been recorded the sampler is turned off and the sampler’s rain guard shield is closed and
secured. The retrieval of the canister is similar to the setup, the event average barometric pressure and average temperature are recorded by the sampler’s flow control system, or from an FRM PM 2.5 sampler or other nearby source.

**Hexavalent Chromium.** The prepared filter, in its PFA holder, is frozen prior to field deployment in a cleaned transport plastic container. The field operator opens the plastic container wearing powder free vinyl gloves. The vinyl gloves are always worn when handling PFA filter holders in the lab or the field. A cleaned glass funnel is attached to the air inlet of the PFA filter holder. The assembly is attached to the sampler and programmed for the sample event. The retrieval of the PFA filter holder is similar to the setup. The event average barometric pressure and average temperature are recorded from the sampler. The PFA filter holder is returned to the plastic transport container and returned to the lab. Upon arrival, the transport container with exposed filter is stored in a freezer. The appropriated paper documentation and Chain of custody is filled out and then stored in the same freezer with the sample. When batch size is attained the batch of filters and paper documents are packed into a heavy duty cooler with pre-frozen blue ice bricks. The cooler is then transported to Chester Lab Net were the sampled filters are relinquish to the analyst.

Passive deposition (contamination of sample due to deposition before or after the sample period) will be minimized by the operator installing and retrieving the samples as close to the sample event as possible.

### B.3.3. Temperature Preservation Requirements

The temperature requirements of the laboratory and field situations are detailed in the IO and TO methods.

In the HV PM 10 weighing room, particulate filters must be conditioned for a minimum of 24 hours prior to pre-sample weighing, although a longer period of conditioning may be required. The weighing room temperature must be maintained between 20° and 30° C, with no more than a +/- 5° C change over the 24 period prior to weighing the filters. The weighing room relative humidity must be maintained between 30% and 35%, with no more than a +/- 2.5% change over the 24 period prior to weighing the filters.

During transport from the laboratory to the sample location, while stored at the sample location, and during the trip back to the Lab, there are no specific requirements for temperature control of the VOC and PM-10 sampling media. There are specific requirements for the PUF/XAD, DNPH, and Hexavalent Chromium cartridges. See Table B.3-1.

#### Table B.3-1 Media Transport and Storage Temperature Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Transport to site</th>
<th>Storage at site</th>
<th>Time to retrieve exposed sample</th>
<th>Transport to Lab</th>
<th>Storage at Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM 10 filter</td>
<td>None</td>
<td>None</td>
<td>48 hrs or ASAP</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>VOC canister</td>
<td>None</td>
<td>None</td>
<td>48 hrs or ASAP</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>PUF/XAD® cartridge and filter</td>
<td>&lt;4° C</td>
<td>&lt;4° C</td>
<td>48 hrs or ASAP</td>
<td>&lt;4° C</td>
<td>&lt;4° C</td>
</tr>
<tr>
<td>DNPH Cartridge</td>
<td>&lt;4° C</td>
<td>&lt;4° C</td>
<td>48 hrs or ASAP</td>
<td>&lt;4° C</td>
<td>&lt;4° C</td>
</tr>
<tr>
<td>Hexavalent Chromium</td>
<td>&lt;0° C</td>
<td>&lt;0° C</td>
<td>48 hrs or ASAP</td>
<td>&lt;0° C</td>
<td>&lt;0° C</td>
</tr>
</tbody>
</table>

Coolers with frozen blue ice bricks will be used to transport the PUF/XAD and DNPH modules and cartridges to and from the sample site maintaining the media in the 1 - 5° C range. Hexavalent Chromium filters and sample holders begin the shipment frozen and should not exceed the 1 - 5° C range during transport. A recording temperature logging device will accompany the samples when they are shipped from remote site using a commercial carrier. PUF/XAD and DNPH cartridges will
be stored in the site refrigerator both before and after sampling. Hexavalent Chromium cartridges will be stored in a freezer. Sampling media will be kept in their protective containers and in the transport coolers. Excessive heat must be avoided (e.g., do not leave in direct sunlight or in a closed-up car during summer).

Samples exceeding the required temperatures during shipping and storage will be analyzed as usual, but the results will be flagged to indicate that the sample temperature exceeded QA requirements. The reason for the warming of the media during shipping will be investigated and any findings documented by AQM and QA staff. Corrective active will be taken to ensure that samples are transported within temperature limits.

B.3.4. Holding Times

Permissible holding times for the various samples are provided in Table B.3-2.

<table>
<thead>
<tr>
<th>Item</th>
<th>Holding Time</th>
<th>From:</th>
<th>To:</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM 10 filter</td>
<td>No limits</td>
<td>Completion of sample period</td>
<td>Time of analysis</td>
<td>IO-3.5</td>
</tr>
<tr>
<td>VOC canister</td>
<td>&lt;30 days</td>
<td>Completion of sample period</td>
<td>Time of analysis</td>
<td>TO-15 Compendium Section 9.4.2.1</td>
</tr>
<tr>
<td>PUF/ XAD® cartridge and filter</td>
<td>&lt;14 Days</td>
<td>Completion of sample period</td>
<td>Time of extraction</td>
<td>Method ASTM D6209-98</td>
</tr>
<tr>
<td></td>
<td>&lt;40 Days</td>
<td>Time of extraction</td>
<td>Time of analysis</td>
<td>EPA NATTS TAD</td>
</tr>
<tr>
<td>DNPB Cartridge Filter</td>
<td>&lt;14 days</td>
<td>Completion of sample period</td>
<td>Time of extraction</td>
<td>TO-11 Compendium Section 11.1.1</td>
</tr>
<tr>
<td></td>
<td>&lt;30 days</td>
<td>Time of extraction</td>
<td>Time of analysis</td>
<td></td>
</tr>
<tr>
<td>Hexavalent Chromium</td>
<td>&lt;30 days</td>
<td>Completion of sample period</td>
<td>Time of extraction</td>
<td>Method CARB-039 EPA NATTS TAD</td>
</tr>
<tr>
<td></td>
<td>&lt;24 hours</td>
<td>Time of extraction</td>
<td>Time of analysis</td>
<td></td>
</tr>
</tbody>
</table>

B.3.5. Sample Custody

Proper sample custody minimizes accidents by assigning responsibility for all stages of sample handling and ensures that problems will be detected and documented if they occur. A sample is in custody if it is in actual physical possession or it is in a secured area that is restricted to authorized personnel. Appropriate documentation will occur at all stages of sampling media handling throughout the data collection operation.

B.3.5.1. Pre-Sampling

The Department’s pre-sampling SOP define how the samples will be enumerated, conditioned, weighed, placed into the protective shipping container, sealed, and stored or refrigerated.
B.3.5.2. Post Sampling

The field sampling SOP specifies the techniques for properly collecting and handling the sample media, and specifies the documentation and chain of custody record for each sample collected.

B.3.5.3. Sample Receipt

The samples will be received at the Department Laboratory and logged into the LIMS according to SOP. The samples are received and securely placed into the custody of the analytic lab by recording on the chain of custody form a sample tracking time & date stamp.

B.3.6. Quality Assurance Sampling

40 CFR Part 58, Appendix A, requires at least 25% (minimum of one) of the samplers be collocated with a primary sampler for each parameter sampled in the state wide sampling network. The collocated sampler is sometimes referred to as a duplicate sampler. Although the requirements in the CFR do not directly relate to air toxics monitoring the EPA NATTS TAD uses them as guidelines. More specifically, the Department's QA guidelines suggest that ten per cent of the samples collected have a collocated duplicate. ODEQ will be collecting collocated duplicate samples for each sample method at the designated collocation site on a schedule that meets the 10% to 25% range criteria. The designated collocation site is the Portland North Roselawn station. ODEQ will be collecting 2 collocated duplicate samples per month for PM-10, VOC, SVOC, Carbonyls, and Hexavalent Chromium on the national 1/6 schedule at the PNR site for a total of 24. The current network consists of air toxics 3 sites. Every 6th day sampling results in 60 samples per site per year. From three sites the total is 180 per year. 24 duplicates per every 180 samples results in a 13% collection rate. This frequency of duplicate collection will be reviewed for adequacy annually, as data from the network becomes available. See B.3-3 for details on the location of QA samplers.

### Table B.3-3 Co-located Samplers

<table>
<thead>
<tr>
<th>Site</th>
<th>Metals</th>
<th>PM 10</th>
<th>VOC</th>
<th>SVOC</th>
<th>Carbonyl</th>
<th>Cr6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portland North Roselawn</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

B.3.6.1. Collocation Duplicate Evaluation

The following general procedures will be used:

**Relative Percent Difference (RPD) for a Single Check ($d_i$)** - The RPD, $d_i$, for each check is calculated using the following equation, where $X_i$ represents the original concentration and $Y_i$ represents the concentration reported for the duplicate concentration. The $i$ represents the individual chemical species for each sample method.

$$d_i = \left( \frac{|X_i - Y_i|}{(X_i + Y_i)/2} \right) \times 100$$

**Coefficient of Variation (CV)** – also referred to as Relative Standard deviation (RSD). The standard deviation (SD) of the $d_i$ values over a period of time divided by the mean ($\bar{x}$) of the $d_i$ values. CV is calculated using duplicate concentrations from separate sample events using the following equation, where SD represents the standard deviation of population of individual differences ($d_i$) calculated from equation 1), and $\bar{x}$ represents the average of the population. The CV is calculated for each individual chemical species for each sample method.

$$CV = \frac{SD}{\bar{x}}$$

**Corrective action** - The percent difference calculation is used for control charting purposes, data grading, and to trigger correction action.
B.4. Analytical Methods

At the heart of the data gathering process are the sampling and analytical systems used to provide the ambient air measurements of pollutant concentrations. No federal reference or equivalent methods have been specified for these pollutants so each laboratory is free to use methods that they consider the best possible, given their resources and abilities. The ODEQ Laboratory has chosen methods from EPA's Compendium of Methods and Technical Assistance Documents for both Organic and for Inorganic analyses. The exceptions are the ASTM and CARB methods for SVOC and hexavalent chromium. These analytical procedures should provide results consistent with our data quality objectives, since these same methods are also being used by other air quality agencies around the country.

Five separate sampling and analysis protocols will be used in order to measure gaseous volatile, semi-volatile, carbonyl compounds, particulate metals, and hexavalent chromium. The collected samples will be logged in at the ODEQ Laboratory then distributed to the inorganic, the organic laboratory sections or, in the case for the hexavalent chromium, Chester Lab Net for analysis.

B.4.1. Particulate Metals

Particulate filters are weighed prior to any analysis for elemental content. Subsequently, sample preparation and analysis procedures follow EPA Compendium Method IO-3.5, and details can be found in the references. The ODEQ laboratory uses an alternative metals analysis procedure using inductively coupled plasma analysis with mass spectrometry detection and identification. This procedure requires extraction of approximately 15% of the sample load area from the filter and is thus destructive; however, it offers the advantage of measuring additional metals of interest and of providing lower detection limits. Additional extractions from some of the filters are done for replicate and other analysis. The remainder of the sample is archived for additional analysis. The details for this method variation are also contained in the reference.

B.4.2. Volatile Organic Compounds

Sample preparation and analysis procedures are from the EPA Compendium Method TO-15. Details of these procedures can be found in the references. A specific volume of sample is drawn from the canister into a cryogenic trap and cooled with liquid argon. The concentrated sample extracts are then analyzed using gas chromatography with mass spectrometry detection and identification. Surrogate compounds, used as internal standards, are spiked into all samples during this process.

Method calibration and quality control procedures, as well as acceptance criteria are all described in the reference.

B.4.3. Carbonyl Compounds

EPA Compendium Method TO-11 is followed for sample preparation and analysis. Details of these procedures can be found in the references. Components on the DNPH cartridge are extracted, and then injected into a high pressure liquid chromatography system. Surrogate compounds, used as internal standards, are spiked into all samples during this process. Method calibration and quality control procedures, as well as acceptance criteria are all described in the reference.

B.4.4. Semi-Volatile Organic Compounds

Sample preparation and analysis procedures from the Method ASTM D6209-98 are followed. Details of these procedures can be found in the references. The entire contents of the sample module, consisting of the polyurethane foam plugs, XAD® and the filter, are extracted, then concentrated. Surrogate compounds, used as internal standards, are spiked into all samples during this process. Sample extracts are analyzed using gas chromatography with mass spectrometry.
detection and identification. Method calibration and quality control procedures, as well as acceptance criteria are all described in the reference.

B.4.5. Hexavalent Chromium

Sample preparation and analysis procedures from the Method CARB-039 are followed. Details of these procedures can be found in the references. The filter preparation and analysis is done by Chester LabNet. The entire filter is processed. Sample extracts are analyzed using ion chromatography. Method calibration and quality control procedures, as well as acceptance criteria are all described in the reference.

B.5. Quality Control

Quality Control (QC) is the overall system of activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the project plan. QC is both pro-active and corrective in preventing the generation of unacceptable data.

To assure the quality of data from air monitoring measurements, two distinct and important inter-related functions must be performed. One is the control of the measurement process through broad quality assurance activities, such as establishing policies and procedures, developing data quality objectives, assigning roles and responsibilities, conducting oversight and reviews, and implementing corrective actions. The other is the control of the measurement process through the implementation of specific quality control procedures, such as audits, calibrations, checks, replicates, routine self-assessments, etc. In general, the greater the control of a given monitoring system, the better will be the resulting quality of the monitoring data. Figure B.5-1 QA Activities shows a number of QA activities that help to evaluate and control data quality for the program.

Figure B.5-1 QA Activities
B.5.1. QC Records

Quality Control records (with archival backups) will be maintained which will contain all QC data, include the calibrations, maintenance information, routine internal QC checks of reference standards, laboratory and field sample media blanks, and external QA audits. This data will be regularly reviewed and used to identify long-term trends. QC charts are maintained on each analytical instrument and included in their maintenance notebooks. These charts may allow the discovery of excess drift that could signal an instrument malfunction. QC charting shall be implemented within LIMS as the system is developed.

At the beginning of each analysis day, after zeroing and calibrating the instruments and measuring the working standard, the laboratory filter blanks for the current sample batches are analyzed. The zero, working standard and blank measurements are recorded on the laboratory data form and in the laboratory QC notebook or database.

Corrective action measures will be taken as appropriate to ensure good quality data. These are also recorded.

B.5.2. Calibrations

Calibration is the comparison of a measurement standard or instrument with another standard or instrument to determine and correct any variation (deviation) in the accuracy of the item being compared and thus minimize bias.

In general these calibration activities follow a two step process:

- Certifying the calibration standard and/or transfer standard against an authoritative standard, and
- Comparing the calibration standard and or transfer standard against the routine sampling/analytical instruments.

Calibration requirements for the field and laboratory equipment are found in the respective SOP for each analysis and field sample method.

B.5.3. Blanks

Concentrations of air toxics in the ambient air can be extremely low and contamination introduced by the measurement process itself can be significant. Blank samples are used to determine the extent and source of this potential contamination. Many and various types of blanks can be employed to resolve certain issues in the entire sample and analytical methods. There are three types of blanks that will be routinely employed in the air toxics program:

- **Reagent blanks** - provide an estimate of contamination resulting from preparation of the sampling medium. Each group of sampling media must be tested prior to use to determine the extent of contamination. Each group is referenced as a ‘Lot’ with unique identification for traceability.
- **Method blanks** - provide an estimate of contamination occurring at the laboratory facility and the analytic equipment or process. Details of the use of method blanks can be found in the analytical method SOP.
- **Field blanks** - provide an estimate of total measurement system contamination. By comparing information from Reagent or Method blanks against the field blanks, one can assess contamination from field activities. Details of the use of the field blanks can be found in field SOP.

The evaluation of blanks for each parameter is performed according to each method SOP. In general the sample media is considered clean when there is no detection of species at or below the limit of quantification (LOD). When contaminations are detected appropriate measures will be taken to identify the source and an evaluation of the data affected will be made by the QA officer in consultation with all participants of the sample chain.
B.5.4. Quality Control Measures

Day-to-day quality control is implemented through the use of various checks on the samples or instruments that are used for comparison. Table B.5-1 contains a complete listing of QC measures for this program. Detailed method-specific procedures are included in the field and analytical methods sections of this QAPP.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Reporting Units for 24 hr event</th>
<th>Precision (CV)</th>
<th>Accuracy (Bias)*</th>
<th>Representing</th>
<th>Comparability (Method Selection)</th>
<th>Complete-ness**</th>
<th>Minimum Detection Limits***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metals HV PM 10 Particulate</td>
<td>ng/m³ (LTP)</td>
<td>15%</td>
<td>+/- 25%</td>
<td>Neighborhood</td>
<td>Inductively Coupled Plasma Spectrometry - Mass Spectrometry</td>
<td>&gt;85%</td>
<td>0.01 ng/m³ (LTP)</td>
</tr>
<tr>
<td>Carbonyls</td>
<td>μg/m³ (LTP)</td>
<td>15%</td>
<td>+/- 25%</td>
<td>Neighborhood</td>
<td>Liquid Chromatography</td>
<td>&gt;85%</td>
<td>0.05 μg/m³ (LTP)</td>
</tr>
<tr>
<td>Volatile Organic Compounds</td>
<td>ppbV</td>
<td>15%</td>
<td>+/- 25%</td>
<td>Neighborhood</td>
<td>Gas Chromatography - Mass Spectrometry</td>
<td>&gt;85%</td>
<td>0.1 ppbV</td>
</tr>
<tr>
<td>Semi-Volatile Organic Compounds</td>
<td>ng/m³ (LTP)</td>
<td>15%</td>
<td>+/- 25%</td>
<td>Neighborhood</td>
<td>Gas Chromatography - Mass Spectrometry</td>
<td>&gt;85%</td>
<td>0.50 ng/m³ (LTP)</td>
</tr>
<tr>
<td>Hexavalent Chromium</td>
<td>ng/m³ (LTP)</td>
<td>15%</td>
<td>+/- 25%</td>
<td>Neighborhood</td>
<td>Liquid Chromatography</td>
<td>&gt;85%</td>
<td>0.10 ng/m³ (LTP)</td>
</tr>
</tbody>
</table>

*Bias is based on proficiency test scores.

**Valid samples collected compared to samples planned.

***The detection limits are ranges and different chemical species have differing limits of detection. The minimum values have been stated here in this table.

B.5.4.1. Precision

Precision measurements will be obtained using co-located monitoring and laboratory replicate analysis.

Co-located Monitoring. Duplicate samples for each type of measurement will be collected on the schedule and locations as stated in section B3 of this QAPP. These samples will be designated as either from the primary or the duplicate sampler. Analysis and comparison of these two samples will provide a measure of sampling precision.

Replicate Analyses. Equally paired aliquots from a sample will be analyzed on ten percent (10%) of the samples, for each analytical method. Analysis and comparison of these aliquots will provide a measure of analytical method precision. Aliquots are considered to be identical but not interchangeable and will be given unique identifiers for records and clerical reasons.

The following algorithms will be used to evaluate co-located and laboratory replicate data.

- **Relative Percent Difference (RPD).** The relative percentage difference, \( RPD_i \), for each analyzed chemical species \( i \), is calculated by using the following equation, where \( X_i \) represents the concentration produced from the primary sample, or principle aliquot, and \( Y_i \) represents the concentration reported for the duplicate sample, or sequential aliquot.
\[
RPD_i = \left[ \frac{|X_i - Y_i|}{(X_i + Y_i)/2} \right] \times 100
\]

- **Precision of a Single Sampler or Analysis - Quarterly Basis.** For particulate sampler \(i\), the individual 95% confidence limit, produced during the calendar year are pooled using the following equations: where \(i\) = the number of checks made during the calendar quarter and \(Si\) is the standard error calculated for each quarterly set. Precision data is generated for each individual compound.

  - Upper 95% Percent Limit
  
  \[\text{Limit} = d_i + 1.96 \times S_i / 2\]

  - Lower 95% Percent Limit
  
  \[\text{Limit} = d_i - 1.96 \times S_i / 2\]

  (See appendix for example calculations and additional equations used)

**Quarterly Corrective Action.** Corrective action will be initiated if a calendar quarter of data fails to meet the 10% (±5%) confidence limits. When the Confidence Limit is greater than 10% the routine data for that monitor will be flagged. The QA Office, the Lab and the Air Monitoring Managers will work together to identify the problem and a solution. The problem and solution will be reported and appropriately filed under response and corrective action. This information will also be included in the final project report.

**B.5.4.2. Accuracy**

Two accuracy checks are used in the air toxics monitoring program.

- **Flow Rate Audits (Field).** The flow rate audit is accomplished by measuring the sampler’s normal operating flow rate using a certified flow rate transfer standard. Details are provided in the method SOP. Calculation of measurement uncertainty is described by:

  \[
  Fd_i = 100 \left( \frac{FY_i - FX_i}{FX_i} \right)
  \]

- **Instrument Checks (Lab).** An example of an instrument check would be the checks of the working standards used for the micro-balances. ODEQ uses ASTM class 1 weights for its primary and secondary (working) balance standards and NIST supplied standards for both metals and gases.

  **Instrument Accuracy - Single Check (d\(j\)).** The difference, \(d_j\), for each instrument \(j\) is calculated, where \(X\) represents the certified value (known) and \(Y\) represents the reported value.

  \[
  d_j = Y - X
  \]

**B.5.4.3. Completeness**

Completeness is a quality assurance measure that is determined at the end of the project. Percent completeness is calculated as the ratio of the number of valid samples obtained to the number of scheduled samples. This value is provided in the final project report.

**B.5.4.4. Representativeness**

This is a measure of how well the reported results reflect the actual ambient air concentrations and is primarily determined by the project design and the siting of the measurement stations. This will be provided in the final project report.
It is the intent of this plan to collect homogeneous samples. If collocated precision data does not support this hypothesis, corrective action shall be taken, which may include further sampling.

B.5.4.5. Comparability

Comparability is a measure of the similarity of this data to ambient air toxics data collected in other geographic areas. It is primarily ascertained through the use of standard methods of sampling and analysis. However, since standard methods of air toxics measurement have not been specified, ODEQ will employ methods commonly used by other agencies as well as manufacture some of the equipment in house. In all cases sampling will be performed in such a way as to conform to the EPA NATTS TAD.

Laboratory audits will be performed, usually under EPA auspices, as an independent check of the laboratory’s entire analytical system. Typically, an unknown audit sample, generated by an outside laboratory, will be shipped directly to the laboratory. The Sample Tracker will log the sample into the laboratory system as it would a normal sample and the lab technician will handle the audit sample in the same manner as all other samples. Once the analysis is performed, the lab section manager will review the results and send them to the initiating laboratory. The equation used to define percentage difference \( d_i \) for each individual compound audit, \( i \), is calculated as:

\[
d_i = 100 \left( \frac{Y_i - X_i}{X_i} \right)
\]

Such that \( X_i \) represents the audit standard concentration from a certified laboratory (known) and \( Y_i \) represents the indicated value obtained from the ODEQ laboratory.

Comparability will also be determined by comparing measured concentrations to modeled concentrations provided by EPA’s National Scale Air Toxics Assessment (NATA) or to ODEQ modeling data if available. Results of any laboratory audits or monitor-to-model comparisons will be provided in the final project report.

B.5.4.6. Minimum Detection Limit (MDL)

The MDL are determined individually for each pollutant analyzed by each method employed. Details are provided in each of the test method SOPs.


The purpose of this element of the QAPP is to describe the procedures used to verify that all instruments and equipment are maintained in sound operating condition and are capable of operating at acceptable performance levels. Good maintenance procedures not only are essential for obtaining reliable data but are also important for minimizing instrument downtime.

B.6.1. Testing and Inspection

All samplers used in the project will meet the instrument requirements described in the Compendium of EPA Methods or ASTM methods. Therefore, they are assumed to be of sufficient quality for the data collection operation. Field operators will perform operational checks to verify continuing performance within specifications. If any of these checks are out of specification, the field technicians will attempt to correct them or if necessary request assistance from the air monitoring calibration and repair section.

Equipment used in the laboratory for analysis will likewise meet method performance requirements specified in their respective test method SOPs. Laboratory analysts will perform periodic checks to verify continuing performance and will attempt to correct any instruments operating outside specifications.
B.6.2. Maintenance

There are many items that need maintenance attention in the network. This section describes the field and laboratory procedures that will be used.

B.6.2.1. Field Equipment Maintenance

Preventive maintenance checks of the samplers and their frequency are detailed in Table B.6-1.

### Table B.6-1 Preventive Maintenance on Field Instruments

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Item</th>
<th>Maintenance Frequency</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM-10 sampler</td>
<td>Motor/brush replacement</td>
<td>6 Months</td>
<td>Lab Technician</td>
</tr>
<tr>
<td></td>
<td>Clean inside of sampler</td>
<td>Monthly</td>
<td>Field Technician</td>
</tr>
<tr>
<td>PUF/XAD® sampler</td>
<td>Clean inside of sampler</td>
<td>Monthly</td>
<td>Field Technician</td>
</tr>
<tr>
<td></td>
<td>Brushless motor replacement</td>
<td>2 Years</td>
<td>Lab Technician</td>
</tr>
<tr>
<td></td>
<td>Brush motor replacement or repair</td>
<td>3 Months</td>
<td>Lab Technician</td>
</tr>
<tr>
<td>VOC sampler</td>
<td>Replace sample lines</td>
<td>Annually</td>
<td>Field Technician</td>
</tr>
<tr>
<td></td>
<td>Clean flow controller</td>
<td>6 Months</td>
<td>Field Technician</td>
</tr>
<tr>
<td></td>
<td>Clean sample lines</td>
<td>3 Months</td>
<td>Field Technician</td>
</tr>
<tr>
<td>Carbonyl sampler</td>
<td>Pump replacement</td>
<td>Annually</td>
<td>Lab Technician</td>
</tr>
<tr>
<td></td>
<td>Clean cartridge connectors</td>
<td>3 Months</td>
<td>Field Technician</td>
</tr>
<tr>
<td></td>
<td>Clean flow Controller</td>
<td>6 Months</td>
<td>Lab Technician</td>
</tr>
<tr>
<td></td>
<td>Clean whole sampler</td>
<td>3 Months</td>
<td>Field Technician</td>
</tr>
<tr>
<td>Glass air intake manifold</td>
<td>Clean Manifold</td>
<td>3 Months</td>
<td>Field Technician</td>
</tr>
<tr>
<td></td>
<td>Replace C-Flex® connector tubing</td>
<td>3 Months</td>
<td>Lab Technician</td>
</tr>
<tr>
<td></td>
<td>Vacuum leak Check</td>
<td>3 Months</td>
<td>Lab Technician</td>
</tr>
<tr>
<td></td>
<td>Replace Viton® seals</td>
<td>Annually</td>
<td>Lab Technician</td>
</tr>
<tr>
<td>Cr6+</td>
<td>Clean PVC probe support</td>
<td>Monthly</td>
<td>Field Technician</td>
</tr>
<tr>
<td></td>
<td>Clean whole sampler</td>
<td>Monthly</td>
<td>Field Technician</td>
</tr>
</tbody>
</table>
B.6.2.2. Laboratory Equipment Maintenance

The following tables detail the maintenance items for a variety of laboratory equipment, how frequently they will be performed, and who will be responsible for performing the maintenance.

Table B.6-2 Preventive Maintenance in Balance Room

<table>
<thead>
<tr>
<th>Item</th>
<th>Maintenance Frequency</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-point micro-balance maintenance calibration</td>
<td>Annually</td>
<td>Balance analyst</td>
</tr>
<tr>
<td>Comparison of NIST Standards to laboratory working and primary standards</td>
<td>Annually</td>
<td>Balance analyst</td>
</tr>
<tr>
<td>Cleaning weigh room</td>
<td>Monthly</td>
<td>Balance analyst</td>
</tr>
<tr>
<td>MERV 13 filter replacement</td>
<td>Annually</td>
<td>Balance analyst</td>
</tr>
<tr>
<td>HVAC system preventive maintenance</td>
<td>Yearly</td>
<td>DAS / Balance Analyst</td>
</tr>
<tr>
<td>Computer back-up</td>
<td>Weekly</td>
<td>IT support</td>
</tr>
<tr>
<td>Computer virus check</td>
<td>Weekly</td>
<td>IT support</td>
</tr>
<tr>
<td>Computer system preventive maintenance (clean out old files, compress hard drive, inspect)</td>
<td>Yearly</td>
<td>IT support</td>
</tr>
</tbody>
</table>

Table B.6-3 Preventive Maintenance in Organic Laboratory

<table>
<thead>
<tr>
<th>Item</th>
<th>Maintenance Frequency</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-point maintenance calibration</td>
<td>6 Months</td>
<td>Lab analyst</td>
</tr>
<tr>
<td>Comparison of NIST Standards to laboratory working and primary standards</td>
<td>Monthly</td>
<td>Lab analyst</td>
</tr>
<tr>
<td>Replace chromatography column</td>
<td>As necessary</td>
<td>Lab analyst</td>
</tr>
<tr>
<td>Test lines for pressure integrity</td>
<td>Annually</td>
<td>Lab analyst</td>
</tr>
<tr>
<td>Replace detector</td>
<td>3 years</td>
<td>Lab analyst</td>
</tr>
<tr>
<td>Computer back-up</td>
<td>Weekly</td>
<td>Lab analyst</td>
</tr>
<tr>
<td>Computer virus check</td>
<td>Weekly</td>
<td>Lab analyst</td>
</tr>
<tr>
<td>Computer system preventive maintenance (clean out old files, compress hard-drive, inspect)</td>
<td>Yearly</td>
<td>PC support personnel</td>
</tr>
</tbody>
</table>
Table B.6-4 Preventive Maintenance in Inorganic Laboratory

<table>
<thead>
<tr>
<th>Item</th>
<th>Maintenance Frequency</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-point maintenance calibration</td>
<td>Annually</td>
<td>Lab analyst</td>
</tr>
<tr>
<td>Comparison of NIST Standards to laboratory working and primary standards</td>
<td>Annually</td>
<td>Lab analyst</td>
</tr>
<tr>
<td>Equipment maintenance</td>
<td>Yearly</td>
<td>Lab analyst</td>
</tr>
<tr>
<td>Computer back-up</td>
<td>Weekly</td>
<td>IT support</td>
</tr>
<tr>
<td>Computer virus check</td>
<td>Weekly</td>
<td>IT support</td>
</tr>
<tr>
<td>Computer system preventive maintenance (clean out old files, compress hard-drive, inspect)</td>
<td>Yearly</td>
<td>IT support</td>
</tr>
</tbody>
</table>

B.7. Instrument/Equipment Calibration and Frequency

This section describes the calibration procedures and standards used for both the sampling and analytical phases of this project.

B.7.1. Temperature Calibration


A calibration relationship to the temperature standard (an equation or a curve) will be established for each thermometer and thermistor that is accurate to within 2% over the expected range of ambient temperatures at which it is to be used. All temperature measuring devices must be re-verified and/or recertified at least annually. The actual frequency of re-certification depends on the type of temperature standard; some are more stable than others.

The ODEQ Lab uses NIST-traceable mercury in glass thermometer for laboratory calibration of thermometers and for certification of field thermistors. The field temperature standards are thermistor probes with a range sufficient for summertime and wintertime temperatures. Each probe comes with a certificate of NIST-traceability with the same kind of information as the thermometer certificate.

B.7.2. Flow Calibration


Calibration and subsequent calibration verifications will be performed with devices that are traceable to NIST standards. Each sampling device is subjected to a multipoint flow calibration or verification on a twice yearly basis. Documents of calibration or verification are maintained by the air monitoring metrologist.

Upon initial receipt of any new, repaired, or replaced air toxics sampler, a technician will perform flow rate verification (as per calibration laboratory SOP) on the sampler to determine if performance is acceptable.

The Carbonyl sampler flow rate will be measured by rotometers that have been certified on the
laboratory’s NIST traceable Bios Dry Cal® DC-2.

The PM-10 Hi volume sampler will be calibrated by the laboratory rootsmeter which has been certified on the laboratory’s NIST traceable spirometer. Subsequent field calibration verifications will be performed with a differential flow transfer standard which has been calibrated on the rootsmeter which is certified on the laboratory’s NIST traceable spirometer.

The SVOC PUF sampler flow is calibrated at the lab on the laboratory rootsmeter which is certified on the laboratory’s NIST traceable spirometer. Annual calibration recertification may be performed in the field with a flow transfer standard that has been calibrated on the laboratory rootsmeter which has been certified on the NIST traceable spirometer.

B.7.3. Analytical Equipment

The EPA Quality Assurance Handbook, Volume II (EPA, 2008) and the Technical Assistance Document (TAD) for The National Air Toxics Trends Stations Program (EPA, 2009) provides detailed information on laboratory equipment calibration and methods. In general:

- For balances, a 5g NIST-traceable weight is used to verify that the balance is weighing within the tolerance limits. This is done before and after each batch of filter weightings. Any difference in weight is noted. Corrective action is taken as required by the balance SOP. Balances receive a multipoint calibration against NIST traceable weight annually along with preventative maintenance.
- For the Gas Chromatography, the NIST Traceable cylinder is attached to a mass flow control calibration unit. Reference components are measured before and after each set of samples. Recoveries and retention times are noted.
- For the Liquid Chromatography, the procedure is the same, with the exception of the compounds injected. Response peaks are observed and recorded. This procedure is repeated at the end of the analysis batch run.
- Three standard solutions of metals are injected into the ICP and the responses noted.

Instruments are calibrated using NIST traceable standards (if available) once a year. The ODEQ laboratory also maintains a set of standards for each of the laboratory systems. Calibrations are performed using these standards as listed in table B7-1.

Table B.7-1 Analytical Equipment Calibration Requirements

<table>
<thead>
<tr>
<th>Analytical Parameter</th>
<th>Instrument</th>
<th>Type of Standard</th>
<th>Frequency</th>
<th>Acceptance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate Mass</td>
<td>Electronic balance</td>
<td>NIST traceable weights</td>
<td>Before and after each batch run.</td>
<td>Within 0.6 mg</td>
</tr>
<tr>
<td>Particulate Metals</td>
<td>Inductively coupled plasma - mass spectrometer</td>
<td>High purity reagents - High purity grade standards</td>
<td>Before and after each batch run</td>
<td>Linear correlation coefficient &gt; 0.995</td>
</tr>
<tr>
<td>Carbonyl Compounds</td>
<td>Liquid chromatography</td>
<td>High purity 2,4 dinitrophenyl hydrazine crystals dissolved in acetonitrile</td>
<td>Before and after each batch run</td>
<td>Linear correlation coefficient &gt; 0.99</td>
</tr>
<tr>
<td>Semi-Volatile Organic Compounds</td>
<td>Gas chromatography</td>
<td>High purity benzo [a] pyrene standard solutions</td>
<td>Before and after each batch run</td>
<td>Linear correlation coefficient &gt; 0.99</td>
</tr>
</tbody>
</table>
### B.8. Inspection and Acceptance of Supplies and Consumables

The ODEQ laboratory shall use established purchasing procedures. Field personnel who are delegated the responsibility of ordering supplies shall inspect the order upon receipt ensuring that traceability requirements are met. Lab Managers shall ensure that personnel in their sections are trained in this procedure.

### B.9. Non-direct Measurements

Historical continuous data, particulate data, and previous HAPs data was used in selecting the sites used for this project. Data was validated in a similar fashion as required by this project. Validation procedures have changed over time with the use of computer equipment; however the data flagging criteria has remained the same.

### B.10. Data Management

The Department will follow standard procedures for the timely preparation, review, approval, issuance, use, control, revision and maintenance of documents and records.

#### B.10.1. Document Control

Table B.10-1 shows the categories and types of records and documents to which document control applies for air toxics information.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Record/Document Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management and Organization</td>
<td>State Implementation Plan</td>
</tr>
<tr>
<td></td>
<td>Reporting agency information</td>
</tr>
<tr>
<td></td>
<td>Organizational structure</td>
</tr>
<tr>
<td></td>
<td>Personnel qualifications and training</td>
</tr>
<tr>
<td></td>
<td>Training certification</td>
</tr>
<tr>
<td></td>
<td>Quality Management Plan</td>
</tr>
<tr>
<td></td>
<td>Document Control Procedure</td>
</tr>
<tr>
<td></td>
<td>EPA Directives</td>
</tr>
<tr>
<td></td>
<td>Grant allocations</td>
</tr>
<tr>
<td></td>
<td>Support contracts</td>
</tr>
<tr>
<td>Site Information</td>
<td>Network description</td>
</tr>
<tr>
<td></td>
<td>Site characterization file</td>
</tr>
<tr>
<td></td>
<td>Site maps</td>
</tr>
<tr>
<td></td>
<td>Site pictures</td>
</tr>
</tbody>
</table>
### B.10.2. Data Management Operations

This section describes all the aspects of data management necessary for this air toxics monitoring project. This includes an overview of the mathematical operations and analyses performed on raw, “as-collected” data. These operations include data recording, validation, transformation, transmittal, reduction, analysis, management, storage and retrieval, and reporting.

Data processing activities for air toxics data are summarized in Figure B.10-1. Data processing steps are integrated, to the extent possible, into the existing data processing system used for criteria pollutant monitoring. The air monitoring databases resides on servers at both the Laboratory and the DEQ Headquarters. DEQ uses the Microsoft SQLServer database software.

Sample tracking and chain of custody information is entered into the Laboratory Information Management System (LIMS) at four points as shown in Figure B.10-1. Laboratory managers are able to obtain reports on status of samples, location of specific samples, etc. using LIMS. All users must be authorized by their manager and receive a password in order to log on to and use the LIMS. Different access privileges are given each authorized user depending on that person's need. The following privilege levels are defined:

- **Data Entry Privilege** - The individual may see and modify only data within LIMS that he or she has entered. After a data set has been “committed” to the system by the data entry operator, all further changes will generate entries in the system audit trail.
- **Reporting Privilege** - The individual may generate reports.
- Data Administration Privilege - Data Administrators for the LIMS are allowed to change data as a result of QA screening and related reasons. All operations resulting in changes to data values are logged to the audit trail.

The Data Administrators are responsible for performing the following tasks on a regular basis:

- generating summary data reports for management
- uploading verified and validated data to EPA AIRS database.
- merging and correcting any duplicate data entry files
- running verification and validation routines, and correcting data as necessary
Figure B.10-1 Data Management and Sample Flow Diagram
C. ASSESSMENT AND OVERSIGHT

C.1. Assessments and Response Actions

An assessment is defined as an evaluation process used to measure the performance or effectiveness of the monitoring network or quality system, and the various measurement phases of the data gathering operation.

The results of quality assurance assessments indicate whether the control efforts are adequate or need to be improved. Documentation of all quality assurance and quality control efforts implemented during the data collection, analysis, and reporting phases is important to data users who can then consider the impact of these control efforts on the data quality. Both qualitative and quantitative assessments of the effectiveness of these control efforts will identify those areas most likely to impact the data quality and to what extent.

In order to ensure the adequate performance of the quality system, the ODEQ in conjunction with the EPA Region X office and OAQPS, will perform the following assessments:

- Management Systems Reviews (MSR)
- Technical Systems Audits (TSA)
- Internal Audits
- Audits of Data Quality
- Network Reviews
- Data Quality Assessments

This project does not require any special audits to be performed by ODEQ; however the ODEQ laboratory shall honor EPA’s request to perform an audit, which could be directly related to this project.

ODEQ shall participate in Performance Testing Studies, conduct routine internal audits, and network reviews. The QAO shall prepare a corrective action plan for the deficiencies identified in each audit. The QAO shall report the status of the corrective action procedures to the laboratory administrator ensuring the completion of the plan.

C.1.1. Management Systems Reviews (MSR)

EPA conducts a Management Systems Review (MSR) and a Technical Systems Audits (TSA) every three years. This review is a qualitative assessment of a data collection operation or organization to establish whether the prevailing quality management structure, policies, practices, and procedures are adequate. The MSR will use appropriate regulations, and the QAPP to determine the adequate operation of the air program and its related quality system. It will cover both criteria pollutant and air toxics monitoring efforts.

C.1.1.1. NELAC internal audit

The QAO shall organize an assessment team, which will collect and evaluate information through data review and personnel interviews. The assessment team will make observations which are used to judge the laboratory’s conformance to the established National Environmental Laboratory Accreditation Program (NELAP) standards. The assessment report documents these observations. The QAO shall ensure corrective procedures are completed and documented.

The following areas shall be evaluated to determine the laboratory's compliance with the NELAP standards:

- Organization and management
- Quality System - establishment, assessments, essential quality controls, and data verification
- Personnel
- Physical facilities - accommodation and environment
• Equipment and reference materials
• Measurement traceability and calibration
• Test methods and standard operating procedures (SOPs)
• Sample handling, sample acceptance policy and sample receipt
• Records
• Laboratory report format and contents
• Subcontracting of analytical samples
• Outside support services and supplies
• Dealing with complaints

C.1.1.2. Audits of Data Quality

Each analyst is responsible for maintaining the quality of the data generated. Data is validated for precision and accuracy by the analyst, prior to reporting. The Data Quality Objectives and acceptance criteria for this project are outlined in Table B.5-1 above. ODEQ laboratory section managers shall review analytical QC through the data approval process used in LIMS.

C.1.1.3. Network Reviews

Conformance with the requirements of the monitoring network will be determined through an annual review. This network review will be used to determine how well the air monitoring network is achieving its required objectives, and how it should be modified to continue to meet those objectives. The QA and Air Monitoring sections will be responsible for conducting the network review, with the Air Monitoring Section responsible for corrective actions.

Prior to the network review, significant data and background information for the review will be compiled and evaluated. Such information may include the following:

• Network files (including updated site information and site photographs)
• AIRS reports
• Air quality data summaries
• Sampling Event Reports
• Emission information

C.1.1.3.1. Location of Monitors

Adequacy of the location of monitors can only be determined on the basis of stated objectives. Maps, graphical overlays, and GIS-based information will be helpful in visualizing or assessing the adequacy of monitor locations. Plots of potential emissions and/or historical monitoring data versus monitor locations may also be used.

During the network review, the stated objective for each monitoring location or site will be “reconfirmed” and the spatial scale “verified” and then compared to each location to determine whether these objectives can still be attained at the present location.

C.1.1.3.2. Probe Site Requirements.

The on-site visit will consist of the physical measurements and observations to determine that requirements are being met. Prior to the site visit, the reviewer will obtain and review the following:

• most recent hard copy of site description (including any photographs)
• data on the seasons with the greatest potential for high concentrations for specified pollutants
• predominant wind direction by season

A checklist similar to the checklist used by the EPA Regional offices during their scheduled network reviews will be used. This checklist can be found in the SLAMS/NAMS/PAMS Network Review Guidance which is intended to assist the reviewers. In addition to the items
on the checklist, the reviewer will also perform the following tasks:

- ensure that the inlet is cleaned and documented on a regular predetermined schedule
- record findings in field logbooks and/or checklist
- take photographs/videotape in the 8 directions and 1 of the whole site, a hand drawn sketch map which will include compass directions to orient the photographs may be helpful
- document site conditions with additional photographs/videotape and or drawings

C.1.1.3.3. Other Requirements

In addition to the items included in the checklists, other aspects of the network review and determination of overall adequacy of the monitoring program may include:

- installation dates of new monitors
- re-location of existing monitors and dates of the occurrence
- sighting criteria problems and suggested solutions
- problems with data submittals and data completeness
- maintenance and replacement of existing monitors and related equipment
- quality assurance problems
- air quality studies and special monitoring programs

A report of the network review will be written within 30 days of the review and appropriately filed. Corrective actions will be carried out by the Air Monitoring Section.

C.1.1.4. Data Quality Assessments (DQA)

A data quality assessment is the statistical analysis of environmental data to determine whether the quality of data is adequate to support the decisions which will be made by the Air Program. Data are appropriate if the level of uncertainty meets the Data Quality Objectives specified in this plan. This process is described in detail in Guidance for the Data Quality Assessment Process, EPA QA/G-9 and is summarized below.

- Review the DQO and sampling design of the project.
- Conduct a preliminary data review. Review Precision and Accuracy (P&A) and other available QA reports; calculate summary statistics, generate plots and graphs. Look for patterns, relationships, or anomalies.
- Select the best statistical test for analysis based on the preliminary review and identify underlying assumptions about the data for that test.
- Verify that the underlying assumptions made by the selected test hold true for the data and the consequences.
- Perform the statistical tests, document the results, and evaluate the performance of the project for future reference.
- The Data Quality assessment will be included in the final project report.
- Estimates of the data quality will be calculated on the basis of single monitors and aggregated to all monitors.

<table>
<thead>
<tr>
<th>Assessment Activity</th>
<th>Frequency</th>
<th>Personnel Responsible</th>
<th>Schedule</th>
<th>Report Completion</th>
<th>Reporting/Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSR &amp; TSA</td>
<td>1/3 years</td>
<td>EPA Region X</td>
<td>TBA</td>
<td>90 days after activity</td>
<td>EPA / ODEQ Laboratory Division</td>
</tr>
</tbody>
</table>
C.1.2. Response and Corrective Action Reports

The Response and Corrective Action Report procedure will be followed whenever a problem is found, such as a safety defect, an operational problem, or a failure to comply with procedures. A Response and Corrective Action Report is one of the most important ongoing reports to management because it documents primary QA activities and provides valuable records of QA activities.

Based on the results of the DQA the Department may initiate any of a number of actions. This could include such things as network siting changes, sampling or analytical changes, quality control changes, and data handling changes, or no action at all. Recommendations will be presented in the project final report.

C.1.2.1. Sampling and Measurement System Corrective Action

Corrective action measures will be taken to ensure the data quality objectives are attained. Refer to appropriate SOP for details of likely problems and corrective actions.

C.2. Reports to Management

This section describes the quality-related reports and communications to management necessary to support air toxics network operations and the associated data acquisition, validation, assessment, and reporting.

Important benefits of regular QA reports to management include the opportunity to alert the management of data quality problems, to propose viable solutions to problems, and to procure necessary additional resources. Management should not rely entirely upon the MSR and TSA for their assessment of the data, since they only occur once every two or three years.

Effective communication among all personnel is an integral part of a quality system. Regular, planned quality reporting provides a means for tracking the following:

- adherence to scheduled delivery of data and reports,
- documentation of deviations from approved QA and test plans, and the impact of these deviations on data quality
- analysis of the potential uncertainties in decisions based on the data

Required reports to management for monitoring in general are discussed in various sections of 40 CFR Parts 53 and 58. Report format and content are described in guidance developed by EPA's Quality Assurance Division (QAD) and the Office of Air Quality Planning and Standards (OAQPS). These reports are described in the following subsections.
C.2.1. Quality Assurance (QA) Annual Report

Periodic assessments of air toxics data should be reported to EPA. The final or annual report for this project will provide this assessment. It will describe both the quality objectives for measurement data and how those objectives have been met.

For reporting air toxics measurement uncertainties, the report will contain the following summary information:

- Flow Rate Audit results
- Co-located Samplers Audit results, estimating Precision and Bias
- Laboratory Audit results, which include any “PT” samples that are sent to the laboratory by EPA

C.2.2. Quality Control (QC) Network Review Reports

The previous Section of this plan describes these reviews and the reporting requirements.

Field personnel record daily maintenance and inspections in site logs that are reviewed and compiled into a monthly report. This monthly report is routed through the laboratory managers and QAO’s and filed.

C.2.3. Internal Laboratory Audit Report

Internal audits of the Laboratory are reported as described in the previous sections of this plan. These reports will be filed and made available to EPA personnel during their Management Systems Reviews.

C.2.4. Technical System Audit Reports

The Technical System Audits of the monitoring system conducted by ODEQ are reported as described in the previous section of this plan. These reports will be filed and made available to EPA personnel during their Management Systems Reviews.

D. DATA VALIDATION AND USABILITY ELEMENTS

D.1. Data Review, Verification, and Validation

ODEQ personnel shall review, verify, and validate analytical data reported by the laboratory through the Lab Information Management System (LIMS). The methods used by Lab staff are described below. Some analytical work may be contracted to other laboratories. The data from these contract Labs will be reviewed to determine if it meets the data quality objectives of the project. The contract Labs must provide sufficient QA/QC support data to enable the evaluation of the quality of their results. Data for contract labs will be uploaded to the LIMS system, along with the supporting QA/QC data, for use by the agency and others. Data not meeting the data quality objectives will be flagged appropriately.

D.2. Data Elements and Validation Methods

The table B.10-1 presented earlier lists ODEQ documents, reports, and data elements used to complete the review, verification, and validation of the air toxics data produced by the ODEQ Lab. This section describes the data elements generated by ODEQ’s air toxics programs and the methods used to verify and validate the data records.

D.2.1. Summary Reports for EPA

ODEQ shall submit to EPA, through the Region X Office using the EPA AIRS data system, reports of all the EPA target ambient air toxics monitoring data from all the monitoring stations. These reports will be submitted according to the schedule in the work plan and will contain the following information:
• Site and monitoring information.
• City name (when applicable).
• County name and street address of site location.
• AIRS-AQS site code.
• AIRS-AQS monitoring method code.
• Monitoring data.
• Sampling schedule used, once every 6 days, every day, etc. and duration.

D.2.2. Data Recording

Records will be kept of all raw data required for the calculation of a pollutant concentration, final data submitted to the EPA AIRS database, and all QA/QC data. These records are collected electronically or on data forms that are maintained by the field monitoring and analytical sections. All hard copy information will be filled out in indelible ink. Corrections will be made by drawing one line through the incorrect entry, initialing and dating this correction, and placing the correct entry alongside the incorrect entry. If this cannot be accomplished legibly then the information should be provided on a new line.

D.2.2.1. Notebooks

Staff notebooks. The Department will issue notebooks or daily calendar diary to each field and laboratory technician. This notebook will be unique and associated with the individual. Although data entry forms are associated with all routine environmental data operations, the notebooks can be used to record additional information about these operations.

Field Logbooks. Logbooks will be issued for each sampling site and each field sample instrument when appropriate. These will be bounded books with sequential page numbers as a standard lab log book or ‘Blue Book’. The log books will be retained as a whole document, pages or parts of the book shall constituted a record. Log entries will record instrumentation history, routine operations as well as inspection and maintenance activity.

Lab notebooks. Notebooks will also be issued for each of the laboratory instruments. These notebooks will be uniquely numbered and associated with laboratory equipment. Instrument parameters, and other information specified in the SOP, will be recorded upon each use of the instrument.

D.2.2.2. Electronic data collection

Data entry, validation, and verification functions are all integrated in the LIMS. Laboratory personnel enter bench sheets as part of the data flow as shown in Figure B.10-1. Procedures for filling out the laboratory sheets and subsequent data entry are provided in the specific method SOPs.

Some instruments have an automated means for collecting information that would otherwise be recorded on data entry forms. In order to reduce the potential for data entry errors, automated systems will be utilized where appropriate and will record the same information that is found on data entry forms. In order to provide a back-up, a hard copy of automated data collection information will be stored for the appropriate time frame in project files.

D.2.3. Data Validation

Data validation refers to those activities performed after the field data have been collected or raw analytical results are available. The difference between data validation and quality control techniques is that the quality control techniques attempt to minimize the amount of bad data being collected, while data validation seeks to prevent any bad data from getting through the data collection and storage systems to the final report.

Data validation is a combination of checking that data processing operations have been carried out correctly and of monitoring the quality of the field operations. Data validation can identify problems
in either of these areas. Once problems are identified, the data can be corrected or invalidated, and corrective actions can be taken for field or laboratory operations. Numerical data stored in the LIMS are never internally overwritten by condition flags. Flags denoting error conditions or QA status are saved as separate fields in the data base, so that it is possible to recover the original data.

D.2.3.1. Electronic Validation Activities

Range Checks Almost all monitored parameters have natural and inherent simple range checks. For example, valid times must be between 00:00 and 23:59, summer temperatures must be between 5 and 50 degrees Celsius, etc. The data entry operator is notified immediately when an entry is out of range. The operator has the option of correcting the entry or overriding the range limit. The specific values used for range checks may vary depending on season and other factors. Since these range limits for data input are not regulatory requirements, the Air Division QAO may adjust them from time to time to better meet quality goals.

Completeness Checks When the data are processed certain completeness criteria must be met. For example, samples must have certain data recorded, such as a start time, an end time, an average flow rate, dates weighed or analyzed, and operator and technician names. The data entry operator will be notified if an incomplete record has been entered before the record can be closed.

Internal Consistency and Other Reasonableness Checks Several other internal consistency checks are built into the LIMS. For example, the end time of a sample must be greater than the start time. Computed filter volume (integrated flow) must be approximately equal to the exposure time multiplied by the nominal flow. Additional consistency and other checks will be implemented as the result of problems encountered during data screening.

Data Retention Raw data sheets are retained on file for a minimum of five years, and are readily available for audits and data verification activities. After five years, hardcopy records and computer backup media are cataloged, boxed, and placed in storage until the retention schedule determines they can be recycled or destroyed.

Statistical Data Checks Errors found during statistical screening will be traced back to original data entry files and to the raw data sheets, if necessary. These checks shall be run on a monthly schedule and prior to any data submission to AIRS.

Sample Batch Data Validation Sample batches are flagged when QC values for a parameter is outside of acceptance criteria. Batches containing too many flags would be rerun and or invalidated.

D.2.3.2. Manual Validation Activities

It is preferable that data review be performed as soon as possible after the field data or raw analytical result is available, so that the questionable data can be checked by reviewing information on unusual events and on meteorological conditions, both of which can aid in the validation. Also, timely corrective actions may be taken when indicated to minimize further generation of questionable data.

Personnel performing data review should:

• Be familiar with typical diurnal concentration variations (e.g., the time when daily maximum concentrations occur) and the interrelationship between pollutants. For example, benzene, toluene and xylene concentrations usually increase and decrease together, due to these being attributed to mobile sources, whereas, metals are usually attributable to manufacturing process, and may have a different temporal cycle.
• Be familiar with the type of instrument malfunctions that cause characteristic trace irregularities.
• Recognize that cyclical or repetitive variations (at the same time each day or at periodic
intervals during the day) may be caused by line voltage or temperature variations. Nearby source activity can also cause erroneous or non-representative measurements.

- Recognize that flow traces showing little or no activity often indicate flow problems, or sample line leaks.

Data Identification Checks

Data with improper identification codes are useless. Sample identification fields that must be correct are time, location, parameter and sampler ID.

Unusual Event Review

Extrinsic events (e.g., construction activity, power outages, dust storms, volcanic eruptions, unusual traffic volume, and traffic jams) can sometimes help to explain unusual data. This information could also be used to explain why no data are reported for a specified time interval, or it could be the basis for deleting data from a file for specific analytical purposes.

Relationship Checks

Air toxics data sets contain many physically or chemically related parameters. These relations can be routinely checked to ensure reasonableness and consistency. For example, benzene and toluene are mobile source driven. Benzene and toluene are found in samples within a specific ratio range. When the range is exceeded this would be cause to investigate the sample collection. Chemical species that are not considered HAPS but exist in the global atmosphere at known stable concentrations can be used as bench marks in the analytic data set.

Review of Spikes, Blanks and Replicates

Generally, recovery of spikes in samples should be greater than 80%. Blanks should not be more than 3 times the MDL for any compound. The difference in concentration of replicates should be within +/- 10%. If any of these are outside of this boundary, then appropriate corrective actions are warranted.

Data Review Testing

Some tests can check values in a data set that appear atypical when compared to the whole data set. Common anomalies of this type include unusually high or low values (outliers) and large differences in adjacent values. These tests will not detect errors that alter all values of the data set by either an additive or multiplicative factor (e.g., an error in the use of the scale). The following tests for internal consistency are used as needed:

- Data Plots
- Ratio Test
- Students “t-test”

D.2.4. Data Transformation

Calculations for transforming raw data from measured units to final concentrations are provided in the method SOP.

D.2.5. Data Transmittal

Data transmittal occurs when data are transferred from one person or location to another, or when data are copied from one form to another. Some examples of data transmittal are copying raw data from a notebook onto a data entry form for keying into a computer file and electronic transfer of data over a telephone or computer network. Table D.2-1 summarizes data transfer operations.
Table D.2-1 Data Transfer Operations

<table>
<thead>
<tr>
<th>Description of Data Transfer</th>
<th>Originator</th>
<th>Recipient</th>
<th>QA Measures Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keying data into LIMS or LASAR</td>
<td>Laboratory technician (hand-written data form)</td>
<td>Data processing personnel</td>
<td>Double key entry</td>
</tr>
<tr>
<td>Electronic data transfer</td>
<td>Between computers or over network</td>
<td>Data processing personnel</td>
<td>Parity checking; transmission protocols</td>
</tr>
<tr>
<td>Sample receiving and chain-of-custody</td>
<td>Sample tracker</td>
<td>LASAR computer (sample tracker enters data at a local terminal)</td>
<td>Sample numbers are verified automatically; reports indicate missing filters and/or incorrect data entries</td>
</tr>
<tr>
<td>Calibration and audit data</td>
<td>QA staff</td>
<td>Air Monitoring Supervisor</td>
<td>Entries are checked by Air Monitoring Supervisor and QAO</td>
</tr>
<tr>
<td>AIRS data summaries</td>
<td>Air Quality Monitoring Data System Operator</td>
<td>AIRS (U.S. EPA)</td>
<td>Entries are checked by Air Quality Monitoring Operator and QAO</td>
</tr>
</tbody>
</table>

D.2.6. Data Reduction

Data reduction processes involve aggregating and summarizing results so that they can be understood and interpreted in different ways. Regular reporting of results to AIRS will be made, as specified in the project work plan. Additional data summaries to EPA Region X may include:

- average concentration for a station or set of stations for a specific time period
- accuracy, bias, and precision statistics
- data completeness reports based on numbers of valid samples collected during a specified period

As an integral part of all data transformations and reductions is the audit trail that provides documentation for changes made to a data set during processing. Typical reasons for data changes that would be recorded include the following:

- corrections of data input due to human error
- application of revised calibration factors
- addition of new or supplementary data
- flagging of data as invalid or suspect
- logging of the date and times when automated data validation programs are run

Audit trail records will include the following fields:

- operator's identity (ID code)
- date and time of the change
When routine data screening programs are run, the following additional data are recorded in the audit trail:

- version number of the screening program
- values of screening limits (e.g., upper and lower acceptance limits for each parameter)
- numerical value of each data item flagged and the flag applied

The audit trail is produced automatically and can only document changes; there is no "undo" capability for reversing changes after they have been made. Available reports based on the audit trail include:

- log of routine data validation, screening, and reporting program runs
- report of data changes by station for a specified time period
- report of data changes for a specified purpose
- report of data changes made by a specified person

Because of storage requirements, the System Administrator must periodically move old audit trail records to backup media. Audit trail information will not be moved to backup media until after the data are reported to AIRS. All backups will be retained so that any audit trail information can be retrieved for at least three years.

**D.2.7. Data Summary and Analysis**

Procedures for Air Toxics monitoring have been developed. It is anticipated that as the Air Toxics Monitoring Program matures, additional data analysis procedures will be developed. The following specific summary statistics will be tracked and reported for the network:

- Pollutant concentration mean, maximum, and minimum
- Single sampler bias or accuracy (based on audit flow checks and laboratory audits)
- Single sampler precision (based on co-located data)
- Comparison of concentrations between sites
- Time series plots of concentration
- Network-wide bias and precision
- Data completeness

<table>
<thead>
<tr>
<th>Table D.2-2 Report Equations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criterion</strong></td>
</tr>
<tr>
<td>Accuracy of single sampler flow. The percentage difference ($F_d$) for a single flow rate audit $i$ is calculated, where $FX_i$ represents the audit standard flow rate (known) and $FY_i$ represents the sampler indicated flow rate.</td>
</tr>
<tr>
<td>Relative percent difference for a single check ($RPD_i$) Were $X_i$ and $Y_i$ are concentrations from the primary and duplicate samplers, respectively. Here $i$ is the particular sample event.</td>
</tr>
<tr>
<td>Bias of a single sampler - Annual Bias ($\mu_i$)- average of individual percent differences between sampler and reference value; $n$ is the number of measurements over the period</td>
</tr>
</tbody>
</table>
Upper 95% Confidence Limit

<table>
<thead>
<tr>
<th>Upper 95% Confidence Limit</th>
<th>Limit = ( \mu + 1.96 \times \frac{S}{\sqrt{2}} )</th>
</tr>
</thead>
</table>

Lower 95% Confidence Limit

<table>
<thead>
<tr>
<th>Lower 95% Confidence Limit</th>
<th>Limit = ( \mu - 1.96 \times \frac{S}{\sqrt{2}} )</th>
</tr>
</thead>
</table>

Completeness (C) expressed as a percent, were \( N \) is the number of samples.

\[
C = 100 \left( \frac{N_{\text{valid}}}{N_{\text{Theoretical}}} \right)
\]

D.2.8. Data Tracking

The LIMS/LASAR system contains the necessary input functions and reports necessary to track and account for the whereabouts of samples, and the status of analytical operations for specific data. Information about sample location is updated at data entry terminals at the points of significant operations. The following input locations are used to track sample location and analytical results:

- Laboratory
- Sampling media receipt (by lot)
- Pre-sampling processing or weighing (individual filter or cartridge number first enters the system)
- Canister number (VOC only)
- Filter packaged for the laboratory (filter numbers in each package are recorded)
- Shipping (package numbers are entered for both sending and receiving)
- Sample receipt (package is opened and filter numbers are logged in)
- Filter post-sampling weighing
- Filter archival

In most cases the tracking data base and the monitoring data base are updated simultaneously. For example, when the filter is pre-weighed, the weight is entered into the monitoring data base and the filter number and status are entered into the tracking data base. For VOC canisters, the sample handling is different. The VOC canisters are reused many times before they are retired from field use. Each canister has its own unique code that designates the can number. When the canister is sent into the field, a canister number becomes a portion of the tracking code. This allows the sample that was in the canister to be tracked.

D.2.9. Data Storage and Retrieval

All the information collected for this project will be retained for 3 years from the date ODEQ submits its final report to EPA unless otherwise noted. However, if any litigation, claim, negotiation, audit or other action involving the records has been started before the expiration of the 3-year period, the records will be retained until completion of the action and resolution of all issues which arise from it, or until the end of the regular 3-year period, whichever is later.

<table>
<thead>
<tr>
<th>Table D.2-3  Data Archive Policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Type</td>
</tr>
<tr>
<td>------------------------------------</td>
</tr>
<tr>
<td>Weighing records; chain of custody forms</td>
</tr>
<tr>
<td>Laboratory Notebooks</td>
</tr>
<tr>
<td>Field Notebooks</td>
</tr>
<tr>
<td>Data Type</td>
</tr>
<tr>
<td>------------------------------</td>
</tr>
<tr>
<td>Data Base</td>
</tr>
<tr>
<td>(excluding audit trail</td>
</tr>
<tr>
<td>records)</td>
</tr>
<tr>
<td>Trail record</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>HV PM 10</td>
</tr>
<tr>
<td>PUF/XAD®</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>VOC canisters</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>DNP Cartridge</td>
</tr>
</tbody>
</table>

The final data records are stored in the LASAR system on a Laboratory server. Security of data in the database is ensured by the following controls:

- Password protection on the database that defines three levels of access to the data
- Regular password changes (quarterly for continuing personnel; passwords for personnel leaving the Air or Laboratory Divisions will be canceled immediately)
- Storage of media including backup tapes in locked, restricted access areas

D.3. Reconciliation with User Requirements

Jeffrey M. Smith (ODEQ LEAD Air Quality Monitoring Manager) shall coordinate the laboratory’s involvement with reconciling issues of sample collection, siting, equipment operation, detection limits, turn-around time, and upload of data to LASAR and EPA databases (AQS). Reconciling issues with the interpretation of air toxics data shall lie with Sarah Armitage (ODEQ Air Quality Division).

D.3.1. Reconciliation with Data Quality Objectives

Data quality assessment is a critical part of determining the value of the measurements made during this project. Following data validation and verification, the data quality assessment indicates how well the data can support the intended use. Data that is marked as estimated may be used for decision making purposes and will be included in any data transmittals to EPA. This section of the QAPP will outline the assessment procedures that will be followed to determine whether the sampling and the laboratory analyses are producing data that comply with the stated goals. It will also indicate what action will be taken as a result of the assessment process. This process is thoroughly described in EPA QA/G-9: Guidance for Data Quality Assessment.

The Data Quality Objectives for this air toxics monitoring project were developed in section A7 Quality Objectives and Criteria of this QAPP and can be summarized briefly as:

To determine the ambient air concentrations of air toxics in the sampled areas, and to determine the spatial and temporal variations of those concentrations within a city or geographic area.

D.3.2. Data Quality Assessment (DQA)

In order to determine if this project's stated Data Quality Objectives have been met, the assessment
process must follow statistical routines. The following four steps will discuss how this will be achieved.

D.3.2.1. Review of Data Quality Objectives and Sampling Design

Section A7 of this QAPP contains the details for the development of the DQO, including defining the objectives of the air toxics monitoring network and developing limits on the decision errors. Section B contains the details for the sampling design, including the rationale for the design, the design assumptions, and the sampling locations and frequency. If any deviations from the sampling design have occurred, these will be indicated and their potential effect carefully considered throughout the entire DQA. A preliminary data review will be performed by the quality assurance officer to uncover potential limitations to using the data, to reveal outliers, and generally to explore the basic structure of the data.

D.3.2.2. Review Quality Assurance Reports

The first step is to review the quality assurance reports. All relevant quality assurance reports, internal and external, that describe the data collection and reporting process will be reviewed qualitatively. Particular attention will be directed to looking for anomalies in recorded data, missing values, and any deviations from standard operating procedures. Any concerns will be further investigated in the next two steps.

D.3.2.3. Select the Statistical Test

The second step is to calculate basic summary statistics, generate graphical presentations of the data, and review these summary statistics and graphs. This will be done for each of the primary and QA samplers. Summary statistics will be calculated on an annual basis and will include only valid samples. These following statistical tests will be performed:

- Test to examine distribution of the data
- Simple annual averages of all pollutants
- Examination of bias and precision of the data
- Seasonal averages to determine any seasonal variability

Particular attention will be given to the impact on the statistics caused by the observations noted in the quality assurance review. ODEQ may evaluate the influence of a potential outlier by evaluating the change in the summary statistics resulting from exclusion of the outlier.

D.3.2.4. Verify Assumptions of Statistical Test

There are no NAAQS to use for comparison to air toxics concentrations. Therefore, verification of the data must be done against estimated values, such as models. However, before this can occur, the distribution, tests for trends, and tests for outliers must be examined.

**Normal distribution for measurement error** The assumption that measurement errors are normally distributed is common in environmental monitoring. Small departures from normality generally do not create serious problems and ODEQ will evaluate the reasonableness of the normality assumption by reviewing a normal probability plot and employing the Coefficient of Variance Test. If the plot or statistics indicate possible violations of normality, ODEQ may need to determine the sensitivity of the DQO to departures in normality.

**Trends Analysis** A simple linear regression test can be performed to observe the temporal variations in the data sets. Air toxics emissions from mobile sources would vary with the diurnal variations of traffic in urban and suburban environment. A linear regression test would provide information on whether certain compounds are tied to mobile sources. For instance, benzene is identified as major mobile HAP. If a linear regression is performed against a compound whose source is unknown, then its correlation coefficient would provide information on its possible source. Seasonal plots can also be useful in providing information about sources with seasonal emissions characteristics.
**Measurement precision and bias** For each sampling system the 95% confidence limits will be determined. If any exceed the DQO the impact on data use will be considered and actions to reduce these errors identified for future studies. The algorithms from Section B.5.4 will be used for creating the confidence intervals.

**D.3.3. Draw Conclusions from the Data**

If the sampling design and the statistical tests bear out, it can be concluded that the network design and the uncertainty of the data are acceptable. This conclusion can then be written in the Annual Report to management. Management may then decide how else to use the data, such as performing risk assessments, public education, or further analysis by the State and EPA of the data.
E. REFERENCES


Network Design and Site Exposure Criteria for Selected Noncriteria Air Pollutants, EPA


Compendium Method for the Determination of Inorganic Compounds in Air, Section IO-3.5. U.S. Environmental Protection Agency, June 1999,


E.1. Monitoring SOPs

- Semi-Volatile Organic Compounds (SVOC). DEQ11-LAB-0010-SOP, version 1.0
- Carbonyls (Ketones and Aldehydes). DEQ12-LAB-0010-SOP, version 1.5
- PM₁₀ Metals. DEQ11-LAB-0042-SOP, version 1.0
- Hevavalent Chromium Sampling. DEQ11-LAB-0052-SOP version 1.0

E.2. Analytical SOPs

- Volatile Organic Compounds (VOCs) In Air (TO-15). DEQ08-LAB-0047-SOP
- PAHs In Air (ASTM D6209-98). DEQ08-LAB-0046-SOP
- Ketones and Aldehydes In Air (TO-11A). DEQ03-LAB-0014-SOP
- Air Toxics Metals in Particulate On High Volume Filters: DEQ05-LAB-0024-SOP
- Chester LabNet SOP