QUALITY ASSURANCE PROJECT PLAN

for the

AMBIENT AIR MONITORING PROGRAM
130 LIBERTY STREET
DECONSTRUCTION PROJECT

September 7, 2005

LOWER MANHATTAN DEVELOPMENT CORPORATION
1 Liberty Plaza
New York, New York

1.0 TITLE AND APPROVAL SHEET

Quality Assurance Project Plan for Ambient Air Monitoring Program, 130 Liberty Street, New York, New York

Document Title

Lower Manhattan Development Corporation (LMDC)

Lead Organization (Agency, State, Tribe, Federal Facility, PRP, or Grantee)

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Preparer's Name and Organizational Affiliation

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September 7, 2005

Preparation Date (Day/Month/Year)

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Signature/Date

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Investigative Organization's Project Manager: _____

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Gary Hunt/TRC Environmental

Printed Name/Organization

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Signature/Date

Robin Nelson/TRC Environmental

Printed Name/Organization

Investigative Organization's Project QA Officer: _____

Signature/Date

Elizabeth Denly/TRC Environmental

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Lead Organization's Project Manager: _____

Signature/Date

William Kelley/LMDC

Printed Name/Organization

Laboratory Project Managers _____

Signature/Date

Charles LaCerra/EMSL Analytical, Inc.

Printed Name/Title/Date

_____

Signature/Date

Karen Dahl/Severn Trent Laboratory

Printed Name/Title/Date

Signature/Date
Colin Davies/Brooks Rand Laboratory
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Signature/Date
Yves Tondeur, PhD/Alta Analytical Perspectives
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Signature/Date
Robert Wagner/Northeast Analytical Inc.
Printed Name/Title/Date

Signature/Date
Paul Duda/Chester LabNet
Printed Name/Title/Date

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3.0 DISTRIBUTION LIST

3.1 Distribution List

The Distribution List (Table 3-1) documents who will receive copies of the approved Quality Assurance Project Plan (QAPP) and any subsequent revisions or amendments to the QAPP. A complete copy of the QAPP and any subsequent revisions will be maintained on file at TRC Environmental Corporation (TRC), New York, New York.

All project personnel performing work on the 130 Liberty Street Ambient Air Monitoring Program will read and comply with this QAPP.

Table 3-1. Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Document Control Number
Pat Evangelista	WTC Coordinator	US EPA Region 2	212-637-4447	L2005-346
Sal Carlomagno	Project Manager	NYSDEC	718-482-4944	L2005-346
Chris Alonge	Project Manager	NYSDOL	518-457-7201	L2005-346
Krish Radhakrishnan	Project Manager	NYCDEP	718-595-3718	L2005-346
Richard Mendelson	Project Manager	OSHA	212-620-3200	L2005-346
Robert Iulo	Project Manager	NYCDOB	212-566-0011	L2005-346
William Kelley	Project Manager	LMDC	212-962-2300	L2005-346
Edward Gerdts	Principal-in-Charge	TRC	212-221-7822	L2005-346
Gary Hunt	Project Manager	TRC	978-656-3551	L2005-346
Robin Nelson	Corporate QA Director	TRC	512-329-6080	L2005-346
Elizabeth Denly	Project QA Officer	TRC	978-656-3577	L2005-346
David Gill	Field Sampling Coordinator	TRC	978-656-3529	L2005-346
Ping Zhou	Data Manager	TRC	978-656-3522	L2005-346
Brian Porembski	Field Staff	TRC	978-656-3523	L2005-346

Table 3-1. Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Document Control Number
Charles LaCerra	Project Manger	EMSL Analytical, Inc.	1-800-220-3675	L2005-346
Karen Dahl	Project Manger	Severn Trent Laboratory	916-373-5600	L2005-346
Colin Davies	Project Manger	Brooks Rand Laboratory	206-632-6206	L2005-346
Yves Tondeur, PhD	Project Manger	Alta Analytical Perspectives	910-794-1613	L2005-346
Robert Wagner	Project Manger	Northeast Analytical, Inc.	518-346-4592	L2005-346
Paul Duda	Project Manger	Chester LabNet	503-624-2183	L2005-346

4.0 PROJECT ORGANIZATION

This section identifies the organizations and key personnel participating in the 130 Liberty Street Ambient Air Monitoring Program. The specific roles and responsibilities of the key personnel are included in this section. An explanation of the lines of authority, reporting relationships and communication pathways are provided in this section.

4.1 Project Organization Chart

All organizations involved in the 130 Liberty Street Ambient Air Monitoring Program are identified in the project organization chart (Figure 4-1). The responsibilities of key personnel are described in Section 4.3.

4.2 Communication Pathways

The lines of authority and communication specific to this study are also presented in the organization chart (Figure 4-1). The TRC Project Manager will serve as the communication link between the LMDC, EPA and TRC. The TRC Project Manager will be kept verbally apprised of the program's status by the TRC Field Sampling Coordinator and the TRC Project Quality Assurance (QA) Officer. These individuals will immediately notify the TRC Project Manager of any internal or subcontractor issues that potentially affect budget, schedule, and/or achievement of the project objectives. The TRC Project Manager will in turn communicate these issues to the LMDC Project Manager and EPA Project Manager by telephone. Laboratories will communicate any potential issues to the TRC Project QA Officer who will in turn communicate these issues to the TRC Project Manager if the issues may potentially affect the achievement of project objectives. The TRC Project Manager will in turn notify the LMDC Project Manager and EPA Project Manager of these issues.

4.2.1 Modifications to Approved QAPP

Any changes to the scope or procedures stated in this QAPP will be formally documented as QAPP revisions and must go through the same review and approval process as the original QAPP. The control block in the upper right corner of each changed page will be updated to reflect the date of the change and the revision number or an addendum to the QAPP may be issued.

For changes requiring immediate resolution and implementation, approval by phone will be secured from all levels of management (TRC, LMDC, and EPA). This verbal approval will be documented in phone logs and will be followed by formal revision of the QAPP or a QAPP addendum as described above.

If modifications to the QAPP are mandated by the TRC Project Manager, the TRC Project QA Officer will schedule a meeting with the appropriate team members to discuss the changes, make

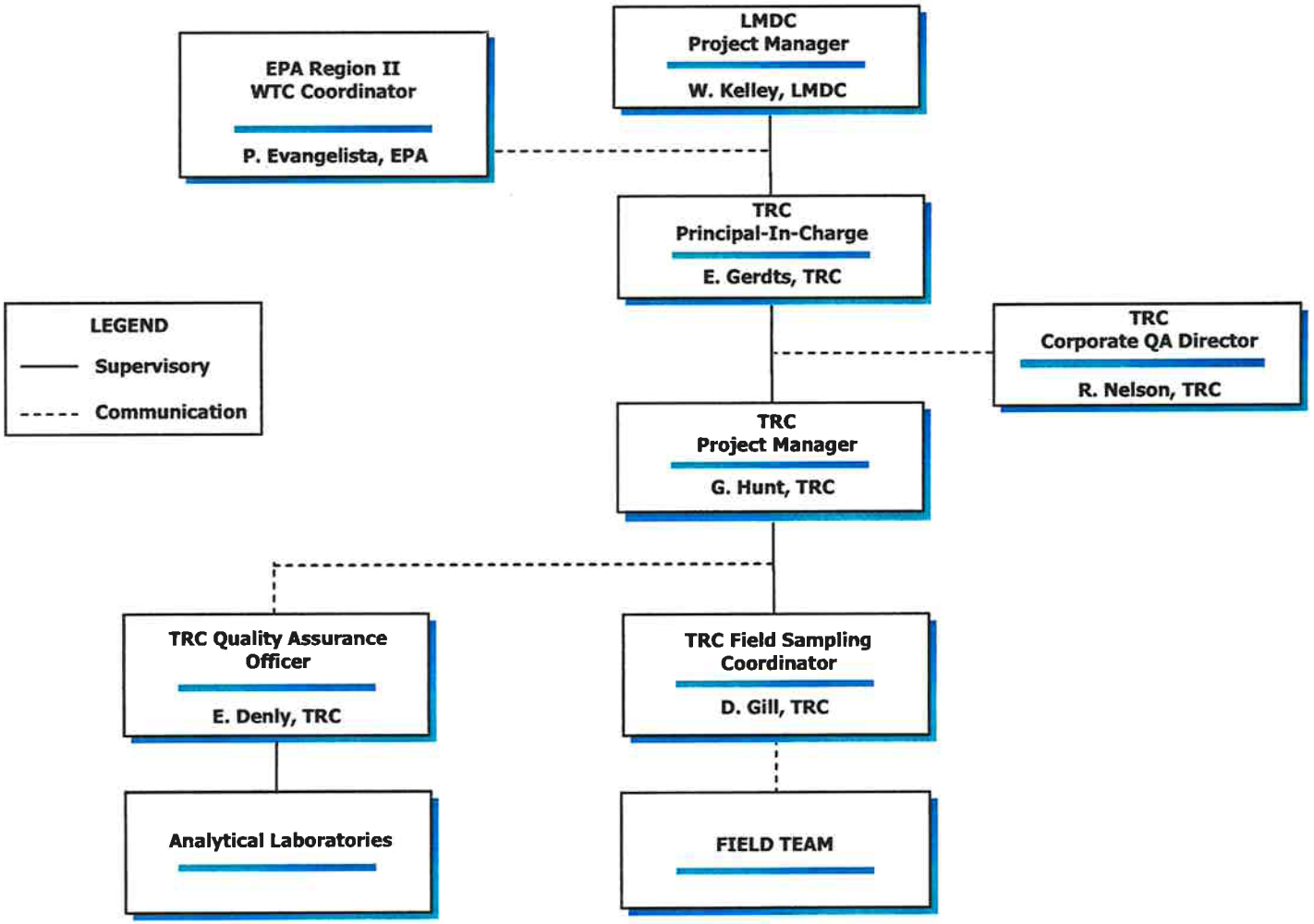

FIGURE 4-1
ORGANIZATION CHART AND COMMUNICATION PATHWAY
LOWER MANHATTAN
DEVELOPMENT CORPORATION
130 LIBERTY STREET
NEW YORK, NEW YORK

LMDC
Lower Manhattan Development Corporation

TRC

Boott Mills South
116 John Street
Lowell, MA 01852
978-970-5600

TRC PROJ. NO.: 48970-0120-00000

AMBIENT AIR
MONITORING PROGRAM

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the necessary modifications to the QAPP or create a QAPP addendum and submit them to the TRC Project Manager for review, and submit the revised QAPP or QAPP addendum to EPA for review and approval. After the revised QAPP has been approved, the revised QAPP or QAPP addendum will be provided to the team members, according to the original QAPP Distribution List. If a revised QAPP is issued, the prior QAPP will be removed and deemed obsolete; copies of the prior QAPP will be retained in project files for documentation purposes.

Corrective action procedures for QAPP modifications during sampling and analysis are discussed in Section 15.3 of the QAPP.

4.3 Personnel Responsibilities and Qualifications

The responsibilities of management, QA, field, and laboratory personnel are outlined below.

4.3.1 Management Responsibilities

EPA Project Manager

The U.S. EPA Project Manager for the 130 Liberty Street Ambient Air Monitoring Program is Mr. Pat Evangelista. His primary responsibilities include administration of EPA responsibilities, oversight of the day-to-day activities, and receipt of all required written matter. Mr. Evangelista is also responsible for providing technical oversight and guidance and reviewing all technical deliverables, including plans and reports.

TRC Principal-in-Charge

The TRC Principal-in-Charge, Mr. Edward Gerdts, will be responsible for periodically auditing the program to ensure compliance with TRC's standard management procedures and providing all necessary senior technical support and program planning.

TRC Project Manager

The TRC Project Manager, Mr. Gary Hunt, has responsibility for technical and scheduling matters and will serve as the main contact with the LMDC and EPA Project Manager. Other duties, as necessary, include

- Assuring adherence to project plans and obtaining approvals for any changes to these plans,
- Assuring that approved procedures meet project objectives,
- Reviewing and approving all sampling procedures,
- Preparing and reviewing all reports,
- Assigning duties to project staff and orienting the staff to the specific needs and requirements of the project,

- Serving as the focus for coordination of all field task activities, communications, reports, and technical reviews, and other support functions, and facilitating activities with the technical requirements of the project,
- Coordinating field and office activities with the TRC Project QA Officer and TRC Field Sampling Coordinator,
- Implementing recommendations made by the TRC Project QA Officer,
- Initiating corrective actions,
- Monitoring schedules for field, analytical, and data validation activities associated with the field sampling program, and
- Maintaining the project file.

4.3.2 Quality Assurance Responsibilities

TRC Project QA Officer

The TRC Project QA Officer, Ms. Elizabeth Denly, has overall responsibility for quality assurance oversight. The TRC Project QA Officer communicates directly to the TRC Project Manager. Specific responsibilities include:

- Preparing the QAPP,
- Reviewing and approving QA procedures, including any modifications to existing approved procedures,
- Providing oversight of the contract laboratory operations,
- Ensuring that QA audits of the various phases of the project are conducted as required,
- Providing QA technical assistance to project staff,
- Approving operating procedures
- Following up on corrective action,
- Ensuring that data validation/data assessment is conducted in accordance with the QAPP, and
- Reporting on the adequacy, status, and effectiveness of the QA program to the TRC Project Manager.

4.3.3 Field Responsibilities

TRC Field Sampling Coordinator

The TRC Field Sampling Coordinator, Mr. David Gill, has overall responsibility for completion of all field activities in accordance with the QAPP and is the communication link between the field team, subcontractors, and TRC project management. Specific responsibilities include:

- Understanding and implementing the QAPP,

- Coordinating activities in the field,
- Assigning specific duties to field team members,
- Ensuring site security and access,
- Training field staff,
- Overseeing and coordinating field data collection,
- Mobilizing and demobilizing of the field team and subcontractors to and from the site,
- Resolving any logistical problems that could potentially hinder field activities, such as equipment malfunctions or availability, personnel conflicts, or weather-dependent working conditions,
- Implementing field quality control (QC) including issuance and tracking of measurement and test equipment; the proper labeling, handling, storage, and shipping of samples; chain-of-custody procedures; and control and collection of all field documentation, and
- Assisting with report preparation.

Field Staff

The field staff reports directly to the TRC Field Sampling Coordinator. The responsibilities of the field team include:

- Understanding and implementing QAPP requirements as they relate to their duties,
- Collecting samples, conducting field measurements, and decontaminating equipment according to documented procedures stated in the QAPP,
- Ensuring that field instruments are properly operated, calibrated, and maintained, and that adequate documentation is kept for all instruments,
- Performing technical procedures and data recording in accordance with the operating procedures,
- Collecting the required QC samples and thoroughly documenting QC sample collection,
- Ensuring that field documentation and data are complete and accurate, and
- Communicating any nonconformance or potential data quality issues to the TRC Field Sampling Coordinator.

4.3.4 Laboratory Responsibilities

Analyses will be performed by the following organizations:

Parameter	Laboratory
Asbestos, Respirable Crystalline Silica and Dust	EMSL Analytical, Inc. 107 Haddon Avenue Westmont, NJ 08108 (800) 220-3675 Contact: Charles LaCerra
Polycyclic Aromatic Hydrocarbons (PAHs) and Metals (antimony, barium, beryllium, cadmium, chromium, copper, lead, manganese, nickel, and zinc)	Severn Trent Laboratory 880 Riverside Parkway West Sacramento, CA 95605 (916) 373-5600 Contact: Karen Dahl
Mercury (total)	Brooks Rand Laboratory 3958 Sixth Avenue NW Seattle, WA 98107 (206) 632-6206 Contact: Colin Davies
Dioxins/Furans (PCDDs/PCDFs)	Alta Analytical Perspectives 2714 Exchange Drive Wilmington, NC 28405 (910) 794-1613 Contact: Yves Tondeur, PhD
Polychlorinated Biphenyls	Northeast Analytical, Inc. 2190 Technology Drive Schenectady, NY 12308 (518) 346-4592 x21 Contact: Robert Wagner
PM_{10} and $PM_{2.5}$	Chester LabNet 12242 SW Garden Place Tigard, OR 97223-8426 (503) 624-2183 Contact: Paul Duda

Laboratory Manager

The Laboratory Manager is ultimately responsible for the data produced by the laboratory. Specific responsibilities include:

- Implementing and adhering to the QA and corporate policies and procedures within the laboratory,
- Approving Standard Operating Procedures (SOPs),
- Maintaining adequate staffing, and
- Implementing internal/external audit findings and corrective actions.

Laboratory QA Manager

The Laboratory QA Manager reports directly to the Laboratory Manager. Specific responsibilities include:

- Approving the laboratory SOPs,
- Ensuring and improving quality within the laboratory,
- Supervising and providing guidance and training to laboratory staff,
- Addressing all client inquiries involving data quality issues,
- Performing QA audits and assessments,
- Tracking external and internal findings of QA audits, and
- Coordinating laboratory certification and accreditation programs.

Laboratory Project Manager

The Laboratory Project Manager is the primary point of contact between the laboratory and TRC. Specific responsibilities of the Laboratory Project Manager include:

- Keeping the laboratory and client informed of project status,
- Monitoring, reviewing, and evaluating the progress and performance of projects,
- Reporting client inquiries involving data quality issues or data acceptability to the Laboratory QA Manager and to the operations staff, and
- Reviewing project data packages for completeness and compliance to client needs.

Laboratory Section Leader

Specific responsibilities include:

- Supervising daily activities within the group,
- Supervising QC activities,
- Supervising the preparation and maintenance of laboratory records,
- Evaluating instrument performance and supervising the calibration, preventive maintenance, and scheduling of repairs, and

- Overseeing or performing review and approval of all data.

Laboratory Analyst/Technician

Each analyst or technician is responsible for:

- Performing technical procedures and data recording in accordance with documented procedures,
- Performing and documenting calibration and preventive maintenance,
- Performing data processing and data review procedures,
- Reporting nonconformances to the appropriate personnel, and
- Ensuring sample and data integrity by adhering to internal chain-of-custody procedures.

Laboratory Sample Custodian

The Sample Custodian ensures implementation of proper sample receipt procedures, including maintenance of chain-of-custody. Other specific responsibilities include:

- Notifying the Laboratory Project Manager of any discrepancies or anomalies with incoming samples,
- Logging samples into the laboratory tracking system,
- Ensuring that all samples are stored in the proper environment, and
- Overseeing sample disposal.

5.0 SPECIAL TRAINING NEEDS/CERTIFICATION

Most of the off-site activities described in this QAPP constitute routine sampling and analyses for which no special training requirements or certifications are needed. However, all TRC staff working on-site will comply with the 130 Liberty Street Health and Safety Plan in effect at the time, will have completed the OSHA/HAZWOPER 40-hour health and safety training, and will also have currently (within the past year) completed the OSHA/HAZWOPER 8-hour annual refresher health and safety training. All health and safety training records are maintained in the TRC files. Prior to the start of the on-site work, all field personnel will be given instruction specific to the project, covering the following areas:

- Organization and lines of communication and authority,
- Overview of the QAPP, including sample collection, handling, and labeling procedures,
- QA/QC requirements,
- Documentation requirements, and
- Health and safety requirements.

Instructions will be provided by the TRC Field Sampling Coordinator and TRC Project QA Officer.

6.0 PROBLEM DEFINITION/BACKGROUND

This section documents project planning, identifies the environmental problem, defines the environmental questions that need to be answered, and provides background information.

6.1 Problem Definition/Site History and Background

The Deutsche Bank Building at 130 Liberty Street

The Deutsche Bank Building at 130 Liberty Street (the "Building") in Lower Manhattan was damaged on September 11, 2001. The condition of the Building was the subject of litigation between Deutsche Bank as its owner and the insurers for the Building.

The Lower Manhattan Development Corporation (LMDC) acquired the Building from Deutsche Bank on August 31, 2004 and has finalized plans to clean and deconstruct the building. Environmental testing and characterization of the building materials, dust, and mold has been conducted. The testing and characterization process is ongoing and the initial results were released on September 14, 2004.

Background

On September 11, 2001, the Building was damaged when debris from the World Trade Center broke windows and cut a 15 story gash in the north façade of the Building. Since September 11, 2001, the Building has been unoccupied and was the subject of litigation between Deutsche Bank and the insurers for the Building.

In October of 2003, Governor Pataki appointed former U.S. Senate Majority Leader George Mitchell to mediate discussions between Deutsche Bank and its insurers. In early 2004, an accord between Deutsche Bank and its insurers was reached to bring down the Deutsche Bank building. The deconstruction will remove the shrouded Deutsche Bank building that has been a constant grim reminder of the events of September 11, 2001.

Under the terms of the accord, LMDC was able to purchase the land and will pay for the deconstruction of the building.

Environmental Testing and Building Characterization

Over the last two years, Deutsche Bank and its insurers have conducted environmental testing of the Building in connection with their litigation. LMDC engaged the services of environmental consultants to conduct its own environmental testing and characterization of the building materials, dust, and mold. A report identifying the initial findings of the characterization study of the building and the contaminants of potential concern was completed by Louis Berger and was released on September 14, 2004.

The Initial Building Characterization Study that was released in September identified the need for supplemental testing to be performed in areas that were previously inaccessible prior to LMDC taking ownership of the building. Once LMDC acquired the building in August, 2004 the supplemental testing occurred in the building's vertical shafts, interior wall interstitial spaces, HVAC system, cell system, curtain wall cavity, and the exterior. These test results were released in January, 2005 and were used as a basis for amending the deconstruction plan.

Cleaning and Deconstruction Work

In December, 2004 the LMDC released the draft Phase I Deconstruction Plan and formally submitted the plan to Federal, State and City Regulatory Agencies for review and comment. The proposed Deconstruction Plan submitted for review to the government regulators provided that the 130 Liberty Street building will be deconstructed in three phases:

- Phase I – Preparation Phase
- Phase I – Asbestos and COPC Abatement and Removal
- Phase II – Structural Deconstruction

The Phase I – Preparation Phase includes the erection of scaffolding and hoists on the full extent of the exterior of the building, construction of interior hoist vestibules, erection of sidewalk sheds and perimeter fencing, exterior negative pressure tent enclosures to implement the Pilot Program, localized roof, façade and general exterior area clean-up and the removal of existing netting on the exterior of the building.

Phase I Asbestos and COPC Abatement and Removal Phase includes the cleaning and removal of all interior surfaces and non-structural elements within the building under containment. The clean-up and abatement will be conducted so that the building at 130 Liberty (Building) can be safely deconstructed to allow for redevelopment of the WTC Site. Phase I of the Deconstruction Project will occur while the work area is placed under negative pressure containment and includes the following general categories: (a) the general area cleanup of WTC dust and debris, (b) removal and disposal of installed porous and certain non-porous building materials and components, (c) cleaning and salvage of certain installed non-porous building equipment and components, (d) removal of building materials containing asbestos which were present in the Building prior to September 11th, 2001 (referred to herein as "ACBM"), primarily within the Building interior, (e) packaging of asbestos and other regulated waste including, but not limited to light bulbs, lighting ballasts, batteries, mercury-containing thermostats, etc. at generation points, movement of containers to the decontamination unit and movement of decontaminated containers to waste loading using an exterior hoist or crane, and (f) cleaning of exterior surfaces of the Building (i.e. building washdown).

During all Phase I activities, a minimum buffer zone of three floors initially for the top three floors and then two floors thereafter, will be maintained between the active abatement and cleanup (Phase I) area and the exterior abatement/structural demolition (Phase II) portion of the project. The proposed cleanup and abatement will be conducted so that the Building can be

safely deconstructed in compliance with applicable law to allow for redevelopment of the WTC Site.

Phase II will include the systematic floor-by-floor deconstruction and removal of the remaining "clean" building components including the clean exterior curtain wall, roof, CMU shafts, concrete deck, large scale mechanical equipment components and structural steel components. Included in Phase II will be the abatement and removal of roof-top asbestos-containing cooling tower transite materials, roof-top caulking and asbestos-containing caulking found on the aluminum column covers and fascia. For each specific floor or regulated abatement work area, all Phase II asbestos abatement work must be completed prior to commencement of any Phase II floor-by-floor deconstruction for that floor or work area.

The deconstruction of the building at 130 Liberty Street is expected to consist generally of: (a) cleaning and preparation of the building for deconstruction; (b) deconstructing the building; (c) undertaking environmental monitoring during the deconstruction; (d) transporting and disposing of all waste and debris from the building; and (e) backfilling, grading and paving the Site as appropriate following the cleaning and deconstruction.

Regulatory Oversight

The LMDC is the owner of 130 Liberty Street and is fully responsible for the cleaning and deconstruction of the building. As a City/State agency that is federally funded through HUD, the LMDC must comply with all Federal, State and City regulations pertaining to environmental protection, asbestos abatement, hazardous material disposal and construction. The LMDC released the draft Phase I deconstruction plan in December, 2004 and formally submitted the plan for review to the following agencies:

- United States Environmental Protection Agency
- United States Occupational Safety and Health Administration (OSHA)
- New York State Department of Labor (NYSDOL)
- New York State Department of Environmental Conservation (NYSDEC)
- New York City Department of Environmental Protection (NYCDEP)
- New York City Department of Buildings
- New York State Department of Transportation
- New York City Department of Transportation
- New York City Office of Emergency Management
    - Fire Department of New York
    - New York Police Department
    - New York City Department of Health and Mental Hygiene

The LMDC received comments from regulatory agencies in January, 2005 and amended the draft deconstruction plan. The LMDC resubmitted a revised plan to the regulatory agencies for final approval in June, 2005. Regulator comments were again received on July 26, 2004. This QAPP and companion Ambient Air Monitoring Plan were prepared in response to the July 26, 2005 regulator comments.

Ambient Air Monitoring Program for the 130 Liberty Street Deconstruction Project

The document entitled *Ambient Air Monitoring Program for the 130 Liberty Street Deconstruction Project,* August 2005 represents a revised and combined air monitoring plan incorporating the following two prior plans: (i) the Draft Plan provided as Section 2 of the Draft Deconstruction Plan issued on December 10, 2004 and (ii) the companion plan prepared by TRC Environmental Corporation (TRC) entitled *Proposed Enhanced Exterior Air Monitoring Approach and Conceptual Design 130 Liberty Street* (October 8, 2004). Both of these documents were issued by the LMDC in December, 2004 for review and comment by federal, state, and local regulators and the general public. At the time of release, readers of the two companion plans were advised by LMDC that, due to their independent development, there were redundancies and a good deal of overlap in the two plans. For this reason, LMDC intended to revise the two programs to ensure that the monitoring programs were complementary and contained the necessary overlap.

6.2 Project Purpose and Objectives

The principal purpose of the air monitoring program is to monitor air quality in the vicinity of 130 Liberty Street during the deconstruction of the building on that property. The plan consists of monitoring of dust in the vicinity of the deconstruction site on both a real-time or continuous basis as well as a time-weighted or integrated basis.

Principal objectives of the program are as follows:

- Monitor dusts as PM_{10} and $PM_{2.5}$ on a real-time or continuous basis such that dust associated with the building deconstruction are maintained below target and trigger action levels.

- In the event that dust levels exceed target and trigger action levels, building deconstruction management personnel will be immediately notified so that all necessary corrective actions can be taken.

- Monitor PM_{10} and $PM_{2.5}$ on a time-weighted or 24-hour average basis to provide assurances that levels of respirable particulate matter associated with the deconstruction are below the 24 hour National Ambient Air Quality Standards (NAAQS) of 150 ug/m^3 and 65 ug/m^3, respectively.

- Collect particulate matter on a time-weighted or integrated basis such that samples are available for monitoring of target compounds potentially associated with World Trade Center dust (e.g., asbestos, lead).

- Compare measured concentrations of project target parameters to action levels established on a compound-specific basis. In the event that measured concentrations exceed any project-specific action level for one or more of these target compounds**,** appropriate corrective actions immediately will be taken.

A project timeline is provided as Figure 6-1.

6.3 Project Action Levels

A two tiered system will be in place during the entire term of the deconstruction project. This system includes use of both Target Air Quality Levels and USEPA Site Specific Trigger Levels for each of the target parameters. A summary listing of the Action Levels provided on a parameter-specific basis is shown in Table 6-1.

Table 6-1. Target Air Quality Levels and USEPA Site-SpecificTrigger Levels

Analyte	Target Air Quality Levels[1]	USEPA Site Specific Trigger Levels[2]
Metals		
Antimony	5 ug/m^3	14 ug/m^3
Barium	5 ug/m^3	5 ug/m^3
Beryllium	0.02 ug/m^3	0.2 ug/m^3
Cadmium	0.04 ug/m^3	2 ug/m^3
Chromium[3]	0.6 ug/m^3	0.6 ug/m^3
Copper	10 ug/m^3	100 ug/m^3
Lead	1.5 ug/m^3	5 ug/m^3
Manganese	0.5 ug/m^3	0.5 ug/m^3
Mercury (Total)	0.3 ug/m^3	3 ug/m^3
Nickel	0.2 ug/m^3	28 ug/m^3
Zinc	16 ug/m^3	160 ug/m^3
Particles and Dust		
Asbestos	0.0009 f/cc (PCME fibers)	70 S/mm^2 (TEM AHERA structures)
Particulate PM_{10} (24 hour average)	150 ug/m^3	150 ug/m^3
Particulate $PM_{2.5}$ (24 hour average)	40 ug/m^3	65 ug/m^3
Respirable Silica (crystalline)	10 ug/m^3	10 ug/m^3
Organics (semi-volatiles)		
Dioxins/Furans (2,3,7,8 – TCDD equivalent)	0.00025 ng/m^3	0.025 ng/m^3
PCB (total Aroclors)	0.12 ug/m^3	12 ug/m^3
PAH (benzo-a-pyrene equivalent)	0.034 ug/m^3	3.4 ug/m^3

[1]A cumulative average after the first week of sampling, except for $PM_{2.5}$ and PM_{10}.
[2]A 24-hour value.
[3]USEPA site-specific trigger level for hexavalent chromium used.

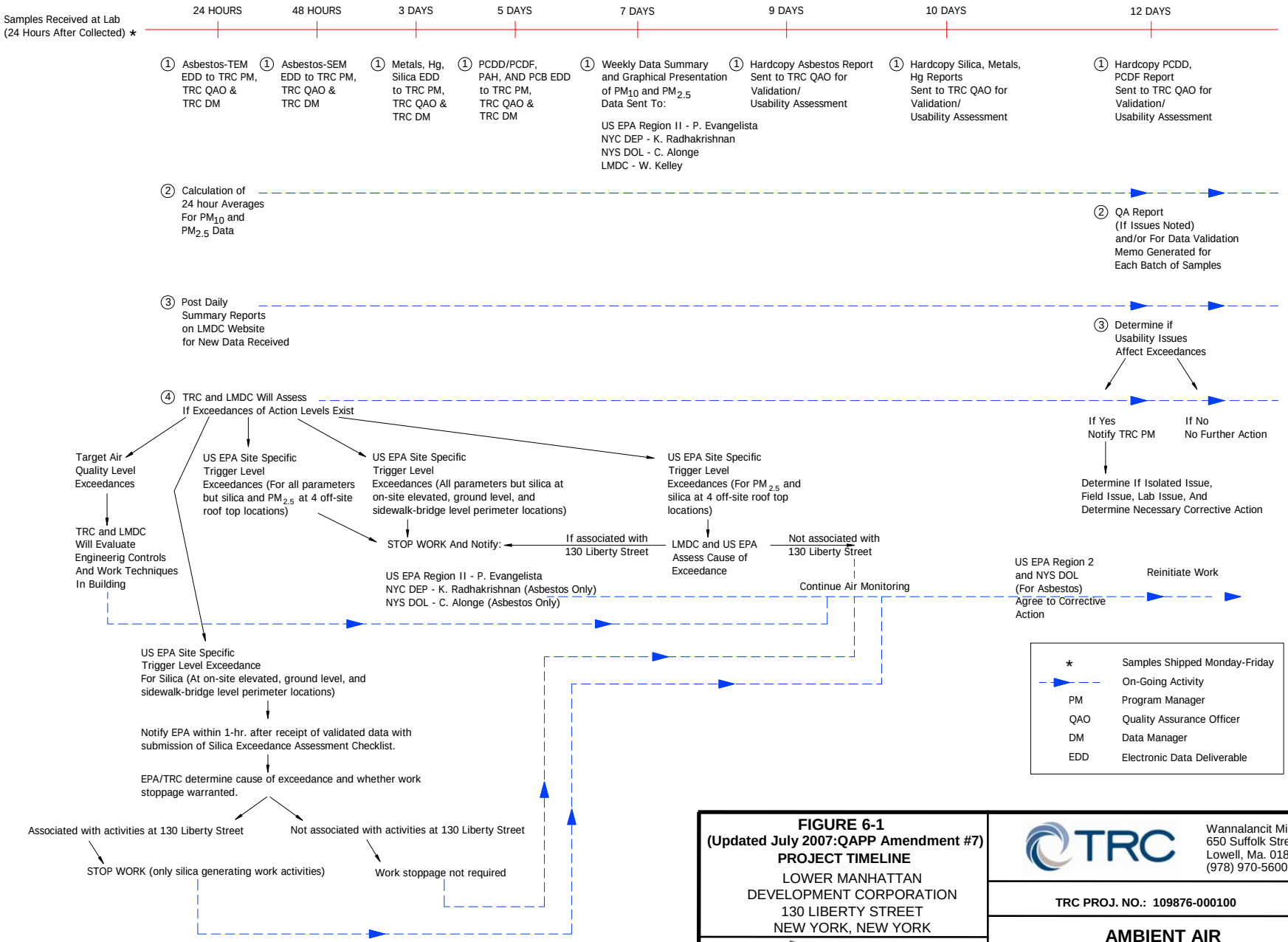

FIGURE 6-1
(Updated July 2007:QAPP Amendment #7)
PROJECT TIMELINE
LOWER MANHATTAN DEVELOPMENT CORPORATION
130 LIBERTY STREET
NEW YORK, NEW YORK

LMDC Lower Manhattan Development Corporation

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, Ma. 01854
(978) 970-5600

TRC PROJ. NO.: 109876-000100

AMBIENT AIR MONITORING PROGRAM

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6.3.1 Decisions Based on Project Action Levels

The following actions will be taken if there is an exceedance of any Target Air Quality Level. If there is an exceedance of both the Target Air Quality Level and USEPA Site Specific Trigger Level, actions associated with the USEPA Site Specific Trigger Level will govern. In the event that the deconstruction project is shut down on account of an exceedance of an air quality action level, monitoring for all parameters will continue. The purpose of the continuation of monitoring will be to demonstrate that concentrations have been restored to acceptable levels.

6.3.2 Target Air Quality Levels

6.3.2.1 Definitions of Exceedances

Any 24-hour $PM_{2.5}$ and PM_{10} value in excess of the Target Air Quality Level will be considered an "exceedance" and the actions described below will be taken.

During the first week of sampling, any sample of an analyte, other than $PM_{2.5}$ and PM_{10}, in excess of 3 times the Target Air Quality level for that analyte, unless superseded by a USEPA Site Specific Trigger Level, will be considered an exceedance and the actions described below will be taken.

Following the first week of sampling, a cumulative average will be established based initially on the first week's results, to which will be added daily values as results are received from the laboratory. A cumulative average value for any analyte other than $PM_{2.5}$ and PM_{10}, in excess of the relevant Target Air Quality Level will be considered an exceedance and the actions described below will be taken.

6.3.2.2 Actions Based on Exceedances

Exceedance at any of the twelve (12) monitoring locations will be handled as set forth in the August 2005 Air Monitoring Plan.

Exceedances of an established Target Air Quality Level for any analyte calculated as provided above will result in an evaluation of engineering controls and work techniques in the source area. The evaluation of engineering controls and work techniques shall determine whether: (i) negative pressure is being maintained in active work areas at the required levels (ii) there are breaches in the containment in active work areas, and (iii) there are any visible emissions from the containment areas. In addition, the evaluation will consider other potential sources contributing to or causing the exceedance.

6.3.3 USEPA Site Specific Trigger Levels

6.3.3.1 Definition of Exceedances

Any 24-hour value (eight-hour value in the case of asbestos and silica) in excess of the USEPA Site Specific Trigger Level will be considered an "exceedance" and the actions described below will be taken.

6.3.3.2 Actions Based on Exceedances

Exceedance of USEPA Site Specific Trigger Levels will result in a stoppage of work associated with the exceedance until an evaluation of emission controls is performed and corrective action is in place. The USEPA Site Specific Trigger Levels are applicable to individual sample results. If any of the individual sample results exceed an USEPA Site Specific Trigger Level, then notification must be made to the USEPA Region 2, NYCDEP and NYSDOL as well as LMDC and LMCCC. Work will be reinitiated once the USEPA Region 2 has agreed (and NYSDOL during the Abatement Phase in the case of asbestos exceedances) to the corrective action(s) proposed to prevent the potential for exceedances in future work and such corrective actions have been implemented. The only exception to the work stoppage requirement will be for an exceedance of the USEPA Site Specific Trigger Level for $PM_{2.5}$ at one of the off-site roof top locations. If the USEPA Site Specific Trigger level for $PM_{2.5}$ is exceeded at an off-site roof top location, regulator notifications as described above will be made and an assessment, with the active involvement of the USEPA, will be performed to determine if the exceedance was due to an off-site or regional condition unrelated to 130 Liberty Street work. If the assessment determines the exceedance to be associated with 130 Liberty Street, the exceedance will result in a stoppage of work associated with the exceedance until an evaluation of emission controls is performed and corrective action acceptable to USEPA is in place.

LMDC's consultant will monitor PM_{10} and $PM_{2.5}$ at each station in the network on a continuous basis. These data will be reviewed on a routine basis during the course of each 24 hour monitoring period and used to alert LMDC of any potential exceedances of 24 hour action levels established for these parameters. Corrective actions will be taken as needed during the course of the work when warranted from review of the continuous monitoring data.

7.0 PROJECT/TASK DESCRIPTION

This section provides a general overview of the activities that will be performed and how and when they will be performed. Specific details for individual project activities will be discussed in later sections of the QAPP.

7.1 Project Overview

Based upon the companion document *Ambient Air Monitoring Program for the 130 Liberty Street Deconstruction Project*, August 2005, the primary objective of this investigation is to monitor air quality in the vicinity of 130 Liberty Street during the deconstruction of the building on that property. The plan consists of monitoring of dust in the vicinity of the deconstruction site on both a real-time or continuous basis as well as a time-weighted or integrated basis. These objectives will be satisfied by the sampling and analysis program outlined in Sections 7.1.1 and 7.1.2. Laboratories performing these analyses are summarized in Section 4.3.4 of the QAPP.

There are multiple aspects and levels to the overall air monitoring program proposed for the deconstruction of 130 Liberty Street. The following is a brief summary of the three (3) components or levels of air monitoring proposed for the project:

- "Level 1": The subcontractors performing aspects of Phase I deconstruction work (largely interior, non-structural efforts) will be responsible for collecting air samples on their personnel directly performing various work activities to determine airborne levels of contaminants potentially generated by the work at the source as required by OSHA.

- "Level 2": The next layer of sampling is for ICR 56 compliance. ICR 56-required sampling will entail sampling the ambient air inside the building during Phase I work outside of work areas, at the personnel and waste load out decontamination stations and other locations. In addition, samples will be collected, as required, outside the building within ten (10) feet of the negative pressure ventilation exhaust. This sampling is further described in the Asbestos and COPC Abatement and Removal Plan sections of the Deconstruction Plan (August, 2005).

- "Level 3": Beyond that, there will be continuous monitoring of the exterior ambient air within the site boundaries and at specific elevated locations, as described in the Ambient Air Monitoring Program (August 2005). This QAPP further defines the technical approach and provides the anticipated schedule of activities for the "Level 3" air monitoring. The other two "levels" of air monitoring outlined above are documented in the Health and Safety Plan and The Asbestos and COPC Abatement and Removal Plan sections of the Deconstruction Plan (August, 2005).

7.1.1 Sampling Tasks

Sampling phases will consist of the following segments: Background, Phase I - Preparation Phase and Phase I – Asbestos and COPC Abatement, and Phase II - Structural Deconstruction. General descriptions of the work included in each phase are presented in the *Ambient Air Monitoring Program for the 130 Liberty Street Deconstruction Project*, August 2005. Sampling methods, sampling QC, sample handling and custody are discussed in other sections of this QAPP. Tables 7-1a, 7-1b, and 7-1c provide a general summary of target parameters, and numbers of field samples and QC samples expected to be collected on a weekly basis for each phase of the program. Tables 7-2 and 7-3 provide a summary of sampling frequencies after the background phase has been completed. Sampling locations are noted on Figures 7-1 and 7-2. Table 7-4 summarizes the sampling locations and the expected use of the data at each location. Photographs of each site are included in Attachment A.

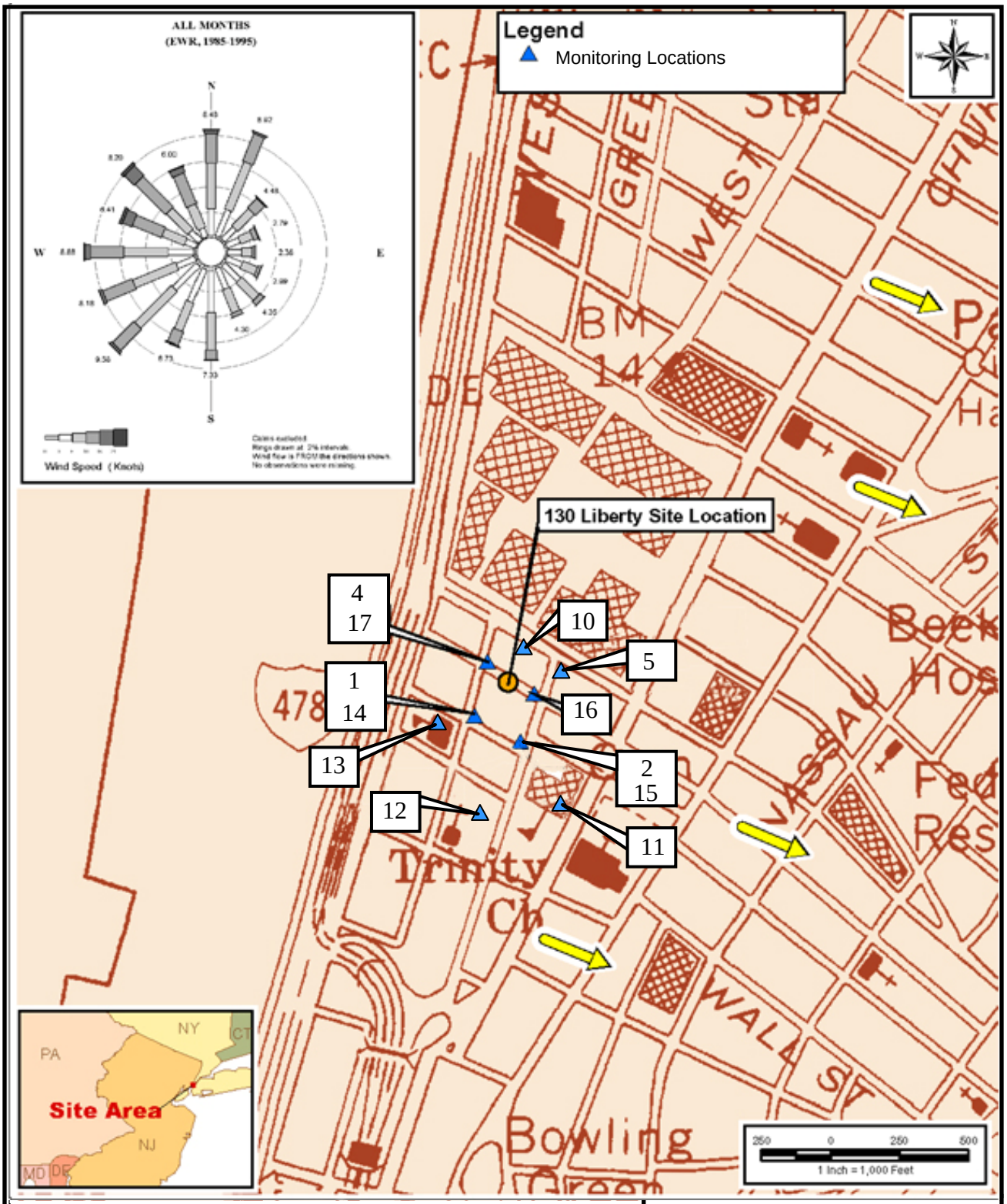
Background

The background ambient air sampling period will consist of two weeks (14 consecutive calendar days) of monitoring performed immediately prior to the start of Phase I - Preparation Phase activities. Samples will be collected at five (5) stations (4 ground level and 1 roof top location located on the roof of the fire house [FDNY 10-10 House]) in the monitoring network. All target parameters will be collected over a 24-hour integrated period with the exception of asbestos, silica, PM_{10}, $PM_{2.5}$, and mercury. Mercury will be monitored utilizing a direct read mercury analyzer. PM_{10} and $PM_{2.5}$ will be monitored continuously at each of the five (5) sites while asbestos and silica measurements will be taken at a frequency of once per work shift at each of the sites.

Phase I: Preparation and Asbestos and COPC Abatement and Removal

During the Phase I (abatement phase) air monitoring will take place at twelve (12) stations each day. During the first three (3) days only of Phase I Abatement work, samples will be collected and analyzed for semivolatile organics to include PCDDs/PCDFs, PAHs and PCBs. After this first three (3) day period, sampling for semivolatile organics will be reduced to a once per week frequency employing the entire station network. One day per week on a rotating basis (week #1 Monday, week #2 Tuesday, etc.) samples will be collected at every station in the network. The schedule will be repeated until project completion.

The semivolatile organic samples collected employing this weekly sampling frequency will not be processed for analyses; rather they will be placed in archival storage at the laboratory. A single set of samples will be selected from each weekly sampling event to undergo analyses for PCDDs/PCDs, PAHs and PCBs. The station with the highest 24-hour average PM_{10} concentration ($\mu g/m^3$) recorded with a collocated organic sample each week will be selected for semivolatile organic analyses.



LEGEND:

AVERAGE WIND DIRECTION

SOURCE:
USGS 7.5 Minute Series (Topographic) Quadrangles: Jersey City, NJ-NY
Wind Roses for Newark International Airport, 1985-1995

PROJECT:
130 LIBERTY STREET
DECONSTRUCTION PROJECT

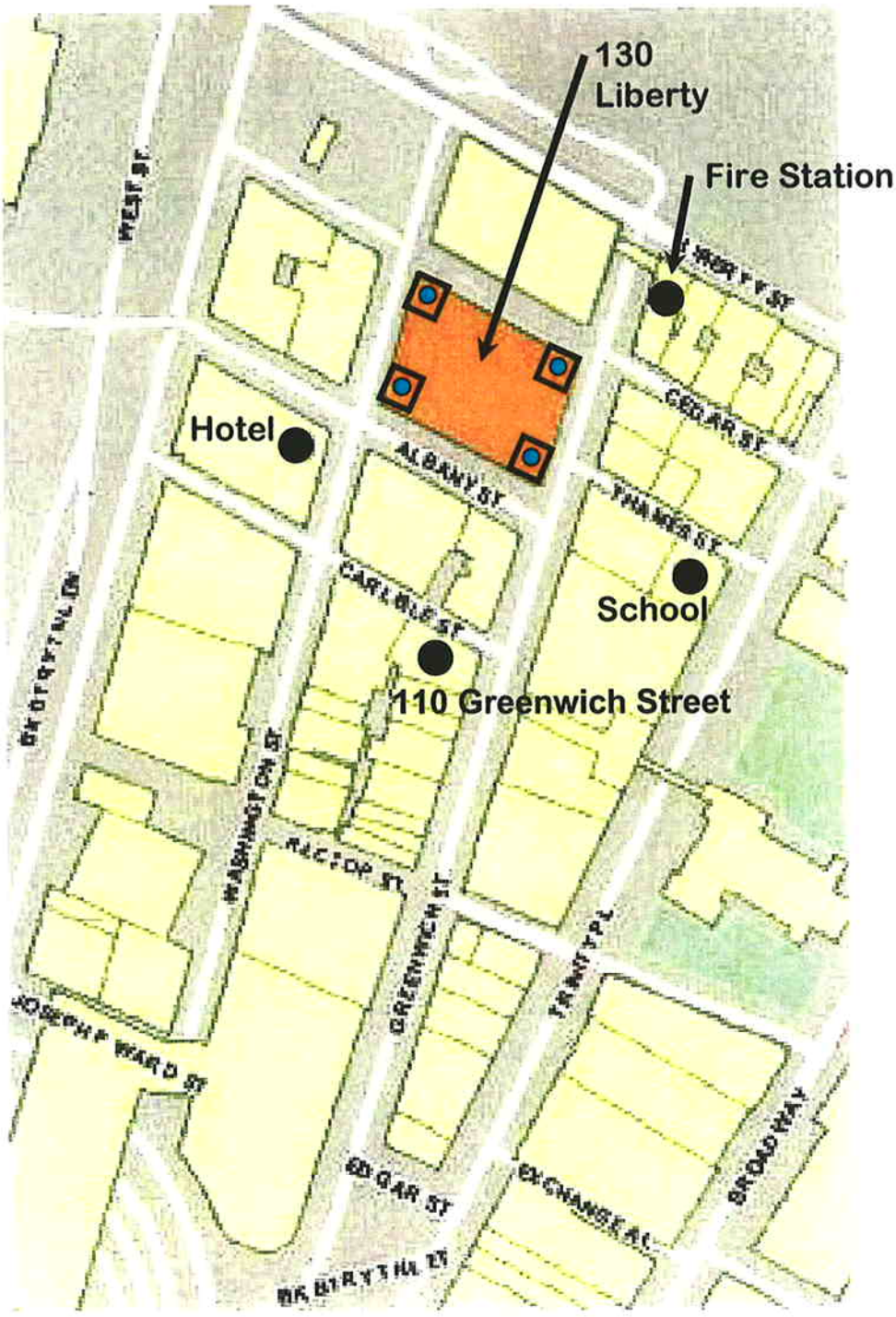
Site Location Map for
Ambient Air Monitoring Locations
130 Liberty Street
New York, New York
Updated June 2007: QAPP Amendment #7

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, Ma. 01854
(978) 970-5600

DRAWN: MAN
CHECKED: GH
SCALE: AS SHOWN
Date 6/26/07

FIGURE 7-1

T:\E_CAD\109876\siteppt2a



Legend:

- Roof top Stations (Off Site)
- Roof top and Scaffolding Stations-130 Liberty Street.

Network Schematic-Locations of Off-Site Elevated Roof -Top Stations and "Floating" Stations on Scaffolding
130 Liberty Street
New York, New York

TRC
Boott Mills South
116 John Street
Lowell, Massachusetts 01852
978-970-5600

DRAWN:MAN
CHECKED: GH
SCALE: AS SHOWN
Date 8/12/05

FIGURE 7-2

48970sampleloc1

Table 7-1a. Background Phase – Two Weeks (14 Consecutive Days)

	No. of Locations Sampled Per Day	No. of Locations Analyzed Per Week	No. of Field Duplicates Collected Per Week	No. of Field/Trip Blanks Collected Per Day	Estimated No. of Samples to Lab Per Day	Estimated No. of Samples to Lab Per Week
Metals	5	5	1	1	6	43
Mercury – Total	5	5	1	1	6	43
Asbestos	5	5	1	1	6	43
PM_{10} -reference	1	1	1	1	1	8
$PM_{2.5}$ -reference	1	1	1	1	1	8
Silica	5	5	1	1	6	43
Dioxins/Furans	5	5	1	1	6	43
PCBs	5	5	1	1	6	43
PAHs	5	5	1	1	6	43

Table 7-1b. Phase I: Preparation Phase & Asbestos and COPC Abatement and Removal

	No. of Locations Sampled Per Day (Preparation Phase)	No. of Locations Sampled Per Day (1st 3 Days of Phase I)	No. of Locations Sampled Per Day (After 1st 3 Days of Phase I)	No. of Field Duplicates Collected Per Week	No. of Field/Trip Blanks Collected Per Day	Estimated No. of Samples to Lab Per Day	Estimated No. of Samples to Lab Per Week (After 1st 3 Days)
Metals	12	12	12	1	1	13	92
Mercury – Total	12	12	12	1	1	13	92
Asbestos	12	12	12	1	1	13	92
PM_{10} -reference	1	1	1	1	1	1	9
$PM_{2.5}$ -reference	1	1	1	1	1	1	9
Silica	12	12	12	1	1	13	92
Dioxins/Furans	12	12	1	1 (+)	1	13 (*)	3
PCBs	12	12	1	1 (+)	1	13 (*)	3
PAHs	12	12	1	1 (+)	1	13 (*)	3

(*) Thirteen (13) samples per day for first 3 days of Phase I; followed by 1 location per week based on highest PM_{10} concentrations.

(+) Field duplicates may not be consistently collected at a frequency of 1/week during Phases I and II as the location selected for analysis will be dictated by PM_{10} measurements.

Table 7-1c. Phase II – Structural Deconstruction

	No. of Locations Sampled Per Day (Preparation Phase)	No. of Locations Sampled Per Day (1st 3 Days of Phase I)	No. of Locations Sampled Per Day (After 1st 3 Days of Phase I)	No. of Field Duplicates Collected Per Week	No. of Field/Trip Blanks Collected Per Day	Estimated No. of Samples to Lab Per Day	Estimated No. of Samples to Lab Per Week (After 1st 3 Days)
Metals	12	12	12	1	1	13	92
Mercury – Total	12	12	12	1	1	13	92
Asbestos	12	12	12	1	1	13	92
PM_{10} -reference	1	1	1	1	1	1	9
$PM_{2.5}$ -reference	1	1	1	1	1	1	9
Silica	12	12	12	1	1	13	92
Dioxins/Furans	12	12	1	1 (+)	1	13 (*)	3
PCBs	12	12	1	1 (+)	1	13 (*)	3
PAHs	12	12	1	1 (+)	1	13 (*)	3

(*) Thirteen (13) samples per day for first 3 days of Phase I; followed by 1 location per week based on highest PM_{10} concentrations.

(+) Field duplicates may not be consistently collected at a frequency of 1/week during Phases I and II as the location selected for analysis will be dictated by PM_{10} measurements.

Table 7-2. Phase I: Preparation Phase & Asbestos and COPC Abatement and Removal Sampling and Analysis Summary

Location	Parameter(s)	Sample Frequency	Analysis Method
Site Area	Mercury (vapor/gas)	Each Day	Lumex, portable mercury analyzer
Site Area	Visible dust emissions	Each Day	Visual observation
Ground/Street Level (4 Locations)	1. Asbestos 2. Silica	Each Day (asbestos and silica are sampled during work shift)	1. TEM/SEM 2. XRD
	3. Metals 4. PCDDs/PCDFs 5. PAHs 6. PCBs 7. Mercury (total)	Each Day (24 hr. Basis)	3. ICP/MS 4. HRGC/HRMS 5. GC/MS 6. GC/ECD 7. IodatedCarbon Trap/CVAFS
	8. PM_{10} 9. $PM_{2.5}$	Continuously "Real-Time" Each Day (PM_{10} and $PM_{2.5}$ on 24 hour basis at each location; PM_{10} and $PM_{2.5}$ reference sampler at 1 location per day on 24-hour basis with location changed monthly)	8. EBAM/Gravimetric 9. EBAM/Gravimetric
Roof Top and Scaffolding[2] (4 locations on roof top and 4 locations on scaffolding)	1. Asbestos 2. Silica	Each Day (asbestos and silica are sampled during work shift)	1. TEM/SEM 2. XRD
	3. Metals 4. PCDDs/PCDFs 5. PAHs 6. PCBs 7. Mercury (total)	Each Day (24 hr. Basis)	3. ICP/MS 4. HRGC/HRMS 5. GC/MS 6. GC/ECD 7. Iodated Carbon Trap/CVAFS
	8. PM_{10} 9. $PM_{2.5}$	Continuously "Real-Time" Each Day (PM_{10} and $PM_{2.5}$ on 24 hour basis at each location; PM_{10} and $PM_{2.5}$ reference sampler at 1 location per day on 24-hour basis with location changed monthly)	8. EBAM/Gravimetric 9. EBAM/Gravimetric
Roof Top Location	Meteorological Monitoring[1]	Continuously "Real-Time" Each Day	

[1]Meteorological monitoring will include the following parameters: wind speed, wind direction, and ambient temperature.

[2]If Phase I Asbestos and COPC Abatement proceeds below the scaffold monitors, then additional air monitoring for metals utilizing NIOSH methods will be conducted at the exhaust manifolds on the lowest elevation of the work area grouping.

Table 7-3. Phase II – Structural Deconstruction Phase Sampling and Analysis Summary

Location	Parameter(s)	Sample Frequency	Analysis Method
Site Area	Mercury (vapor/gas)	Each Day	Lumex, portable mercury analyzer
Site Area	Visible dust emissions	Each Day	Visual observation
Ground/Street Level (4 Locations)	1. Asbestos 2. Silica	Each Day (asbestos and silica are sampled during work shift)	1. TEM/SEM 2. XRD
	3. Metals 4. PCDDs/PCDFs 5. PAHs 6. PCBs 7. Mercury (total)	Each Day (24 hr. Basis)	3. ICP/MS 4. HRGC/HRMS 5. GC/MS 6. GC/ECD 7. Iodated Carbon Trap/CVAFS
	8. PM_{10} 9. $PM_{2.5}$	Continuously "Real-Time" Each Day (PM_{10} and $PM_{2.5}$ on 24 hour basis at each location; PM_{10} and $PM_{2.5}$ reference sampler at 1 location per day on 24-hour basis with location changed monthly)	8. EBAM/Gravimetric 9. EBAM/Gravimetric
Roof Top and Scaffolding[2] (4 locations on roof top and 4 locations on scaffolding)	1. Asbestos 2. Silica	Each Day (asbestos and silica are sampled during work shift)	1. TEM/SEM 2. XRD
	3. Metals 4. PCDDs/PCDFs 5. PAHs 6. PCBs 7. Mercury (total)	Each Day (24 hr. Basis)	3. ICP/MS 4. HRGC/HRMS 5. GC/MS 6. GC/ECD 7. Iodated Carbon Trap/CVAFS
	8. PM_{10} 9. $PM_{2.5}$	Continuously "Real-Time" Each Day (PM_{10} and $PM_{2.5}$ on 24 hour basis at each location; PM_{10} and $PM_{2.5}$ reference sampler at 1 location per day on 24-hour basis with location changed monthly)	8. EBAM/Gravimetric 9. EBAM/Gravimetric
Roof Top Location	Meteorological Monitoring[1]	Continuously "Real-Time" Each Day	

[1]Meteorological monitoring will include the following parameters: wind speed, wind direction, and ambient temperature.

[2] If Phase I Asbestos and COPC Abatement proceeds below the scaffold monitors, then additional air monitoring for metals utilizing NIOSH methods will be conducted at the exhaust manifolds on the lowest elevation of the work area grouping.

Table 7-4. Summary of Relevant Information-Sampling Locations

Site Location	Direction from 130 Liberty Street	Upwind or Downwind	Conformance to EPA/ACOE Siting Criteria	Expected Use of Data
Ground Level – Washington St /Albany Street	Southwest Corner	Predominantly Upwind	Does not Meet Building /Roadway Setback Distances	Represents Primarily Upwind/Background Contributions; Also Represents Downwind Contributions Some % of the Time.
Ground Level-Albany St/Greenwich St	Southeast Corner	Predominantly Downwind	Does not Meet Building /Roadway Setback Distances	Represents Primarily Downwind Contributions; Also Represents Upwind /Background Contributions Some % of the Time.
Ground Level-Greenwich St	Northeast Corner	Predominantly Downwind	Does not Meet Building /Roadway Setback Distances	Represents Primarily Downwind Contributions; Also Represents Upwind /Background Contributions Some % of the Time.
Ground Level-Washington St/Cedar St.	Northwest Corner	Predominantly Upwind	Does not Meet Building /Roadway Setback Distances	Represents Primarily Upwind/Background Contributions; Also Represents Downwind Contributions Some % of the Time.
Scaffolding at Building Corner; Floating Elevation	Northwest Corner	Predominantly Upwind	Does not Meet Building Setback Distances	Represents Primarily Upwind/Background Contributions; Also Represents Downwind Contributions Some % of the Time. Also Represents Any Emissions in the Immediate Vicinity of the Scaffolding Monitoring Station at Elevation.
Scaffolding at Building Corner; Floating Elevation	Southwest Corner	Predominantly Upwind	Does not Meet Building Setback Distances	Represents Primarily Upwind/Background Contributions; Also Represents Downwind Contributions Some % of the Time. Also Represents Any Emissions in the Immediate Vicinity of the Scaffolding Monitoring Station at Elevation.

Table 7-4. Summary of Relevant Information-Sampling Locations

Site Location	Direction from 130 Liberty Street	Upwind or Downwind	Conformance to EPA/ACOE Siting Criteria	Expected Use of Data
Scaffolding at Building Corner; Floating Elevation	Northeast Corner	Predominantly Downwind	Does not Meet Building Setback Distances	Represents Primarily Downwind Contributions; Also Represents Upwind/Background Contributions Some % of the Time. Also Represents Any Emissions in the Immediate Vicinity of the Scaffolding Monitoring Station at Elevation.
Scaffolding at Building Corner; Floating Elevation	Southeast Corner	Predominantly Downwind	Does not Meet Building Setback Distances	Represents Primarily Downwind Contributions; Also Represents Upwind/Background Contributions Some % of the Time. Also Represents Any Emissions in the Immediate Vicinity of the Scaffolding Monitoring Station at Elevation.
Roof Top Off Site 124 Liberty St-FDNY 10-10 House	Northeast	Predominantly Downwind	May Not Meet Setback Distance Criteria for Roof Placement	Represents Primarily Downwind Contributions; Also Represents Upwind/Background Contributions Some % of the Time.
Roof Top Off Site-90 Trinity Place – School	Southeast	Predominantly Downwind	May Not Meet Setback Distance Criteria for Roof Placement	Represents Primarily Downwind Contributions; Also Represents Upwind/Background Contributions Some % of the Time.
Roof Top Off Site- 85 West St-Marriott Hotel	Southwest	Predominantly Upwind	May Not Meet Setback Distance Criteria for Roof Placement	Represents Primarily Upwind/Background Contributions; Also Represents Downwind Contributions Some % of the Time.
Roof Top Off Site- 110 Greenwich	South	Predominantly Downwind	May Not Meet Setback Distance Criteria for Roof Placement	Represents Primarily Downwind Contributions; Also Represents Upwind/Background Contributions Some % of the Time.

Phase II – Structural Deconstruction

During Phase II of the deconstruction project, air monitoring will take place at twelve (12) stations each day. During the first three (3) days only of Phase II, samples will be collected and analyzed for semivolatile organics to include PCDDs/PCDFs, PAHs and PCBs. After this first three (3) day period, sampling for semivolatile organics will be reduced to a once per week frequency employing the entire station network. One day per week on a rotating basis (week #1 Monday, week #2 Tuesday, etc.) samples will be collected at every station in the network. The schedule will be repeated until project completion.

The semivolatile organic samples collected employing this weekly sampling frequency will not be processed for analyses; rather they will be placed in archival storage at the laboratory. A single set of samples will be selected from each weekly sampling event to undergo analyses for PCDDs/PCDFs, PAHs and PCBs. This sample set will be selected after consideration of the PM_{10} data corresponding to the sites and days where organic samples were collected. The station with the highest 24-hour average PM_{10} concentration ($\mu g/m^3$) recorded with a collocated organic sample each week will be selected for analyses.

Monitoring will cease at project completion pursuant to completion of deconstruction plan activities.

7.1.2 Analytical Tasks

In February 2002, a multi-agency task force headed by the USEPA was formed to evaluate indoor environments for the presence of contaminants related to the WTC terrorist attacks that might pose long-term health risks to local residents. As part of this evaluation, a task force sub-committee was established to identify Contaminants of Potential Concern (COPC Committee) that are likely associated with the WTC disaster and establish health-based benchmarks for those contaminants in support of planned residential cleanup efforts in Lower Manhattan.

In addition, a number of other studies conducted by USEPA (EPA/600/R-03/142 December 2003) and work performed by Louis Berger Group were examined as a means of establishing a listing of target parameters appropriate to satisfy the purpose and objectives of the current deconstruction project. These objectives include monitoring of dust potentially related to the deconstruction as well as identifying levels of COPCs associated with the materials at 130 Liberty Street. In this manner the deconstruction project can proceed while providing an ample margin of safety for human health and the environment in the vicinity of the project site.

Based upon these criteria, the following target parameters were selected for inclusion in the monitoring program:

- PM_{10}-Respirable Particulate
- $PM_{2.5}$-Respirable Particulate
- Asbestos

- Crystalline Silica
- PCDDs/PCDFs
- PAHs
- PCBs
- Metals (antimony, barium, beryllium, cadmium, chromium, copper, lead, mercury [gaseous and total] manganese, nickel and zinc).

The analyses of asbestos, crystalline silica, PCDDs/PCDFs, PAHs, PCBs, metals, particulate bound mercury, PM_{10} 24-hour reference samples, and $PM_{2.5}$ 24-hour reference samples will be performed by fixed laboratories. Field analyses during this investigation will include PM_{10}-Respirable Particulate, $PM_{2.5}$-Respirable Particulate, and gaseous mercury. The data produced from all analyses will be evaluated and used.

8.0 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

This section provides an overview of the environmental decisions that need to be made and the level of data quality needed to ensure that these decisions are based on sound scientific data.

8.1 Project Quality Objectives

As discussed in Section 6.2, the principal objective of the air monitoring program is to monitor air quality in the vicinity of 130 Liberty Street during the deconstruction of the building on that property. This objective will be satisfied by the sampling and analysis program outlined in Tables 7-1a, 7-1b, 7-1c, 7-2, 7-3, and 7-4. These tables outline the data needs by type, quantity, and quality.

The type of data needed to meet the project quality objectives (PQOs) includes the required contaminants of concern, concentration levels, media to be sampled, analysis type, and appropriate sampling techniques. These are detailed on Tables 7-1a through 7-1c, 7-2, 7-3, 7-4, and 8-1 and in Section 10.0. The quantity of data needed to meet the PQOs includes the number of samples for each analytical parameter of each media and a definition of the project boundaries. The first of these items is detailed on Tables 7-1a through 7-1c. The second of these items is dictated by the *Ambient Air Monitoring Program for the 130 Liberty Street Deconstruction Project,* August 2005. The quality of data needed to achieve the PQOs includes the necessary data quality indicators (precision, accuracy, representativeness, comparability, completeness, selectivity, and sensitivity) required of each analytical parameter used for each media sampled. The limits set on each of these items are referred to as measurement performance criteria and define the quality of data generated. All measurement performance criteria have been established for each parameter in order to ensure the data are sound, highly defensible, and with quantitation limits significantly below project action levels.

The type, quantity, and quality of data needed to achieve the objectives listed above were predetermined. The COCs are outlined in Table 8-1 and include the quantitation limits and associated project action levels for each contaminant of concern. This table has been completed for each parameter.

In general, the proposed analytical methodologies will be able to achieve the PQOs. That is, the analytical methodologies are generally capable of detecting the target analytes well below the applicable action limit. These methods provide data of known quality and can be used for the objectives of this program. However, in order to ensure that the analytical methodologies are capable of achieving the data quality objectives, measurement performance criteria have been set for the analytical measurements in terms of accuracy, precision, representativeness, completeness, sensitivity, selectivity, and comparability.

Table 8-1. Comparison of Laboratory Quantitation Limits with Project Action Levels

Parameter	Estimated Volume to be Collected	Laboratory Quantitation Limits (QLs)		Project Action Levels	
				Target Air Quality Level	USEPA Site-Specific Trigger Levels
Metals					
Antimony	1440 m^3	2.4 µg	1.67 x 10^{-3} µg/m^3	5 µg/m^3	14 µg/m^3
Barium	1440 m^3	120 µg	0.083 µg/m^3	5 µg/m^3	5 µg/m^3
Beryllium	1440 m^3	1.2 µg	8.33 x 10^{-4} µg/m^3	0.02 µg/m^3	0.2 µg/m^3
Cadmium	1440 m^3	1.2 µg	8.33 x 10^{-4} µg/m^3	0.04 µg/m^3	2 µg/m^3
Chromium[3]	1440 m^3	12 µg	8.33 x 10^{-3} µg/m^3	0.6 µg/m^3	0.6 µg/m^3
Copper	1440 m^3	6 µg	4.17 x 10^{-3}µg/m^3	10 µg/m^3	100 µg/m^3
Lead	1440 m^3	1.2 µg	8.33 x 10^{-4} µg/m^3	1.5 µg/m^3	5 µg/m^3
Manganese	1440 m^3	6 µg	4.17 x 10^{-3}µg/m^3	0.5 µg/m^3	0.5 µg/m^3
Mercury	0.576 m^3	0.015 µg	0.026 µg/m^3	0.3 µg/m^3	3 µg/m^3
Nickel	1440 m^3	6 µg	4.17 x 10^{-3}µg/m^3	0.2 µg/m^3	28 µg/m^3
Zinc	1440 m^3	24 µg	0.0167 µg/m^3	16 µg/m^3	160 µg/m^3
Particles and Dust					
Asbestos	2.88 m^3		0.002 s/cm^3	0.0009 f/cm^3 (PCME fibers)	70 S/mm^2 (TEM AHERA structures)
Particulate PM_{10} (24 hour avg.-reference)	24 m^3	10 µg	0.42 µg/m^3	150 µg/m^3	150 µg/m^3
Particulate $PM_{2.5}$ (24 hour avg.-reference)	24 m^3	10 µg	0.42 µg/m^3	40 µg/m^3	65 µg/m^3
Respirable Silica (crystalline)	1.0 m^3	5 µg	5 µg/m^3 (2)	10 µg/m^3	10 µg/m^3
Dioxins/Furans					
Dioxin TEQ	288 m^3	100.2 pg	3.48 x 10^{-4} (1) ng/m^3	0.00025 ng/m^3	0.025 ng/m^3
2,3,7,8-TCDD	288 m^3	10 pg	3.47 x 10^{-5} ng/m^3	NA	NA
1,2,3,7,8-PeCDD	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
1,2,3,4,7,8-HxCDD	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
1,2,3,6,7,8-HxCDD	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
1,2,3,7,8,9-HxCDD	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
1,2,3,4,6,7,8-HpCDD	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
OCDD	288 m^3	100 pg	3.47 x 10^{-5} ng/m^3	NA	NA
2,3,7,8-TCDF	288 m^3	10 pg	3.47 x 10^{-5} ng/m^3	NA	NA
1,2,3,7,8-PeCDF	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
2,3,4,7,8-PeCDF	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
1,2,3,4,7,8-HxCDF	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA

Table 8-1. Comparison of Laboratory Quantitation Limits with Project Action Levels

Parameter	Estimated Volume to be Collected	Laboratory Quantitation Limits (QLs)		Project Action Levels	
				Target Air Quality Level	USEPA Site-Specific Trigger Levels
1,2,3,6,7,8-HxCDF	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
2,3,4,6,7,8-HxCDF	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
1,2,3,7,8,9-HxCDF	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
1,2,3,4,6,7,8-HpCDF	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
1,2,3,4,7,8,9-HpCDF	288 m^3	50 pg	1.74 x 10^{-4} ng/m^3	NA	NA
OCDF	288 m^3	100 pg	3.47 x 10^{-5} ng/m^3	NA	NA
PCB Aroclors					
Aroclor 1016	7.2 m^3	0.1 µg	0.014 µg/m^3	0.12 µg/m^3	12 µg/m^3
Aroclor 1221	7.2 m^3	0.1 µg	0.014 µg/m^3	0.12 µg/m^3	12 µg/m^3
Aroclor 1232	7.2 m^3	0.1 µg	0.014 µg/m^3	0.12 µg/m^3	12 µg/m^3
Aroclor 1242	7.2 m^3	0.1 µg	0.014 µg/m^3	0.12 µg/m^3	12 µg/m^3
Aroclor 1248	7.2 m^3	0.1 µg	0.014 µg/m^3	0.12 µg/m^3	12 µg/m^3
Aroclor 1254	7.2 m^3	0.1 µg	0.014 µg/m^3	0.12 µg/m^3	12 µg/m^3
Aroclor 1260	7.2 m^3	0.1 µg	0.014 µg/m^3	0.12 µg/m^3	12 µg/m^3
Total PCBs	7.2 m^3	0.7 µg	0.098 µg/m^3	0.12 µg/m^3	12 µg/m^3
Polynuclear Aromatic Hydrocarbons					
PAH BAP equivalent	288 m^3	2.31 µg	8.02 x 10^{-3} µg/m^3	0.034 µg/m^3	3.4 µg/m^3
Benzo(a)anthracene	288 m^3	1 µg	3.47 x 10^{-3} µg/m^3	NA	NA
Chrysene	288 m^3	1 µg	3.47 x 10^{-3} µg/m^3	NA	NA
Benzo(b)fluoranthene	288 m^3	1 µg	3.47 x 10^{-3} µg/m^3	NA	NA
Benzo(k)fluoranthene	288 m^3	1 µg	3.47 x 10^{-3} µg/m^3	NA	NA
Benzo(a)pyrene	288 m^3	1 µg	3.47 x 10^{-3} µg/m^3	NA	NA
Indeno(1,2,3-cd)pyrene	288 m^3	1 µg	3.47 x 10^{-3} µg/m^3	NA	NA
Dibenz(a,h)anthracene	288 m^3	1 µg	3.47 x 10^{-3} µg/m^3	NA	NA
Gaseous Mercury	NA	NA	0.002 µg/m^3	0.3 µg/m^3	3 µg/m^3

(1) QL is just below Target Air Quality Level; estimated detection limit (EDL) will be below Target Air Quality Level by greater factor (typically by a factor of 10).
(2) QL is representative of most common form of crystalline silica (alpha-quartz). The QL for the remaining two forms of crystalline silica (cristobalite and tridymite) are higher at 20 µg/m^3 but are rarely detected.
(3) USEPA Site-Specific Trigger level for hexavalent chromium used.

NA – Not applicable

The meteorological monitoring data will be used as follows:

- Wind Speed: Will be used to predict travel distance and travel time of contaminants and potential volatilization of contaminants from a work zone.

- Wind Direction: will be used to indicate the direction in which contaminants will be transported and used to designate locations as upwind, downwind, or crosswind relative to the potential contaminant emission source.

- Ambient Temperature: will be used in predicting the rise of a buoyant plume and in quantifying the degree of contaminant volatilization.

Wind rose plots displaying wind directions and speeds on a frequency basis will be generated daily. The data for these plots will be provided by the site specific meteorological station. These data will be used to make upwind and downwind station assignments during each 24 hour sampling event. These station assignments will be used as part of the investigations and/or corrective actions to take place in the event that exceedances are measured for any target parameter at any of the twelve (12) network stations.

The measurement performance criteria for the remaining parameters are further defined in this section. The number of samples needed for each parameter and matrix were defined in the *Ambient Air Monitoring Program for the 130 Liberty Street Deconstruction Project,* August 2005 and are summarized in Tables 7-1a, 7-1b, and 7-1c.

8.2 Measurement Performance Criteria

The 130 Liberty Street Ambient Air Monitoring Program is designed to produce data of the quality necessary to achieve PQOs and meet or exceed the minimum standard requirements for field and analytical methods. The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting which will provide results that are scientifically valid, and the levels of which are sufficient to meet PQOs. Specific procedures for sampling, chain of custody, laboratory and field instruments calibration, laboratory analysis, reporting of data, internal quality control, preventative maintenance of field and laboratory equipment, and corrective action are described in other sections of this QAPP. The purpose of this section is to state the specific, required QA objectives for accuracy, precision, representativeness, completeness, sensitivity, selectivity, and comparability.

Measurement performance criteria for precision, accuracy/bias, representativeness, completeness, sensitivity, quantitation limits, selectivity, and comparability have been established for each parameter and are summarized in Tables 8-2 through 8-9. These measures of performance are also referred to as Data Quality Indicators (DQIs) and are discussed in detail below.

8.2.1 Precision

Precision is the agreement among a set of replicate measurements without consideration of the "true" or accurate value: i.e., variability between measurements of the same material for the same analyte. Precision is measured in a variety of ways including statistically, such as calculating variance or standard deviation. The results of the background phase will be used to monitor overall precision (field and laboratory) and will be included as Attachment B to the QAPP, when available.

Field Precision Objectives

Field precision is assessed through the collection and measurement of collocated samples (also called field duplicates) which consist of a second sample in addition to the original field sample. In general, field duplicates will be collected at a frequency of once per week per analytical parameter. Precision will be measured through the calculation of relative percent difference (RPD). The resulting information will be used to assess sample homogeneity, spatial variability at the site, sample collection reproducibility, and analytical variability. Field duplicate RPDs must be $\leq$ 40. Field precision will be maintained by utilizing experienced/trained sampling crews and conducting field audits.

In addition, during the background phase of the program, the precision of the mercury sampling and analysis method will be tested. Ambient air samples will be collected at one location using a series of four iodated carbon traps prespiked (50 ng/trap) with mercury. These samples will provide data on the precision of the method under actual field sampling conditions. Following the background phase, one field spike will be performed every other week, alternating with the field duplicates.

Laboratory Precision Objectives

Precision in the laboratory is assessed through the calculation of RPD for duplicate preparation and analyses of laboratory control samples, or replicate injections of samples. Laboratory precision measures both sample preparation and analysis reproducibility. Precision control limits and frequency of precision measurements are provided in Tables 8-2 through 8-9.

8.2.2 Accuracy

Accuracy is the closeness of agreement between an observed value and an accepted reference value. The difference between the observed value and the reference value includes components of both systematic error (bias) and random error.

Table 8-2. Measurement Performance Criteria Table – Metals by ICP/MS

QC Sample or Activity	Frequency	Measurement Performance Criteria	Corrective Action	DQI
Field Duplicates	1/week	*RPD $\leq$ 40 when positive results for both samples are $\geq$ 5x QL *No situation where one result is detected at $\geq$ 5x QL and other result is not detected	Assess laboratory precision, and /or qualify data.	Precision-Overall
Laboratory Duplicates	1/prep batch	RPD < 20 if results are $\geq$ 5x QL	Qualify data.	Precision-Laboratory
Laboratory Control Sample	1/prep batch	Percent recoveries 75-125%	Determine cause of problem, reanalyze, and/or qualify data.	Accuracy/Bias
Laboratory Control Sample Duplicate	1/prep batch	Percent recoveries 75-125%; RPD < 20	Determine cause of problem, reanalyze, and/or qualify data.	Accuracy/Bias and Precision
Serial Dilution Analysis	1/batch	$\pm$ 10% of original result	Qualify data.	Accuracy/Bias
Interference Check Sample	1/8 hours	Percent recoveries 80-120%	Recalibrate and reanalyze and/or qualify data.	Accuracy/Bias
Calibration Blanks	1/10 samples	Absolute value of target metal must be < QL	Reclean, reanalyze, and/or qualify data.	Accuracy/Bias - Contamination
Preparation Blanks	1/prep batch	Absolute value of target metal must be < QL	Reclean, reanalyze, and/or qualify data.	Accuracy/Bias - Contamination
Field/Trip Blanks	1/day	Absolute value of target metal must be < QL	Reclean, reanalyze, and/or qualify data.	Accuracy/Bias - Contamination
Quartz Fiber Filter Media Cleaning Verification Check	1/batch	Absolute value of target metal must be < QL	Obtain new lot of media.	Accuracy/Bias - Contamination
Internal Standards	Every sample, blank, QC	Samples: 30-130% of IS calibration blank Calibration Standards: 80-120% of IS in calibration blank	Dilute sample 5x, add IS and reanalyze, and/or qualify data.	Accuracy/Bias
Instrument Tune	Daily, prior to calibration and sample analysis	Mass resolution < 1.0 amu at 10% peak height and mass calibration $\pm$ 0.1 amu from the expected value	Retune instrument, repeat tune solution and analysis.	Accuracy/Bias
Data Completeness Check	NA	Field 80%, Laboratory 95%	NA	Data Completeness

Reanalyze: refers to reanalysis of same digestate or QC sample.

Table 8-3. Measurement Performance Criteria Table – PAHs by GC/MS-SIM

QC Sample or Activity	Frequency	Measurement Performance Criteria	Corrective Action	DQI
Field Duplicates	1/week [1]	*RPD ≤ 40 when positive results for both samples are ≥ 5x QL *No situation where one result is detected at ≥ 5x QL and other result is not detected	Assess laboratory precision, and/or qualify data.	Precision-Overall
Internal Standards (extraction spike)	Every sample, blank, QC	Percent recoveries 25-150%	Reanalyze and/or qualify data.	Accuracy/Bias
Method Blanks	1/batch	No target compounds > QL	Reclean, reanalyze and/or qualify data.	Accuracy/Bias-Contamination
Field/Trip Blanks	1/day [2]	No target compounds > QL	Reclean, reanalyze, and/or qualify data.	Accuracy/Bias - Contamination
Laboratory Control Sample	1/batch	Percent recoveries 60-140%	Determine cause of problem, reanalyze, and/or qualify data.	Accuracy/Bias
Laboratory Control Sample Duplicate	1/batch	Percent recoveries 60-140%; RPDs < 50	Determine cause of problem, reanalyze, and/or qualify data.	Accuracy/Bias and Precision
Recovery Standards (pre-analysis spike)	Every sample, blank, QC	-50% to +100% of area counts in continuing calibration standard; ± 20 seconds of retention times in continuing calibration standard	Reanalyze and/or qualify data.	Accuracy/Bias
Field Spike (prior to sampling)-13C-fluorene at 1000 ng	Every Sample	Percent recoveries 60-120%	Reanalyze and/or qualify data.	Accuracy-Overall
Data Completeness Check	NA	Field 80%, Laboratory 95%	NA	Data Completeness
PUF/XAD Media Cleaning Verification Check	1/batch cleaned	No target compounds > QL	Reclean and retest media.	Accuracy/Bias-Contamination
PFTBA Tune	Every day, prior to sample analysis	Masses within 0.45 amu of target mass for masses 69, 219, and 264	Retune instrument, reanalyze PFK.	Accuracy/Bias

[1] Field duplicates may not be consistently collected at a frequency of 1/week during Phases I and II as the location selected for analysis will be dictated by PM_{10} measurements.
[2] Will be collected at a frequency of 1/day; during Phase I and II only 1 field/trip blank per week will be analyzed.
Reanalyze: refers to reanalysis of same extract.

Table 8-4. Measurement Performance Criteria Table – PCBs by GC/ECD

QC Sample or Activity	Frequency	Measurement Performance Criteria	Corrective Action	DQI
Field Duplicates	1/week[1]	*RPD ≤ 40 when positive results for both samples are ≥ 5x QL *No situation where one result is detected at ≥ 5x QL and other result is not detected	Assess laboratory precision, and/or qualify data.	Precision-Overall
Surrogates	Every sample, blank, QC	Percent recoveries TCMX and DBCP 60-120%	Reanalyze if both surrogates outside limits or one <10%, and/or qualify data.	Accuracy/Bias
Method Blanks	1/prep batch	No target compounds > QL	Reclean, reanalyze and/or qualify data.	Accuracy/Bias-Contamination
Field/Trip Blanks	1/day[2]	No target compounds > QL	Reclean, reanalyze, and/or qualify data.	Accuracy/Bias - Contamination
PUF Media Cleaning Verification Check	1/batch cleaned	No target compounds > QL	Reclean batch.	Accuracy/Bias-Contamination
Laboratory Control Sample	1/prep batch	Percent recoveries 70-130%	Determine cause of problem, reanalyze, and/or qualify data.	Accuracy/Bias
Laboratory Control Sample Duplicate	1/prep batch	Percent recoveries 70-130% RPD < 50	Determine cause of problem, reanalyze, and/or qualify data.	Accuracy/Bias and Precision
Dual Column Analysis	Every sample, blank, QC	%D between columns < 25	Narrate/flag data.	Precision
Data Completeness Check	NA	Field 80%, Laboratory 95%	NA	Data Completeness

[1]Field duplicates may not be consistently collected at a frequency of 1/week during Phases I and II as the location selected for analysis will be dictated by PM_{10} measurements.

[2]Will be collected at a frequency of 1/day; during Phase I and II only 1 field/trip blank per week will be analyzed.

Reanalyze: refers to reanalysis of same extract.

Table 8-5. Measurement Performance Criteria Table – PCDDs/PCDFs by HRGC/HRMS

QC Sample or Activity	Frequency	Measurement Performance Criteria	Corrective Action	DQI
Field Duplicates	1/week[2]	*RPD ≤ 40 when positive results for both samples are ≥ 5x QL *No situation where one result is detected at ≥ 5x QL and other result is not detected	Assess laboratory precision, and/or qualify data.	Precision-Overall
Extraction Standards (pre-extraction)	Every sample, blank, QC	Percent recoveries 50-120% for tetra-hexa congeners and 40-120% for hepta and octa congeners	Reanalyze and/or qualify data.	Accuracy/Bias
Field Spikes[1] (pre- sampling)	Every sample, blank, QC	Percent recoveries 70-130%	Reanalyze and/or qualify data.	Accuracy/Bias
Laboratory Control Sample (BCS3)	1/ batch (10 samples)	Percent differences between LCS RRF and ICAL RRF ≤ 20	Determine cause of problem, reanalyze, and/or qualify data.	Accuracy/Bias
	2/analytical sequence	RPD between 2 LCS analyses ≤ 20	Determine cause of problem, reanalyze, and/or qualify data.	Precision
Method Blanks	1/ batch	No target compounds > QL	Reclean, reanalyze and/or qualify data.	Accuracy/Bias-Contamination
Field/Trip Blanks	1/day[3]	No target compounds > QL	Reclean, reanalyze, and/or qualify data.	Accuracy/Bias - Contamination
PUF Media Cleaning Verification Check	1/batch cleaned	No target compounds > QL	Reclean and retest media.	Accuracy/Bias-Contamination
Recovery Standards	Every sample, blank, QC	Signal: noise ratio must be ≥ 10:1	Reanalyze and/or qualify data.	Accuracy/Bias
Data Completeness Check	NA	Field 80%, Laboratory 95%	NA	Data Completeness

[1]Includes the following compounds:
$^{37}Cl_4$-2,3,7,8-TCDD: 1.6ng
$^{13}C_{12}$-1,2,3,4,7-PeCDD: 4ng
$^{13}C_{12}$-1,2,3,4,6,-PeCDF: 4ng
$^{13}C_{12}$-1,2,3,4,6,9-HxCDF: 4ng
$^{13}C_{12}$-1,2,3,4,6,8,9-HpCDF: 4ng
[2]Field duplicates may not be consistently collected at a frequency of 1/week during Phases I and II as the location selected for analysis will be dictated by PM_{10} measurements.
[3]Will be collected at a frequency of 1/day; during Phase I and II only 1 field/trip blank per week will be analyzed.
Reanalyze: refers to reanalysis of same extract.

Table 8-6. Measurement Performance Criteria Table – Mercury by CVAFS

QC Sample or Activity	Frequency	Measurement Performance Criteria	Corrective Action	DQI
Field Duplicates[1]	1/every other week	*RPD $\leq$ 40 when positive results for both samples are $\geq$ 5x QL *No situation where one result is detected at $\geq$ 5x QL and other result is not detected	Assess laboratory precision, and/or qualify data.	Precision-Overall
Laboratory Control Sample	1/prep batch	Percent recoveries 80-120%	Determine cause of problem, reanalyze, and/or qualify data.	Accuracy/Bias
Method Blanks	1/prep batch	Mercury must be < 15 ng per trap	Reclean, reanalyze and/or qualify data.	Accuracy/Bias-Contamination
Calibration Blanks	1/10 samples	Mercury must be < 50 pg	Reclean, reanalyze and/or qualify data.	Accuracy/Bias-Contamination
Field Spikes[1]	4 spikes/ background phase followed by 1 spike/every other week	Percent recoveries 80-120%; %RSD $\leq$ 30 in background phase	Reanalyze and/or qualify data	Accuracy/Bias and Precision
Duplicate Injections	Every sample, blank, QC	RPDs must be < 10 when positive results for both injections are $\geq$ 5x QL	Reanalyze and/or qualify data.	Precision
Triplicate Injections	Every 10 samples	% RSD $\leq$ 10 when positive results for all injections are $\geq$ 5x QL	Reanalyze and/or qualify data.	Precision
Standard Additions	1/10 samples	Percent recoveries 85-115%	Recalibrate, reanalyze, and/or qualify data.	Accuracy/Bias
Breakthrough Check	1/location during background phase	Back half trap results must be < 2% of front half trap results or < 5ng per trap	Qualify data and/or change subsequent sampling volumes.	Accuracy/Bias
Field/Trip Blanks	1/day	Mercury must be < 15 ng per trap	Reclean, reanalyze and/or qualify data.	Accuracy/Bias-Contamination
Media Cleaning Verification Check	1/batch	Mercury must be < 15 ng per trap	Reclean and retest media.	Accuracy/Bias-Contamination
Data Completeness Check	NA	Field 80%, Laboratory 95%	NA	Data Completeness

[1]Collection of Field Duplicates and Field Spikes will be alternated on a weekly basis.
Reanalyze: refers to reanalysis of same digestate.

Table 8-7. Measurement Performance Criteria Table – Silica by XRD

QC Sample or Activity	Frequency	Measurement Performance Criteria	Corrective Action	DQI
Field Duplicates	1/week	*RPD ≤ 40 when positive results for both samples are ≥ 5x QL *No situation where one result is detected at ≥ 5x QL and other result is not detected	Assess laboratory precision, and/or qualify data.	Precision-Overall
Laboratory Duplicates	1/ batch	RPD < 20 if results are ≥ 5x detection limit	Reanalyze and qualify data.	Precision
Method Blanks	1/ batch	Silica < detection limit	Reclean, reanalyze and/or qualify data.	Accuracy/Bias-Contamination
Field/Trip Blanks	1/day[(1)]	Silica < detection limit	Reclean, reanalyze and/or qualify data.	Accuracy/Bias-Contamination
Data Completeness Check	NA	Field 80%, Laboratory 95%	NA	Data Completeness
Laboratory Control Standards	1/day	Percent recoveries 80-120%	Recalibrate, reanalyze, and/or qualify data.	Accuracy/Bias
Sample Reanalysis	10% of samples	RPD < 100	Recalibrate, reanalyze, and/or qualify data.	Precision

[(1)]Only analyzed if silica is detected in the associated samples.
Reanalyze: refers to reanalysis of same sample.

Table 8-8. Measurement Performance Criteria Table – Asbestos by TEM/SEM[(1)]

QC Sample or Activity	Frequency	Measurement Performance Criteria	Corrective Action	DQI
Field Duplicates	1/week	*RPD $\leq$ 40 when positive results for both samples are $\geq$ 5x QL *No situation where one result is detected at $\geq$ 5x QL and other result is not detected	Assess laboratory precision, and/or qualify data.	Precision-Overall
Standard Reference Materials	1/year	Percent recoveries 80-110%	Recalibrate, reanalyze, and/or qualify data.	Accuracy/Bias
Intra-analyst QC	1/50 samples	< 5 structures: $\pm$ 1 structure 5-20 structures: $\pm$ 2 structures > 20 structures: $\pm$ 3 structures	Recalibrate, reanalyze, and/or qualify data.	Precision
Inter-analyst QC	1/25 samples	< 5 structures: $\pm$ 1 structure 5-20 structures: $\pm$ 2 structures > 20 structures: $\pm$ 3 structures	Recalibrate, reanalyze, and/or qualify data.	Precision
Method Blanks	1/batch	< 53 structures/mm^2 in blank < 18 structures/mm^2 in cumulative average	Locate source of contamination and correct before analysis can proceed.	Accuracy/Bias - Contamination
Field/Trip Blanks	1/day[(2)]	Arithmetic mean of 3 field blanks must be $\leq$ 70 S/mm^2	Retest, reanalyze, and/or qualify data.	Accuracy/Bias - Contamination
Data Completeness Check	NA	Field 80%, Laboratory 95%	NA	Data Completeness

[(1)] Refer to Section 11.1.2.3 for procedures to be used for measuring structures and fibers.
[(2)] Only analyzed if asbestos is detected in the associated samples.
Reanalyze: refers to reanalysis of same sample.

Table 8-9. Measurement Performance Criteria Table – PM_{10} and $PM_{2.5}$ by Gravimetry

QC Sample or Activity	Frequency	Measurement Performance Criteria	Corrective Action	DQI
Field Duplicates	1/week	*RPD $\leq$ 40 when positive results for both samples are $\geq$ 5x QL *No situation where one result is detected at $\geq$ 5x QL and other result is not detected	Assess laboratory precision, and/or qualify data.	Precision-Overall
Field/Trip Blanks	1/day[(1)]	0 $\pm$ 3 µg	Qualify data.	Accuracy/Bias - Contamination
Data Completeness Check	NA	Field 90%, Laboratory 95%	NA	Data Completeness
Sample Reweigh	1/10 samples gross weighing	$\pm$ 10 µg	Qualify data.	Precision
	1/10 samples tare weighing	$\pm$ 10 µg	Qualify data.	Precision

[(1)]Will be collected at a frequency of 1/day; during Phase I and II only 1 field/trip blank per week will be analyzed.

Field Accuracy Objectives

Accuracy in the field is assessed through the adherence to all field instrument calibration procedures, sample handling, preservation, and holding time requirements. Accuracy will also be evaluated through the use of field/trip blanks, field spikes, and cooler temperature blanks.

Field/trip blanks will be collected at a frequency of one per day for each analytical parameter. Field/trip blanks will be used to assess any contamination attributable to shipment and transportation and/or on-site storage of samples and sample media. These blanks will be selected from the media provided for the sampling events by the off-site laboratories and as such the blanks will represent actual field samples with the sole exception that no air will be drawn through them. Analysis of field/trip blanks for silica and asbestos will only occur if these analytes are detected in samples.

In addition, during the background phase of the program, the accuracy of the mercury sampling and analysis method will be tested. Ambient air samples will be collected at one location using a series of four carbon traps prespiked (50 ng/trap) with mercury. These samples will provide data on the accuracy of the method under actual field sampling condition. Following the background phase, one field spike will be performed every other week.

Laboratory Accuracy Objectives

Laboratories assess the overall accuracy of their instruments and analytical methods (independent of sample or matrix effects) through the measurement of "standards", materials of accepted reference value. Accuracy will vary from analysis to analysis because of individual sample and matrix effects. In an individual analysis, accuracy will be measured in terms of method blank results, processing blank results, the percent recovery (%R) of surrogate or internal standard compounds, standard reference materials (SRMs) and/or laboratory control samples (LCSs) and LCS Duplicates. This gives an indication of expected recovery for analytes tending to behave chemically like the spiked or surrogate compounds and provides a measure of bias for the parameter of interest. Accuracy control limits are provided in Tables 8-2 through 8-9. The laboratory method blanks will indicate any adverse effects of sample contamination from an outside source (i.e., sample preparation or sample analysis) and could result in a positive bias.

The frequency of surrogates or internal standards, SRMs, LCSs, LCS Duplicates are defined in Tables 8-2 through 8-9. Laboratory accuracy will be improved by following the EPA and NIOSH methods which include detailed requirements for each analysis, utilizing experienced/trained laboratory personnel, ensuring the purity of all chemicals, and conducting laboratory audits.

Accuracy of the silica analysis will be improved by an initial collection of a dust sample from the site. The dust sample will be collected on each floor of the building, homogenized by the laboratory, and analyzed for silica. This will be the site-specific standard used by the laboratory for the remainder of the program and will serve the following two purposes:

- Will identify the phases of silica potentially present in the air
- Will show interferences that may require the use of secondary and/or tertiary peaks for silica phase quantitation

8.2.3 Representativeness

Representativeness is a qualitative parameter which expresses the degree to which the data and sampling design accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. Representativeness is a qualitative parameter which is dependent upon the proper design of the sampling program and the laboratory quality control program.

The air monitoring network has been designed so as to capture air emissions if any at all potential release points during building deconstruction. This includes monitoring stations at all major compass points at both ground and elevated levels around the building perimeter. These perimeter locations as a result are representative of locations both upwind and downwind of the deconstruction site based upon historical meteorological data available for the New York Metropolitan area. In addition four (4) monitoring stations will be situated out of the immediate vicinity of the deconstruction site on roof tops of buildings again coincident with prevailing winds in the site vicinity. This twelve (12) station network should provide adequate spatial orientation around the deconstruction site so as to capture any dust releases during the deconstruction project. In fact, the scaffolding locations represent “floating” stations which will move coincident with the building deconstruction as it moves from elevation to ground level. The coverage provided by these twelve (12) stations in contemporaneous operation in concert with site specific meteorology will provide sufficient data to examine the source(s) of any exceedances that may occur during the term of the project. This analyses includes contributions from regional or background air quality, effects of the deconstruction activities as well as contributions attributable to activities on site or off site upwind or downwind of the 130 Liberty Street property itself.

Measures to Ensure Representativeness of Field Data

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Ambient Air Monitoring Program, referenced sampling methodologies, and required QC procedures are followed and that proper sampling, sample handling, and sample preservation techniques are used. Refer to Section 10.1 of the QAPP for the sampling design which will provide representative data over the site. Representativeness may also be assessed by the use of field duplicate samples. By definition, field duplicate samples are collected so they are equally representative of a given point in space and time. In this way, they provide both precision and representativeness information. As stated previously, field duplicate samples will generally be collected at a frequency of one per week per analytical parameter.

In general, representativeness in the field will be maximized by following the reference sampling methodologies, proper sample preservation procedures, utilizing experienced/trained sampling crews, and conducting field audits.

Measures to Ensure Representativeness of Laboratory Data

Representativeness in the laboratory is ensured by using the proper analytical procedures, appropriate methods, and meeting sample holding times. Following the detailed requirements outlined in the EPA and NIOSH methods will maximize the representativeness of the laboratory data.

8.2.4 Comparability

Comparability is a qualitative parameter that expresses the confidence with which one data set can be compared to another.

Measures to Ensure Field Comparability

Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the QAPP is followed, sampling and analytical methodologies are followed, and that proper sampling and preservation techniques are used.

Measures to Ensure Laboratory Comparability

Comparability is dependent on the use of the selected EPA and NIOSH methods that are appropriate for producing data that may be compared to the project Action Limits and the reporting of data in standardized units.

8.2.5 Sensitivity

Sensitivity is the ability of the instrument or method to detect the contaminants of concern at the level of interest.

Quantitation Limits

Table 8-1 outlines the required quantitation limits for each matrix, each analytical parameter and each analyte. These quantitation limits are significantly below the project Action Limits. In almost all cases, EPA or NIOSH methodologies were selected with specific requirements or modifications to achieve quantitation limits that are significantly below the project Action Limits. The laboratories selected will, at a minimum, meet the project quantitation limits included in Table 8-1.

Laboratories will need to adjust all quantitation limits based on dilutions, sample volumes, extract/digestate volumes, and cleanup procedures. In all cases, the adjusted quantitation limit (or sample quantitation limit) must be below the project Action Limit. In establishing the

required quantitation limits for this program, these factors were considered in ensuring the project Action Limits would be achieved.

Sensitivity will be maximized by following the EPA and NIOSH methods, utilizing experienced/trained laboratory personnel, and conducting laboratory audits.

8.2.6 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. "Normal conditions" are defined as the conditions expected if the sampling plan was implemented as planned.

Field Completeness Objectives

Field completeness is a measure of the amount of (1) valid measurements obtained from all the measurements taken in the project and (2) valid samples collected. With the exception of the real-time measurements, the field completeness objective will be a minimum of 80 percent. This allows for the potential loss of samples due to sampling problems or media breakage during transport. The completeness objective for the real-time measurements (e.g., PM_{10}, $PM_{2.5}$, gaseous mercury) will be a minimum of 90 percent.

Laboratory Completeness Objectives

Laboratory completeness is a measure of the amount of valid measurements obtained from all valid samples submitted to the laboratory. The laboratory completeness objective will be a minimum of 90 percent. This allows for the potential loss of samples impossible to analyze due to unforeseen interferences and rejected data following data validation.

9.0 NON-DIRECT MEASUREMENTS (SECONDARY DATA)

Previously collected data and information will not be used to make project decisions or design the sampling program.

10.0 FIELD MONITORING REQUIREMENTS

10.1 Monitoring Process Design

Refer to Section 7.1.1 for the monitoring design of this project. This section discusses the areas being sampled, what is being tested, and how often.

10.1.1 Meteorological Data Collection

Potential sources of variability may be due to meteorological data. Due to the complex nature of wind movement in an around buildings in the urban setting of Lower Manhattan, monitoring of wind velocity and direction on a continuous basis is warranted. Data available from regional National Weather Stations (NWS) such as Newark Airport, LaGuardia and Kennedy Airports can be used to complement the localized data but it is likely NWS data may not always be representative of conditions in and around the 130 Liberty Street site. A meteorological station will be deployed in the immediate vicinity of the site. The actual station will initially be located at roof top level at the deconstruction site (130 Liberty Street).

Data from the roof top station will be logged continuously at the unit's data logger and also transmitted via cellular modem to the street level computer station.

The meteorological monitoring component of the air sampling and monitoring program will consist of equipment (Met One) designed to continuously record wind speed, wind direction, and air temperature from a roof mount tower. Monitoring will be done from the roof of the building at 130 Liberty Street until deconstruction activities warrant its physical removal when the roof is removed or access is denied due to ongoing construction activities. The 130 Liberty Street roof-mounted station will then be collocated with one of the off site rooftop air monitoring stations.

10.2 Monitoring Methods

The following sections provide a brief description of the sampling procedures to be employed for each parameter and a summary of the required equipment. Step-by-step operating procedures are included as Attachment C.

10.2.1 Metals (TSP Filters)

Total suspended particulate (TSP) samples to be analyzed for metals will be collected employing high-volume air sampling techniques in accordance with US EPA standard reference method 40 CFR Part 50 Appendix B, *Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High-Volume Method)*. Samples will be collected over an estimated twenty-four hour sampling period. During this period ambient air will be collected at a flow rate of approximately 1 m^3/minute. Numbered, preweighed quartz fiber filters provided by the subcontracted laboratory will be placed in each sampling system prior to the start of each sampling event. The air sampler draws approximately 1200-1500 m^3 through the filter during

each sampling event. The TSP quartz filters will be analyzed for ten (10) metals: antimony, barium, beryllium, cadmium, chromium, copper, lead, manganese, nickel, and zinc.

Equipment and supplies utilized with this sampling approach are as follows:

- Filters –8 x 10 inch quartz fiber filters such as Whatman QMA filters or their equivalent.

- High Volume Sampler – The sampler consists of a protective housing which contains an electric, high-speed, high-volume blower; a filter holder capable of holding 8 x 10 inch filters; a flow controller capable for controlling the air-flow rate through the instrument at 1.0 to 1.8 m3; and a flow indicating device that works by measuring the pressure drop across the sampler such as a magnehelic gauge, a manometer, or rotameter. The sampler should have a gabled roof design. The air inlet should be uniform on all sides and be designed such that the effective particle capture velocity is 20 – 35 cm/sec.

- Thermometer – A thermometer is used to indicate the temperature at the flow rate measurement orifice when temperature corrections are used.

- Barometer – A barometer is used to indicate the barometric pressure at the flow rate orifice when pressure corrections are used.

- Manometer – A water or oil manometer is used to calibrate the flows of the high volume samplers.

- Timing/Control Device – A timing device capable of starting and stopping the sampler to obtain an elapsed run time of 24 hr ±1 hr. The accuracy of the timing device should be ±30 minutes.

- Orifice Transfer Standard – The flow rate transfer standard is a calibrated orifice traceable to NIST standards that consists of either a set of restrictor plates or a variable restrictor that is used to deliver a series of discrete flow rates into the inlet of the high volume sampler so that the sampler flow indicating device on the sampler can be accurately calibrated.

10.2.2 Mercury (Gas)

Real-time monitoring for mercury will be performed utilizing an OhioLumex RA 915+ direct read instrument. The OhioLumex RA 915+ is a factory-calibrated instrument based on a cold vapor Zeeman atomic absorption analytical process that reduces interference from molecular absorption bands and scattered spectra. A mercury electrodeless discharge lamp (EDL) is used as the radiation source. The sampling system consists of a sample pump operating at 20 L/min. and a multi-path sample cell with an effective path length of 10 meters.

Equipment and supplies utilized with this sampling approach are as follows:

- OhioLumex RA-915+ Mercury Analyzer – A portable, self-contained field mercury analyzer used to make real time mercury vapor determinations.

- Air Intake Hose with Pre-Filter – The sampling line and first pass filter used to remove particulate from the sample gas.

- Absorption and Dust Filters – Spare filters used as replacements for the internal particulate and mercury absorbing filters in the instrument.

10.2.3 Asbestos

Asbestos sample collection will be performed in accordance with NIOSH Method 7402 – *Asbestos by TEM* following the recommendations for personal sampling. Samples will be collected at a rate of six liters per minute (6 lpm) for a minimum of eight (8) hours for a resulting total volume of approximately 2.88 m^3. To ensure optimum accuracy, the sampling rate will be adjusted, as needed, to produce a fiber density of 100 to 1,300 fibers/mm^2.

Pump flow rates of each personal sampling pump, with a representative sampler in line, will be measured before and after sample collection. The pump will be run for 10 minutes prior to checking the flow rate. A suitable rotameter (or bubble meter) will be connected to the filter inlet, the flow screw adjusted to the desired sampling value, and the flow rate observed on the rotameter (or bubble meter) will be verified as constant for a minimum of 20 seconds. Flow rates will be recorded on Field Sampling Data Sheets or an equivalent field logbook.

Immediately prior to collecting a sample, the sampler will be fastened to a location (i.e., on a tripod) near the individual's breathing zone, the top cover of the filter cassette cowl extension ("open face") will be removed and positioned "face down" in the sampler. The joint between the extender and monitor body will be wrapped with tape to hold the cassette securely in place and to provide a surface to identify the cassette. By inserting a pin through the hole near the display screen, the elapsed time indicator is reset prior to sampling.

At the end of the sampling period, the top cover and small end caps are replaced. Samples are transported upright to the laboratory in a rigid container with packing material to prevent jostling or damage. To avoid electrostatic forces from causing fiber loss from the sampling filter, untreated polystyrene foam will not be used for any of the shipping container materials.

Samples for asbestos will be collect using two different media to accommodate the SEM and TEM analyses.

Equipment and supplies utilized with this sampling approach are as follows:

- Thompson Personal Sampling Pump (or equivalent) – 5 to 15 lpm

- Battery Pack – Rechargeable lithium ion battery pack (or equivalent), fitted with a belt clip, compatible with the personal sampling pump.

- Filters/TEM analysis – Mixed cellulose ester membrane filters, 0.45-µm pore size, with a non-conductive cowl, supported by a cassette filter holder, suitable for connection with the personal monitoring pump system.

- Filters/SEM analysis –Polycarbonate filters, 01.µm pore size with 25 mm diameter cassette.

- High Flow Rotometer – 2.0 to 20.0 lpm

10.2.4 Respirable Crystalline Silica and Dust

Respirable dust and crystalline sampling will be performed according to NIOSH Method 0600 – *Particulates Not Otherwise Regulated, Respirable* following the recommendations for personal sampling. Samples will be collected at a rate of approximately two liters per minute (2 lpm) for a minimum of eight (8) hours for a resulting total air volume of approximately 1.0 m^3. To ensure optimum accuracy, the sampling rate will be adjusted, as needed, not to exceed 2 mg dust loading on the filter.

Filters are pre-weighed to a constant weight in the controlled weighing area. If static electricity is evident (e.g., filter not releasing easily from the forceps or it attracts the balance pan), the filter should be passed over an anti-static radiation source. Filters are assembled in the filter cassettes and the cassettes closed firmly by placing a plug at each opening of the cassette to prevent leakage around the filter. For at least 2 hours prior to sampling, the filters are equilibrated in either an environmentally controlled weighing area or chamber.

Pump flow rates of each personal sampling pump, with a representative sampler in line and cyclone grit pot in place, will be measured before and after sample collection. The pump will be run for 10 minutes prior to checking the flow rate. A suitable rotameter (or bubble meter) will be connected to the filter inlet, the flow screw adjusted to the desired sampling value, and the flow rate observed on the rotameter (or bubble meter) will be verified as constant for a minimum of 20 seconds. Flow rates will be recorded on Field Sampling Data Sheets or an equivalent field logbook.

The cyclone's grit cap is removed prior to use and the interior inspected. If the inside is visibly scored, replace the cyclone because the dust separation characteristics may be altered. Clean the interior of the cyclone to prevent re-entrainment of large particles.

Assemble the sampler head checking for alignment of the filter holder and cyclone in the sampling head to prevent leakage. Care must be taken to prevent the sampler assembly from inverting at any time.

Immediately prior to collecting a sample, the sampler will be fastened to a location (i.e., on a tripod) near the individual's breathing zone, the top cover of the filter cassette cowl extension ("open face") will be removed and positioned "face down" in the sampler. The joint between the extender and monitor body will be wrapped with tape to hold the cassette securely in place and to provide a surface to identify the cassette. By inserting a pin through the hole near the display screen, the elapsed time indicator is reset prior to sampling.

At the end of the sampling period, the top cover and small end caps are replaced. Samples are transported upright to the laboratory in a rigid container with packing material to prevent jostling or damage. To avoid electrostatic forces from causing fiber loss from the sampling filter, untreated polystyrene foam will not be used for any of the shipping container materials.

Collection of a site-specific dust sample will be performed as discussed in Section 8.2.2. This sample needs to be double-bagged prior to shipment to avoid any potential cross-contamination.

Equipment and supplies utilized with this sampling approach are as follows:

- Personal Monitor and Sampling Pump 0.5 to 3 lpm
- Battery Pack – Nickel metal hydride battery pack (or equivalent), fitted with a belt clip, compatible with the personal sampling pump.
- Filters – Polyvinyl filter (or equivalent hydrophobic membrane filter) supported by a cassette filter holder, 5.0-µm pore size, suitable for connection with the personal monitoring pump system.
- Cyclone – SKC Inc. aluminum cyclone (or equivalent)
- Medium Flow Rotometer – 0.4 to 4.0 lpm
- High Flow Rotometer – 2.0 to 20.0 lpm
- Forceps – Nylon, used when handling the filters

10.2.5 Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs)

Ambient air samples will be collected using a General Metals Works (GMW) PS-1 (or performance equivalent) high volume air sampling system equipped for the collection of semivolatile PCDD/PCDF particulate matter on a 102-mm diameter microquartz fiber filter, as well as a glass cylinder containing a polyurethane sorbent (i.e., PUF plug) for the collection of gas phase PCDDs/PCDFs. At each site, one GMW PS-1 sampler will be used to collect PCDD/PCDF samples according to Method TO-9A. Samples will be collected at a flow rate of

200 to 300 liters per minute (lpm) over a sampling period of approximately 24 hours for a resulting total air volume of approximately 288-432 cubic meters (288-432 m^3).

The PUF (Polyurethane Foam) sampler is a complete air sampling system designed to simultaneously collect suspended airborne particulates as well as trap airborne organic vapors. The PUF sampler is equipped with a bypass blower motor arranged with an independent cooling fan. This feature permits the motor to operate at low sampling flow rates for extended periods without motor failure from overheating.

A dual chambered aluminum sampling module contains both filtering systems. The upper chamber supports the airborne particulate filter media in a circular filter holder. The lower chamber encapsulates a glass cartridge, which contains the PUF for vapor entrapment.

The voltage variator adjustment screw alters the blower motor speed to achieve the desired flow rate. Air flow rate is measured through the flow venturi utilizing a 0-100" Magnehelic Gage. For each sample, the sampling start and end times and flow rates are recorded on Field Sampling Data Sheets or an equivalent field logbook and used to calculate the amount of ambient air sampled.

At the conclusion of each sampling period, the sample is recovered from the sampling train by placing the filter inside the glass cartridge. The glass cartridge is then wrapped with aluminum foil and it is placed back into its original shipping container, labeled, and transported to the analytical laboratory for processing.

Equipment and supplies utilized with this sampling approach are as follows:

- High-Volume Sampler – General Metals Works (GMW) PS-1 (or equivalent), capable of pulling ambient air through the filter/adsorbent cartridge sampling train at a flow rate of 200-300 lpm to obtain a total sample volume of 288-432 m^3 over a 24-hour period.

- High-Volume Sampler Calibrator – Capable of providing multipoint resistance for the high-volume sampler.

- Quartz Fiber Filters – 102 millimeter (102-mm) bindless quartz microfiber filter, Whatman International Ltd, QMA-4 (or equivalent), provided by the laboratory, pre-cleaned and weighed.

- Polyurethane Foam (PUF) Plugs – 3-inch thick sheet stock polyurethane type (density 0.022 g/cm3). Plugs should be slightly larger in diameter than the internal diameter of the cartridge.

- Teflon® End Caps – For sample cartridge. Must fit tightly to provide an adequate seal to prevent pre- or post- sampling exposure to other potential sources of the target analytes.

- Glass Sample Cartridge – For sample collection. The analytical laboratory will insert the PUF plug into the glass sample cartridge during pre-sampling preparation.

- Sample Cartridge Aluminum Shipping Containers – The analytical laboratory will provide individually labeled containers that will be used to transport the sample cartridges to the field location and back to the laboratory for analysis.

- 0-100" Magnehelic Gage.

- White Cotton Gloves – For handling the filters and cartridges.

- Ice Chests – To hold samples at 4°C during shipment to the analytical laboratory.

10.2.6 Polychlorinated Biphenyls (PCBs)

Ambient air samples will be collected using a low-volume SKC Leland Legacy personal sampling pump equipped with a glass cylinder containing a polyurethane sorbent (i.e., PUF plug) for the collection of gas and particulate phase PCBs. Samples will be collected at a flow rate of five liters per minute (5 lpm) with a sampling period of approximately 24 hours for a resulting total air volume of approximately 7.2 cubic meters (7.2 m^3).

The PUF (Polyurethane Foam) sampler is an air sampling system designed to trap airborne organic vapors. The PUF sampler is equipped with a low-volume pump. This feature is designed to permit the motor to operate at low sampling flow rates for extended periods without motor failure from overheating. The sampling cartridge is constructed of borosilicate glass, is filled with the PUF plug, and is connected to the sampling pump by way of flexible tubing.

Pump flow rates of each personal sampling pump, with a representative sampler in line, will be measured before and after sample collection. The pump will be run for 10 minutes prior to checking the flow rate. A suitable rotameter (or bubble meter) will be connected to the filter inlet, the flow screw adjusted to the desired sampling value, and the flow rate observed on the rotameter (or bubble meter) will be verified as constant for a minimum of 20 seconds. Flow rates will be recorded on Field Sampling Data Sheets or an equivalent field logbook.

To initiate sample collection, the aluminum foil is removed from the pre-cleaned cartridge assembly (foil returned to the jar for later use) and the cartridge is attached to the pump with flexible tubing. The sampling assembly is positioned with the intake downward or in a horizontal position. The samplers are fastened to a location (i.e., on a tripod) near the individual's breathing zone at least 30 meters from any obstacle from air flow with the PUF intake and at least 1 to 2 meters above ground level. After the PUF cartridge is correctly inserted and positioned, the power switch is turned on, the elapsed time meter is activated, sampling begins, and the start time is recorded on the Field Data Sheet or equivalent field logbook.

At the conclusion of each sampling period, the power switch is turned off, stop time recorded, the PUF cartridge is removed from the pump and wrapped with its original aluminum foil, the Teflon® end caps are replaced on the cartridge, and it is placed back into its original sealed and labeled container, placed in an ice chest under ice (< 4°C), and transported to the analytical laboratory for processing.

Equipment and supplies utilized with this sampling approach are as follows:

- Low-Volume, Continuous Flow Personal Sampling Pump – SKC Leland Legacy Personal Monitor and Sampling Pump (or equivalent): 5 to 15 lpm.

- Battery Pack – Rechargeable lithium-ion battery pack (or equivalent) compatible with the personal sampling pump.

- Sampling Cartridge – Constructed from a 20-mm (I.D.) by 10-cm borosilicate glass tube drawn down to a 7-mm (O.D.) open connection for attachment to the pump by way of flexible tubing.

- Polyurethane Foam (PUF) Plugs – Cut into a cylinder, 22-mm (I.D.) and 7.6-cm long, fitted under slight compression inside the cartridge. Polyether type (density 0.0225 g/cm3). Plugs should be slightly larger in diameter than the internal diameter of the cartridge. Pre-extracted PUF plugs and glass cartridges may be obtained commercially.

- Teflon® End Caps – For sample cartridge. Must fit tightly to provide an adequate seal to prevent pre- or post- sampling exposure to other potential sources of the target analytes.

- Glass Sample Cartridge – For sample collection. The analytical laboratory will insert the PUF plug into the glass sample cartridge during pre-sampling preparation.

- Flexible Tubing – Used to connect the cartridge assembly to the sampling pump.

- Sample Cartridge Shipping Containers – The analytical laboratory will provide individually labeled containers that will be used to transport the sample cartridges to the field location and back to the laboratory for analysis. This will include aluminum foil wrapped around the cartridge and a glass jar large enough to hold the cartridge.

- White Cotton Gloves – For handling the cartridges.

- Ice Chests – To hold samples at 4°C during shipment to the analytical laboratory.

- High Flow Rotometer – 2.0 to 20.0 lpm

10.2.7 Polycyclic Aromatic Hydrocarbons (PAHs)

PAH samples will be collected using high-volume air samplers fitted with non-size selective quartz fiber filters and sorbent cartridges. This approach, as described in EPA Method TO-13A, does not collect particulate matter representative solely of potential inhalation exposure, but provides for a total of respirable and non-respirable PAHs. Sorbent traps containing polyurethane foam (PUF) and XAD-2® resin in a "sandwich" configuration. The General Metals Works (GMW) PS-1 high volume sorbent sampler (or performance equivalent) located at each monitoring station will be operated at a flow rate of 200 to 300 liters per minute with a sampling period of approximately 24 hours for a resulting total air volume of approximately 288 m^3 – 432 m^3.

The filters and sorbent cartridges will be solvent pre-cleaned and vacuum dried by the analytical laboratory. The pre-cleaned filters and cartridges will be stored wrapped in aluminum foil (or otherwise protected from light) in a Ziploc bag, and over wrapped with bubble wrap until they are carefully installed on the sampler on site.

At the conclusion of each sampling period, the sample is recovered from the sampling train by placing the filter inside the glass cartridge. The cartridge is then wrapped with aluminum foil and it is placed back into its original shipping container, labeled, and transported to the analytical laboratory for processing.

The amount of air sampled through the filters and cartridges will be recorded and the filter/cartridge set placed in an appropriately labeled container and shipped to the laboratory for analysis.

Equipment and supplies utilized with this sampling approach are as follows:

- High-Volume Sampler – General Metals Works model PS-1 (or performance equivalent). Capable of pulling ambient air through the filter/sorbent cartridge at a flow rate of approximately 200-300 lpm over a 24-hour sampling period.

- Sampling Module – Metal filter holder capable of holding a 102-mm circular particle filter supported by a 16-mesh stainless-steel screen and attaching to a metal cylinder capable of holding a 65-mm O.D. (60-mm I.D.) x 125-mm borosilicate glass sorbent cartridge containing PUF and XAD-2® resin in the "sandwich" configuration. To ensure air-tight seals, the filter holder is equipped with inert sealing gaskets placed on either side of the filter and inert pliable gaskets placed at either end of the glass sorbent cartridge.

- High-Volume Sampler Calibrator – Capable of providing multi-point resistance for the high-volume sampler.

- Quartz Fiber Filter – 102 mm binderless quartz microfiber filter. (Provided by the laboratory, pre-cleaned and weighed.)

- Polyurethane Foam (PUF) Plugs – 3-inch thick sheet stock polyurethane type (density 0.022 g/cm3). Plugs should be slightly larger in diameter than the internal diameter of the cartridge.

- XAD-2® Resin – Used to assemble the PUF/XAD-2 "sandwich" cartridges. Supelco (or equivalent). Pre-cleaned and assembled by the analytical laboratory.

- White Cotton Gloves – For handling the filters and cartridges.

- Sample Cartridge Shipping Containers – The analytical laboratory will provide individually labeled containers that will be used to transport the sample cartridges to the field location and back to the laboratory for analysis. This will include aluminum foil wrapped around the cartridge and a glass jar large enough to hold the cartridge.

- 0-100" Magnehelic Gage.

- Ice Chests – To hold samples at 4°C during shipment to the analytical laboratory.

10.2.8 Mercury (Total)

An iodated carbon trap is used to collect total mercury (particulate associated and vapor). The samples are then analyzed using cold vapor atomic fluorescence (CVAFS). The carbon trap is a proven and sensitive method for detecting trace ambient levels of atmospheric mercury. To collect the mercury sample, a personal sampling pump will be attached to the carbon trap and set at a flow rate of approximately 0.4 liters per minute for 24 hours for a resulting total air volume of approximately 0.6 m^3. There will be either be an arrow on the tube indicating the direction of the air flow or the technician should be aware that air needs to flow into the section of the tube with the larger portion of sorbent. Prior to collection, the end plugs of the carbon traps will be removed while wearing clean gloves and placed into the bag in which the tube was received. At the completion of sampling, these plugs will be placed back on the carbon traps while wearing clean gloves. It is essential that these plugs be kept clean during the sampling process.

Equipment and supplies utilized with this sampling approach are as follows:

- Personal Sampling Pump – The pump used to draw the air through the iodated carbon trap.

- Flow Measurement Device – A device such as a rotameter, bubble meter, or gas volume displacement-measuring device such as a "DryCal" flow meter. This device should have a calibration traceable to a NIST certification.

- Iodated Carbon Trap – The carbon trap provided by the subcontracted laboratory that is used to absorb the mercury from the air that is passed through it.

10.2.9 PM_{10}

PM_{10} will be determined by two separate methods. At each location, PM_{10} will be determined by a non-reference method utilizing Met One's E-BAM Mass Monitor, which is a real-time monitor. Anderson RAAS samplers will be used to collect PM_{10} via the US EPA standard reference method (40 CFR Part 50 Appendix J) at one location each day. An Anderson RAAS PM_{10} sampler will be collocated along side the real-time PM_{10} monitors as a QA check. The Anderson RAAS sampler will rotate on a monthly basis through all real-time PM_{10} monitor locations for the duration of the monitoring program.

10.2.9.1 PM_{10} – Reference Method via Anderson RAAS samplers

Particulate samples whose aerodynamic diameter is < 10 μ will be collected using Andersen RAAS samplers operating in the PM_{10} mode. All samples will be collected over an estimated twenty-four hour sampling interval at a prescribed flow rate of 16.67 liters/minute. This equates to a corrected air volume of 24 m^3 per each twenty-four hour sampling event. Pre-weighed Teflon filters (47mm diameter) provided by the subcontracted laboratory will be placed in the RAAS sampler cassette prior to the start of each sampling event.

The sampler specification for the PM_{10} sampler is contained in 40 CFR Part 50 Appendix J. This document specifies the PM_{10} sampling limits, protocol, and instrument specifications. The RAAS systems perform all of the functions required or recommended in the instrument specification part of the standard. The inlet has a 10-micrometer (nominal) cutpoint. The inlet provides wind speed and direction independent sampling and removes particles larger than about 10 micrometers.

Before sampling, the filters are equilibrated to constant temperature and relative humidity conditions and weighed. After sampling, the filters are again equilibrated to the constant temperature and humidity conditions and weighed. The mass concentration is then calculated by dividing the weight of the particulate captured on the filter by the volume of air (at ambient conditions) that passed through the sampler. The flow rate is required to be maintained within 5% of 16.67 liters per minute with a coefficient of variation (a measure of the average short-term variation in flow in %) of less than 2%.

Equipment and supplies utilized with this sampling approach are as follows:

- Filters – Preweighed 47-mm Teflon® filters. Filters should be stored and transported in petri dishes.

- Forceps – Non-serrated forceps should be used to handle the 47-mm filters.

- Anderson RAAS PM_{10} Sampler – A sampling system that meets the requirements of 40 CFR Part 50 Appendix J for the sampling of PM_{10} when operated in the PM_{10} mode. The

Anderson RAAS sampler design incorporates a flow-indicating device, a thermometer, a barometer, and a timing control device into the sample monitor.

- Manometer – A water or oil manometer is used to calibrate the flows of the PM_{10} samplers.

- Timing/Control Device – A timing device capable of starting and stopping the sampler to obtain an elapsed run time of 24 hr ±1 hr. The accuracy of the timing device should be ±15 minutes.

- Flow Rate Transfer Standard – The flow rate transfer standard is a calibrated flow-metering device traceable to NIST standards that is used to deliver a series of discrete flow rates into the inlet of the PM_{10} sampler so that the flow-indicating device on the sampler can be accurately calibrated.

10.2.9.2 PM_{10} – Continuous Monitoring of PM_{10} via Met One E-BAM Samplers

The monitors selected to continuously measure PM_{10} are beta-attenuation monitors manufactured by Met One Instruments, Inc. (Met One).

The E-BAM monitors will be equipped with particle size selective inlets. The design of the inlets is such that particles larger than the desired size range will be removed from the air flow at the prescribed air flow rate. The units will be equipped with an inlet head to separate $PM_{10.}$ Sampling flow rate is critical to maintain the proper particle size cut points of the inlets. Flow rates are maintained at 16.7 liters per minute in the E-BAM monitors using an integral flow meter, pressure sensor, and ambient temperature sensor on board each monitor.

10.2.10 $PM_{2.5}$

$PM_{2.5}$ will be determined by two separate methods. At each location, $PM_{2.5}$ will be determined by a non-reference method utilizing Met One's E-BAM Mass Monitor, which is a real-time monitor. Anderson RAAS samplers will be used to collect $PM_{2.5}$ via the US EPA standard reference method (40 CFR Part 50 Appendix L) at one location per day. An Anderson RAAS $PM_{2.5}$ sampler will be collocated along side the real-time $PM_{2.5}$ monitors as a QA check. The Anderson RAAS sampler will rotate on a monthly basis through all real-time $PM_{2.5}$ monitor locations for the duration of the monitoring program.

10.2.10.1 PM2.5 – Reference Method via Anderson RAAS Samplers

Particulate samples whose aerodynamic diameter is <2.5 µ will be collected using Anderson RAAS samples operating in the $PM_{2.5}$ mode. All samples will be collected over an estimated twenty-four hour sampling interval at a prescribed flow rate of 16.67 liters/minute. This equates to a corrected air volume of or 24 m^3 per each twenty-four hour sampling event. Preweighed Teflon filters (47mm diameter) provided by the subcontracted laboratory will be placed in the RAAS sampler cassette prior to the start of each sampling event.

The sampler specification for the $PM_{2.5}$ sampler is contained in 40 CFR Part 50 Appendix L. This document specifies the $PM_{2.5}$ sampling limits, protocol, and instrument specifications. The RAAS systems perform all of the functions required or recommended in the instrument specification part of the standard. The inlet has 2.5-micrometer (nominal) cutpoint. The inlet provides wind speed and direction independent sampling and removes particles larger than about 2.5 micrometers.

Before sampling, the filters are equilibrated to constant temperature and relative humidity conditions and weighed. After sampling, the filters are again equilibrated to the constant temperature and humidity conditions and weighed. The mass concentration is then calculated by dividing the weight of the particulate captured on the filter by the volume of air (at ambient conditions) that passed through the sampler. The flow rate is required to be maintained within 5% of 16.67 liters per minute with a coefficient of variation (a measure of the average short-term variation in flow in %) of less than 2%.

Equipment and supplies utilized with this sampling approach are as follows:

- Filters – Preweighed 47-mm Teflon® filters. Filters should be stored and transported in petri dishes.

- Forceps – Non-serrated forceps should be used to handle the 47-mm filters.

- Anderson RAAS $PM_{2.5}$ Sampler – A sampling system that meets the requirements of 40 CFR Part 50 Appendix L for the sampling of $PM_{2.5}$. The Anderson RAAS sampler design incorporates a flow-indicating device, a thermometer, a barometer, and a timing control device into the sample monitor.

- Manometer – A water or oil manometer is used to calibrate the flows of the samplers.

- Timing/Control Device – A timing device capable of starting and stopping the sampler to obtain an elapsed run time of 24 hr ±1 hr. The accuracy of the timing device should be ±15 minutes.

- Flow Rate Transfer Standard – The flow rate transfer standard is a calibrated flow-metering device traceable to NIST standards that is used to deliver a series of discrete flow rates into the inlet of the $PM_{2.5}$ sampler so that the flow-indicating device on the sampler can be accurately calibrated.

10.2.10.2 Continuous Monitoring of $PM_{2.5}$ *via Met One E-BAM Samplers*

The monitors selected to continuously measure $PM_{2.5}$ are beta-attenuation monitors manufactured by Met One Instruments, Inc. (Met One).

The E-BAM monitors will be equipped with particle size selective inlets. The design of the inlets is such that particles larger than the desired size range will be removed from the air flow at the prescribed air flow rate. The units will be equipped with an inlet head to separate $PM_{2.5.}$ Sampling flow rate is critical to maintain the proper particle size cut points of the inlets. Flow rates are maintained at 16.7 liters per minute in the E-BAM monitors using an integral flow meter, pressure sensor, and ambient temperature sensor on board each monitor.

10.3 Field Quality Control

This section of the QAPP identifies the QC procedures, checks, samples, and their respective acceptance limits, that will be used to monitor the quality of various aspects of the sampling event. Their required analysis frequency, acceptance limits and corrective actions are also documented in this section of the QAPP.

10.3.1 Field Blanks/Trip Blanks

Field/trip blanks consist of clean sample media. Field/trip blanks accompany samples to the site and return to the laboratory in the same cooler or shipping container. Field/trip blanks will be used to ensure that there is no contamination as a result of the shipment/transportation/on-site storage activities. Field/trip blanks will be collected for all parameters associated with air samples. Field/trip blanks for asbestos and silica will only be analyzed if the asbestos or silica are detected in the associated samples.

10.3.2 Cooler Temperature Blanks

Cooler temperature blanks consist of a sample container filled with non-preserved water (potable or distilled) and are included in all coolers which contain samples which require temperature preservation (PAHs, PCBs, PCDDs/PCDFs). The laboratory uses these temperature blanks to ensure that proper preservation of the samples has been maintained during sample shipment. The temperature of these blanks must be 4 ºC ±2º to demonstrate that proper preservation has been maintained. The laboratory records the results of the temperature blanks on the chain-of-custody or sample login form immediately upon receipt of the samples at the laboratory, prior to inventory and refrigeration.

10.3.3 Field Duplicates

Field duplicates will be collocated samples. Collocated samples are two samples collected next to each other in the same vertical position. Collocated samples require two separate sample collections at the same location. Field duplicates will be used to assess the sampling and analytical reproducibility. With the exception of total mercury, field duplicates will be submitted at a frequency of once per week per analytical parameter. For total mercury, field duplicates and field spikes will be alternated on a weekly basis.

10.3.4 Field Spikes

PCDDs and PAHs

Field spikes are clean media used for sampling and pre-spiked with $^{13}C_{12}$-labeled compounds (similar to the target analytes) and used to evaluate overall accuracy. The media will be spiked in the laboratory, sent out to the field with all sample media, and returned to the laboratory for analysis.

Total Mercury

In addition, during the background phase of the program, the accuracy and precision of the mercury sampling and analysis method will be tested. Ambient air samples will be collected at one location using a series of four carbon traps prespiked (50 ng/trap) with mercury. These samples will provide data on the accuracy and precision of the method under actual field sampling condition. Following the background phase, one field spike will be performed every other week.

10.3.5 Breakthrough Checks

Separate analyses of both front and back half portions of carbon traps for mercury will be performed during the background phase to allow for an assessment of analyte breakthrough. The breakthrough assessment will be performed on all stations during the background phase. Breakthrough on the back half of the trap must be < 2% of the front half of the trap or < 5 ng per trap. If breakthrough criteria are consistently met during the background phase, subsequent measurement will be performed with the front and back halves of the carbon traps combined for analyses.

10.3.6 Media Certification Checks

Media for all analyses collected a on time-integrated basis will be certified clean from the laboratories. The certifications will be performed as batch checks and results will be stored in the project files.

11.0 ANALYTICAL REQUIREMENTS

11.1 Analytical Methods

This section of the QAPP describes the analytical techniques that will be used by the fixed laboratories to generate definitive data for the project. It documents the fixed laboratory analytical methods that will be used to meet measurement performance criteria and achieve the project-required quantitation limits for all contaminants of concern in the specific matrices as identified on Table 8-1.

11.1.1 Fixed Laboratory Analytical Methods and SOPs

Table 11-1 details the analytical methods that will be used in this investigation

11.1.2 Fixed Laboratory Analytical Method/SOP Modifications

The cited methods will be followed as written with the exceptions summarized below. These modifications do not adversely affect the quality or usability of the data as sufficient quality control analyses will be performed demonstrating adequate method performance with these modifications.

11.1.2.1 PAH Extraction by EPA Method TO-13A and Analysis by SW-846 Method 8270C

The analysis of PAHs using SW-846 Method 8270C will be modified to include the use of selective ion monitoring (SIM). Modifications to the sample preparation procedure in EPA Method TO-13 are listed below.

- The XAD-2 resin is dried in a fume hood for 16 hours instead of dried in a vacuum oven with ultra-pure nitrogen for 2-4 hours.
- The laboratory uses methylene chloride-rinsed aluminum foil instead of hexane-rinsed aluminum foil.
- The laboratory uses methylene chloride for the extraction solvent instead of 10% ether/hexane and therefore does not perform the precleaning extraction of 800 mL methylene chloride of the Soxhlet apparatus.
- The final extract is brought down to a volume of 0.5 mL in methylene chloride.

11.1.2.2 Dioxin Extraction by EPA Method TO-9A

- The laboratory uses toluene for the extraction solvent instead of 10% diethyl ether/hexane.

Table 11-1. Summary of Preparation and Analytical Methods

	Preparation Methods	Analytical Method
Metals	40 CFR Part 50 Appendix G – Reference Method for the Determination of Lead in Suspended Particulate Matter Collected from Ambient Air	SW-846 Method 6020A
Total Mercury	EPA Method 324, Determination of Vapor Phase Flue Gas Mercury Emissions from Stationary Sources using Dry Sorbent Trap Sampling	EPA Method 324, Determination of Vapor Phase Flue Gas Mercury Emissions from Stationary Sources using Dry Sorbent Trap Sampling
Asbestos	NA	TEM: 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA), 1987 SEM: German VDI Method 3492
Silica	NA	NIOSH Method 7500, Crystalline Silica by XRD (filter redeposition), Issue 4, March 2003
Particulate PM_{10}	NA	40 CFR Part 50, Appendix J
Particulate $PM_{2.5}$	NA	40 CFR Part 50, Appendix L
PCDDs/PCDFs	EPA Method TO-9A	EPA Method TO-9A
PCBs	EPA Method TO-10A/SW-846 3665A, 3660B	SW-846 Method 8082
PAHs	EPA Method TO-13A	SW-846 Method 8270C
Gaseous Mercury	NA	Ohio Lumex RA 915 + direct read

TO-9A: Determination of Polychlorinated, Polybrominated and Brominated/Chlorinated Dibenzo-p-Dioxin and Dibenzofurans in Ambient Air, January 1999.
TO-10A Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using Low Volume Polyurethane Foam (PUF) Sampling Followed by Gas Chromatographic/Multi-Detector Detection (GC/MD), January 1999.
TO-13A: Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air Using Gas Chromatographic/Mass Spectrometry (GC/MS), January 1999.

11.1.2.3 Asbestos Analyses by TEM (AHERA)

Asbestos analysis will be performed utilizing Transmission Electron Microscopy (TEM) analysis specified in 40 CFR Part 763, Asbestos Hazard Emergency Response Act, (AHERA) in order to measure structures/mm^2, with the following modifications:

- The sensitivity on TEM air samples will be less than 0.002 structures/cc. The laboratory will analyze up to 10 grid openings on the TEM in order to achieve this sensitivity.
- Both length and width of all asbestos fibers will be recorded.
- Confirmation by Energy Dispersive Spectroscopy (EDS) and/or Selected Area Electron Diffraction (SAED) will be performed for each sample.
- The morphology of the fibers will be noted by the aspect ratio and recorded.

In addition to the standard AHERA analysis provided for each sample, a second analysis will be performed for asbestos PCM equivalent (PCME) fibers. These fibers will be defined as any asbestos fiber or bundle with the following features:

- an aspect ratio of 3:1 or greater
- greater than 5 microns in length

Analysis will be performed at a magnification of approximately 2000x with higher magnifications of 10,000 and 20,000x used as needed for precise measurements and identification of individual fibers. Only PCME fibers (both asbestos and non-asbestos) are recorded. Fibers that intersect a grid bar will be recorded as ½ fiber but only if the visible portion is a least 2.5 microns in length. As with the AHERA analysis, identification of asbestos will be performed by a combination of morphology, SAED, and EDXA. Enough grid openings will be analyzed during this phase of analysis to reach a project-specific target analytical sensitivity of less than 0.0009 fibers/cm^3.

In addition, samples may also be analyzed using Scanning Electron Microscopy (SEM) due to the potential overloading problem with TEM which may be caused by excess particulates. This will be determined on a sample-specific basis and performed as needed. SEM is a well-established methodology that utilizes a scanning electron microscope. The SEM can work in many different magnification ranges from 100x to 20,000x. The sample preparation is different than TEM, whereas samples are gold coated and mounted on a stub, with minimal degradation to the original sample. The SEM is more flexible with regard to types of material you can introduce into the chamber. SEM can achieve much better contrast than TEM and results in almost a 3-D image whereas the TEM is a 2-D "shadow". SEMs are typically equipped with Energy Dispersive X-Ray analyzers (EDXA) just like TEM. This enables the analyst to determine the elemental composition of a material or fiber observed. The SEM is not equipped with Electron Diffraction capabilities unlike the TEM, which allows the analyst to determine the crystal structure of a mineral based on a distinct pattern of spots that is produced from the bombardment of an electron beam. Selected Area Electron Diffraction (SAED) is cited in many TEM methods including AHERA and is required to yield a definitive asbestos identification. For this project, however, since the dust has been so well characterized, the need for SAED is not as essential.

11.1.2.4 Metals Analysis by SW-846 Method 6020A

Metals analysis will be performed using SW-846 Method 6020A with the following modifications:

- Samples will be digested using nitric acid as per 40 CFR Part 50 Appendix J, not a mixture of nitric and hydrochloric acid. Sample digestion will be performed using a hotplate or Mod-block digestion procedure.
- Initial ICP/MS instrument calibration will be performed using a blank and a single-point standard.
- The routine calibration procedure will not include the analysis of a High Standard Verification (HSV) standard. Calibration will be verified with the CCB and CCV.

- The laboratory will perform the metals analysis by scanning the selected ion, not scanning all ions from 5-250 amu.
- The internal standard mixture used by the laboratory will include Li, Ge, In, Tm, and Bi.

11.1.2.5 PCB Analysis

PCB extracts for Aroclor analysis will be concentrated to a final volume of 5 mL. If the total PCB analysis yields a result which exceeds the USEPA Site-Specific Trigger Level, a further congener analysis will be performed on the same extract to confirm the total PCB concentration. This analysis will also be performed using GC/ECD; however, further QC analyses for the PCB congener analysis will not be required assuming the results of the PCB Aroclor QC measurements (Table 8-4) demonstrate adequate accuracy and precision of the sample extract analysis.

11.2 Analytical Quality Control

Tables 8-2 through 8-9 summarize the QC procedures checks, and samples, and their respective acceptance limits for each fixed laboratory analytical parameter that will be used during the project.

11.2.1 Field Analytical QC

Calibration procedures discussed in Section 13.2.1 will be adhered to for field analyses of gaseous mercury in order to ensure the accuracy of sample measurements.

11.2.2 Fixed Laboratory QC

All required QC checks and QC samples and the associated QC acceptance limits are detailed in the associated methods and in Tables 8-2 through 8-9.

11.2.2.1 Method Blanks/Preparation Blanks

Method blanks will be performed as part of each analytical batch for each methodology performed. Method blanks are used to evaluate contamination introduced during sample preparation and/or analysis by the laboratory.

11.2.2.2 Instrument Blanks

Instrument blanks are used to evaluate contamination resulting from the analytical reagents and the instrumentation. In addition, instrument blanks are sometimes used to assess potential carryover after the analysis of a highly contaminated sample. Instrument blanks are only required for select analytical parameters.

11.2.2.3 Surrogate Spikes

Surrogate spikes are used to evaluate extraction efficiency or analytical bias on a sample by sample basis for organic parameters. Surrogate spikes are added to all samples for organic parameters. Surrogate spikes are another measure of sample-specific QC.

11.2.2.4 Laboratory Control Samples

Laboratory control samples (LCSs) and LCS Duplicates are used to evaluate almost all parameters for the ability of the laboratory to accurately and precisely identify and quantitate target compounds in a reference matrix when spiked at the mid range of the calibration curve at a known concentration using a secondary source standard. LCSs and/or LCS Duplicates are typically performed as part of each analytical batch for each methodology with the exception of asbestos, PM_{10} and $PM_{2.5}$.

11.2.2.5 Laboratory Duplicate

Laboratory duplicates are used to evaluate laboratory preparation and analysis precision. These analyses are typically performed for inorganic parameters only. Laboratory duplicates are typically performed at a frequency of one per twenty samples.

11.2.2.6 Internal Standards

Internal standards are used to assess the analytical accuracy, precision, and stability. Internal standards are typically only used for organic analyses and ICP/MS analyses. Internal standards are spiked into all samples and are considered a sample-specific QC measure.

11.2.2.7 Standard Reference Materials

Standard reference materials (SRMs) are used to evaluate laboratory preparation and analysis bias for specific compounds in a reference matrix. SRMs will be used for the asbestos analysis.

12.0 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

Summaries of sample media, required sample volumes, preservation, and holding time requirements for all samples are presented in Table 12-1.

With the exception of samples which are completed on Sundays, samples will be delivered to the laboratories via Federal Express immediately after collection on ice (where required) with coolers under custody seal or via courier service. Samples completed on Sundays will be shipped with Monday's shipment.

12.1 Sample Custody

Sample custody is addressed in two parts: field sample collection and laboratory analysis.

A sample is considered to be under a person's custody if

- the item is in the actual possession of a person;
- the item is in the view of the person after being in actual possession of the person;
- the item was in the actual physical possession of the person but is locked up to prevent tampering; and,
- the item is in a designated and identified secure area.

12.1.1 Field Sample Custody

Sample handling is an important part of the field investigation program since samples that are incorrectly handled can affect the quality of data. Sample handling begins at the collection of the samples and continues until the sample has been analyzed. An over-riding consideration essential for the validation of environmental measurement data is the necessity to demonstrate that samples have been obtained from the locations stated and that they have reached the laboratory without alteration. Evidence of sample tracking from collection to shipment, laboratory receipt, and laboratory custody (until proper sample disposal and the introduction of field investigation results as evidence in legal proceedings when pertinent) must be documented.

Sample chain-of-custody and packaging procedures are summarized below. These procedures will ensure that the samples will arrive at the laboratory with the chain-of-custody intact. The TRC Field Sampling Coordinator (or designee) is responsible for overseeing and supervising the implementation of proper sample custody procedures in the field and up until the samples have been transferred to a courier. The chain-of-custody procedures are initiated in the field

Table 12-1. Summary of Media, Preservation, and Holding Time Requirements

Analytical Parameter	Analytical Method	Estimated Sample Volume	Media	Preservation Requirements	Maximum Holding Time
Metals	SW-846 Method 6020A	1440 m^3 (1000 L/min for 24 hours)	8" x 10" quartz fiber filter	None	180 days to analysis
Total Mercury	EPA method 324, modified	0.576 m^3 (0.4 L/min for 24 hours)	2 small iodated carbon traps in series	None	28 days to analysis
Asbestos (TEM)	AHERA	2.88 m^3 (6 L/min for minimum of 8 hours)	25mm diameter cassette with 0.45 µm pore size, mixed cellulose ester filter	None	None
Asbestos (SEM)	German VDI Method 3492	2.88 m^3 (6 L/min for minimum of 8 hours)	25mm diameter cassette with 0.1 µm pore size, polycarbonate filter	None	None
Silica-Respirable	NIOSH Method 7500	1.0 m^3 (2.0-2.1 L/min for 8 hours)	SKC aluminum cyclone; 37 mm diameter cassette with 5.0 µm pore size, polyvinyl chloride filter	None	None
Particulate PM_{10}	40 CFR Part 50, Appendix J	24.05 m^3 (16.7 L/min for 24 hours)	47 mm Teflon filters	None	None
Particulate $PM_{2.5}$	40 CFR Part 50, Appendix L	24.05 m^3 (16.7 L/min for 24 hours)	47 mm Teflon filters	None	None
Dioxins/Furans	EPA Method TO-9A	288 m^3 (200 L/min for 24 hours)	Quartz fiber filter and PUF cartridge	Cool to 4°C	30 days to extraction; 45 days from extraction to analysis
PCBs	SW-846 Method 8082	7.2 m^3 (5 L/min for 24 hours)	PUF cartridge	Cool to 4°C; keep in dark	14 days to extraction; 40 days from extraction to analysis
PAHs	SW-846 Method 8270C	288 m^3 (200 L/min for 24 hours)	Quartz fiber filter, PUF/XAD-2 sandwich cartridge	Cool to 4°C; keep in dark	14 days to extraction; 40 days from extraction to analysis

immediately following sample collection. The procedures consist of: (1) preparing and attaching a unique sample label to each sample collected, (2) completing the chain-of-custody form, and (3) preparing and packing the samples for shipment.

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples.

- All media will be identified by the use of pre-printed adhesive sample labels with site name and location, sample locations, date/time of collection, type of preservation, type of analysis, and sampler's initials. The sample numbering system is presented in Section 14.2.2 of this QAPP. Figure 12-1 provides an example sample label. In most cases, sample labels will be generated prior to the sampling event.

- Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample label because the pen would not function in wet weather. If a label is lost or ruined, sample analysis will continue. If a project action level is exceeded, further investigation will be performed.

- Samples will be transported in containers (coolers) which will maintain the refrigeration temperature for those parameters for which refrigeration is required.

- Samples will be accompanied by a properly completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage location.

- Chain-of-custody records are initiated by the samplers in the field. The field portion of the custody documentation should include: (1) the project name; (2) signatures of samplers; (3) the sample number, date and time of collection; (4) signatures of individuals involved in sampling; (5) identification number of media associated with each sample; and (6) if applicable, air bill or other shipping number. To the extent possible, this information will be entered prior to the sampling event.

- All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler and placed in the project files. An example chain-of-custody is included in Figure 12-2.

- Samples will be properly packaged for shipment and dispatched to the laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of

each sample box or cooler. Asbestos and silica samples must be packed upright in rigid containers to avoid any unnecessary sample disturbance. Shipping containers will be secured for shipment to the laboratory. If an authorized laboratory courier does not pickup the samples from the project site, custody seals will be attached to the front right and back left of the cooler and covered with clear plastic tape after being signed by field personnel. An example of a cooler custody seal is provided in Figure 12-3. Subsequently, the cooler will be strapped shut with strapping tape in at least two locations.

- If the samples are sent by common carrier, the air bill will be used. Air bills will be retained by the laboratory as part of the permanent documentation. Commercial carriers are not required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.

- Samples remain in the custody of the sampler until transfer of custody is completed. This consists of delivery of samples to the laboratory sample custodian, and signature of the laboratory sample custodian on the chain-of-custody document as receiving the samples and signature of sampler as relinquishing samples.

12.1.2 Laboratory Sample Custody

Samples will be received and logged in by a designated sample custodian or his/her designee. Upon sample receipt, the sample custodian will

- Examine the shipping containers to verify that the custody tape is intact,

- Examine all sample containers for damage,

- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the chain-of-custody or sample login records,

- Compare samples received against those listed on the chain-of-custody,

- Verify that sample holding times have not been exceeded,

- Examine all shipping records for accuracy and completeness,

- Sign and date the chain-of-custody immediately (if shipment is accepted) and attach the air bill,

- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the Laboratory Project Manager, who will be responsible for contacting the TRC Project QA Officer,

- Attach laboratory sample container labels with unique laboratory identification and test, and

- Place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory tracking system. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory), type of sample, required tests, date and time of laboratory receipt of samples, and field identification provided by field personnel.

- The Laboratory Project Manager will be notified of sample arrival.

- The completed chain-of-custody, air bills, and any additional documentation will be placed in the final file.

Figure 12-1. Sample Label

Figure 12-1

Sample Label

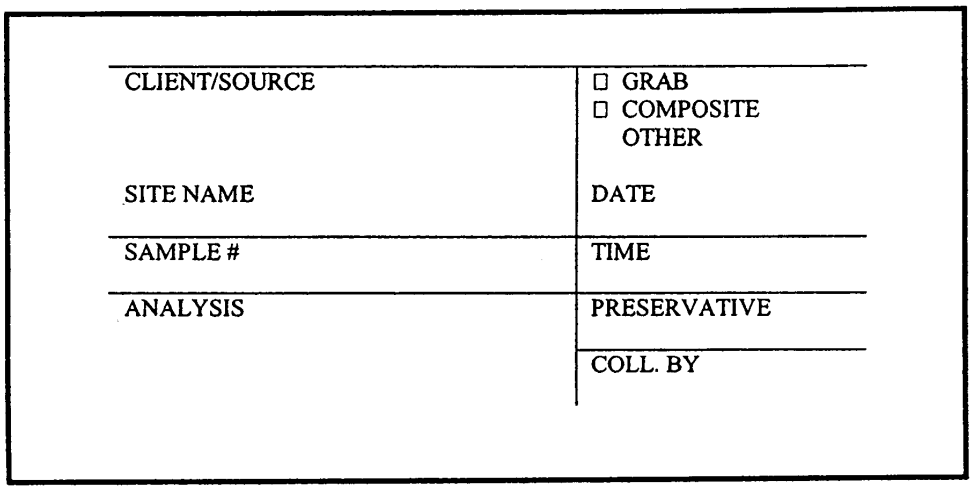


Figure 12-2. Chain-of-Custody

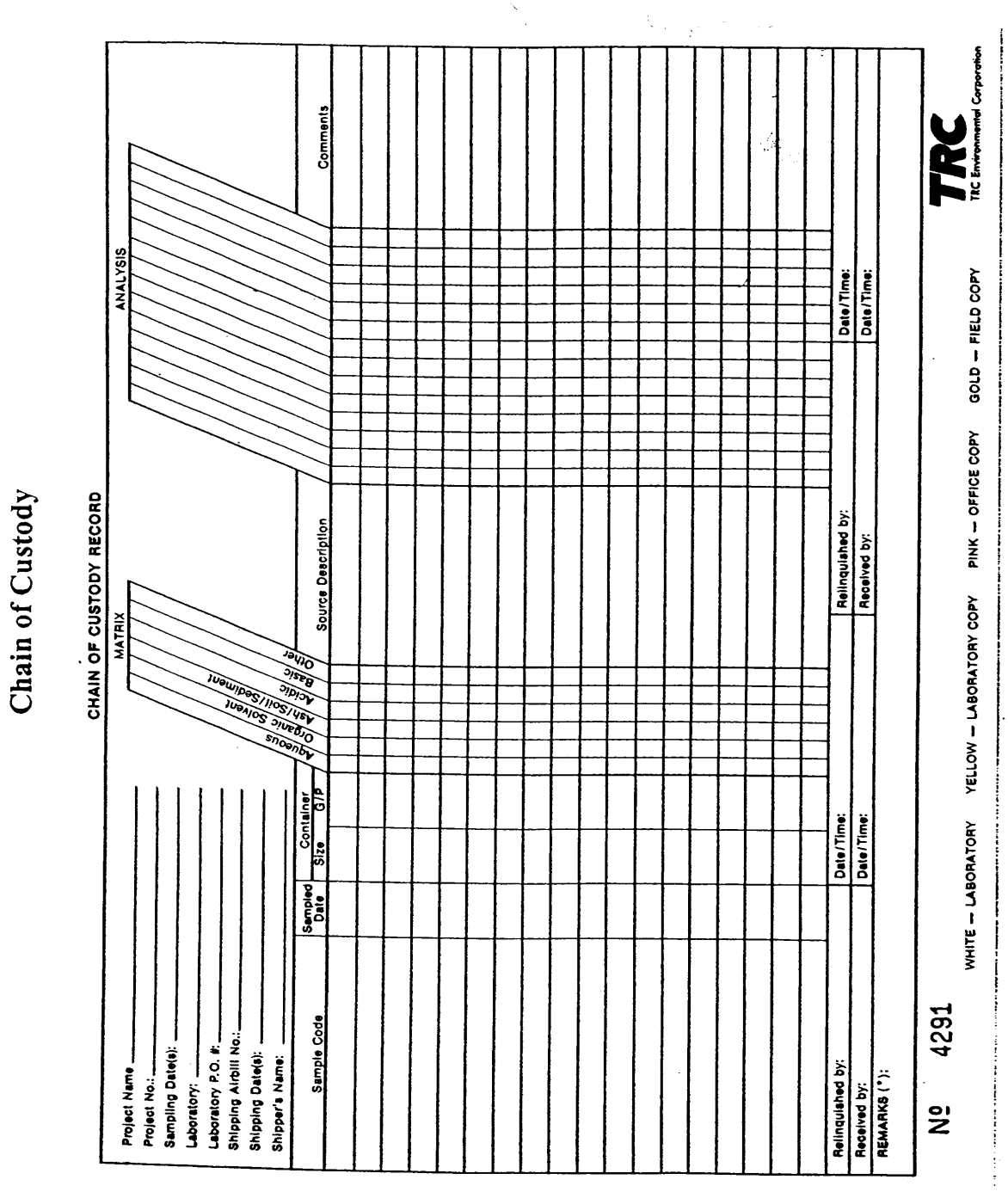
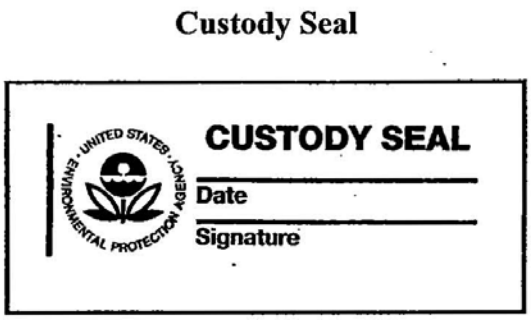


Figure 12-3. Chain-of-Custody Seal



13.0 TESTING, INSPECTION, MAINTENANCE AND CALIBRATION REQUIREMENTS

13.1 Instrument/Equipment Testing, Inspection, and Maintenance

13.1.1 Field Equipment

This section describes the procedures and documentation activities that will be performed to ensure that all field analytical instrumentation and equipment are available and in working order when needed. Instrument maintenance logs must be kept and instrumentation must be checked prior to use. The field instrument preventative maintenance program is designed to ensure the effective completion of the sampling effort and to minimize instrument downtime. The maintenance responsibilities for field instruments will be assigned to the TRC Field Sampling Coordinator. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the instruments. The maintenance schedule will follow the manufacturer's recommendations. Field personnel will also be responsible for ensuring that critical parts are included with the field instruments. Critical spare parts will be immediately available to reduce potential downtime. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes, and/or cannot be obtained in a timely manner.

A spare set of equipment will be maintained on-site to facilitate network continuous operation in the event of equipment failure that cannot be remedied by in situ repair. Additional instruments and equipment will be available within 1-day shipment to avoid delays in the field schedule.

A list of equipment that will be in use each day for the 12 station network as well as the number of spare pieces of equipment on- is included in Attachment D.

Metals (TSP Filters)

Table 13-1a summarizes the inspection, testing, and maintenance activities associated with the high volume samplers used to collect metals (TSP) samples.

Table 13-1a. Maintenance, Testing, and Inspection Activities Associated with Metals (TSP filters) Collected with High Volume Samplers

Equipment	Activity	Acceptance Criteria	Corrective Action
High volume sampler	Single point flow check at normal operating flow rate weekly	Within ±20% of the flow rate indicated by the high volume sampler	Service high volume sampler and perform a new multi-point calibration
Power cords	Check for crimps or cracks	No obvious damage	Replace as necessary
Filter screen and throat	Visually check daily during sample recovery procedure	No obvious deposits	Wipe surface clean as needed

Table 13-1a. Maintenance, Testing, and Inspection Activities Associated with Metals (TSP filters) Collected with High Volume Samplers

Equipment	Activity	Acceptance Criteria	Corrective Action
Gaskets	At 3 month intervals, inspect all gaskets in the sampler	No leaks or compression damage evident	Replace as necessary
Brushes	Replace after 600 – 1000 hrs. of operation	Stable flow rate	Replace as necessary
Motor	Replace as needed	Consult manufacturer for correct model of motor	Obtain the correct model
Tubing and fittings	Visually inspect daily	No crimps, cracks, or obstructions; no crossthreading	Replace as necessary

Mercury (Gaseous) Using a Direct Read Analyzer

Table 13-1b summarizes the inspection, testing, and maintenance activities associated with the gaseous mercury analysis using the Ohio Lumex RA915+ mercury analyzer.

Table 13-1b. Maintenance, Testing, and Inspection Requirements for the Ohio Lumex RA915+ Mercury Analyzer

Fault Symptom	Possible Cause	Corrective Action
Segments of the indicator table on the display and control unit are not highlighted when the analyzer is switched on.	- Power cable is out of order - Display unit cable is out of order - Battery is discharged	-Repair the power cable - Repair the display unit cable - Charge the battery
The (*) symbol at the display and control panel is not dimmed out when the "Lamp ignition" button is pressed: -if the optical switch is in position I - if the optical switch is in position II - if the optical switch is in position III	- Battery is discharged - Operation is possible only with attachments - The single-pass cell is contaminated, compartment windows are contaminated or foreign objects are found in the compartment - Multi-path cell is contaminated	- Charge the battery - Set the optical switch into positions II or III - Remove the single-path cell, check if the compartment windows are clean, make sure that there are no foreign objects inside the compartment - Clean the multi-path cell (see appropriate section)
The battery discharge indicator	The battery is fully discharged	Charge the battery

Table 13-1b. Maintenance, Testing, and Inspection Requirements for the Ohio Lumex RA915+ Mercury Analyzer

Fault Symptom	Possible Cause	Corrective Action
(red) glows for some time and then goes out when the analyzer is switched on.		
In the TEST mode, relative deviation R of the measured test number differs from the tabulated value by more than 25 %.	- Spectral lamp is not switched on - The test cell switch is in idle position - The test cell is out of order - The absorption filter has failed	- Press the "Lamp ignition" button - Set the switch of the test cell to the working position - Shake the test cell 2 – 3 times by the TEST (ON/OFF) switch - Replace the filter

Asbestos, Mercury, and PCBs using a Personal Sampling Pump

Maintenance, testing and inspection requirements for the personal sampling pumps are as follows:

- Routine maintenance will be performed according to the manufacturer's instructions on the following schedule:

Part	Replacement Interval (hours)
Valves	2,000
Pump Diaphragm	2,500
Dampner	2,500
Motor	4,500

Note: Replacement intervals may be shorter in dusty conditions.

- Flow Rate Verification – On a weekly basis, the field technician will verify the sampling flow rate on the sampling pump using a rotameter, bubble meter, or other suitable flow-measuring device that is NIST traceable. The flow rate should not vary from the set point by more than ±10%. If it does, the flow through the pump must be recalibrated.

Respirable Silica using a Personal Sampling Pump

Maintenance, testing, and inspection requirements for the personal sampling pump are as follows:

- Routine maintenance of pump will be performed according to the manufacturer's instructions on the following schedule:

Part	Replacement Interval (hours)
Valves	2,000
Pump Diaphragm	2,500
Dampner	2,500
Motor	4,500

Note: Replacement intervals may be shorter in dusty conditions.

- Flow Rate Verification – On a weekly basis, the field technician will verify the sampling flow rate on the sampling pump using a rotometer, bubble meter, or other suitable flow-measuring device that is NIST traceable. The flow rate should not vary from the set point by more than ±10%. If it does, the flow through the pump must be recalibrated.

PCDDs/PCDFs and PAHs Using a PS-1 High Volume Sampler

Table 13-1c summarizes the maintenance, testing, and inspection activities for the PS-1 samplers.

Table 13-1c. Maintenance, Testing, and Inspection Requirements for the PS-1 Sampler Used for PCDDs/PCDFs and PAHs

Equipment	Frequency/Method	Acceptance Criteria	Corrective Action
PS-1 sampler	Single point flow check at normal operating flow rate on weekly basis	Within ± 20% of the flow rate indicated by the PS-1 sampler	Service PS-1sampler and perform a new multi-point calibration.
Power cords	Check for crimps or cracks	No obvious damage	Replace as necessary
Cartridge Assembly	Visually check on sample recovery days	No obvious deposits	Wipe clean daily
Gaskets	At 3 month intervals, inspect all gaskets in the sampler	No leaks or compression damage evident	Replace as necessary
Brushes	Replace after 600 – 1000 hrs. of operation	Stable flow rate	Replace as necessary

Table 13-1c. Maintenance, Testing, and Inspection Requirements for the PS-1 Sampler Used for PCDDs/PCDFs and PAHs			
Equipment	**Frequency/Method**	**Acceptance Criteria**	**Corrective Action**
Motor	Replace as needed	Consult manufacturer for correct model of motor	Obtain the correct model
Tubing and fittings	Visually inspect on sample recovery days	No crimps, cracks, or obstructions; no crossthreading	Replace as necessary

PM_{10} and $PM_{2.5}$ Using a Reference Sampler

Tables 13-1d summarizes major maintenance activities for the PM_{10} and $PM_{2.5}$ samplers. The manufacturer's documentation should be consulted for a more exhaustive list of maintenance and inspection procedures.

Table 13-1d. Maintenance, Testing, and Inspection Requirement for the Anderson RAAS Sampler Used for PM_{10} and $PM_{2.5}$			
Equipment	**Frequency/Method**	**Acceptance Criteria**	**Corrective Action**
Sampler inlet/receiver tube	Dismantle and clean at manufacturer specified intervals	No obvious particulate deposits or damage	Clean or replace damaged equipment before sampling
Power cords	Check for crimps or cracks	No obvious damage	Replace as necessary
O-Rings	At 3 month intervals, inspect all O-rings in the sampler	No leaks or compression damage evident	Replace as necessary
Tubing and fittings	Visually inspect on sample recovery days	No crimps, cracks, or obstructions; no crossthreading	Replace as necessary
Vacuum pump	Replace diaphragm of vacuum pump annually	NA	NA

- Field QC Flow Check – The field technicians should perform a single point flow check at the normal operating flow rate on a monthly basis. If the results of the field flow check exceed ±10% of the flow rate indicated by the sampler, the sampler should be serviced (if necessary) and a new, full multipoint calibration should be performed.

- Leak Check – The filter used in the sampler is contained within a cassette. A daily leak check is necessary to demonstrate that the portion of the sample flow rate that leaks past the filter without passing through the filter is insignificant relative to the design flow rate of the sampler. The leak check should be performed at 55 mm Hg vacuum or better. Record the initial vacuum. After ten (10) minutes record the final vacuum. Consult the manufacturer's documentation to find the acceptable criteria for the difference between the initial and final

vacuums. This criteria is sampler dependent as it must take into account the internal volume of the sampler under vacuum.

PM_{10} and $PM_{2.5}$ Using a Met One E-BAM Continuous Monitor

Maintenance, testing, and inspection requirements for the E-BAM continuous monitors are as follows.

- Audit flow system periodically by performing leak checks and flow audits.
- Clean inlets once a month.
- Service pump annually or more often as needed.
- Check the measurement system with the Zero and Span plates quarterly.
- Clean dust off of detector-sensing region quarterly during calibration audit.

13.1.2 Analytical Laboratory Equipment

This section describes the procedures and documentation activities that will be performed to ensure that all fixed laboratory instrumentation and equipment are available and in good working order when needed. Table 13-2 details the fixed laboratory instrument maintenance, testing, and inspection requirements. Equipment maintenance logs must be kept and equipment must be checked prior to use.

Table 13-2. Instrument Maintenance, Testing and Inspection Requirements for Fixed Laboratory Analyses

Parameter/Instrument	Maintenance, Testing, and Inspection Activities
Metals/ICP/MS	Clean nebulizer, check pump tubing, replace disposables, check torch alignment, clean spray chamber. Inspect waste and rinse water container levels. Inspect roughing pump oil level and color. Remove and wipe down interface cones (replace as necessary). Inspect the injector and support adapter for cleanliness. Check the peristaltic pump tubing for wear and replace as necessary.
PAHs/GC/MS	Check connections. Replace disposables. Perform injection port maintenance. Clip column. Perform leak checks. Clean detector.
PCBs/GC/ECD	Check connections. Replace disposables. Perform injection port maintenance. Clip column. Perform leak checks. Clean detector.

Table 13-2. Instrument Maintenance, Testing and Inspection Requirements for Fixed Laboratory Analyses

Parameter/Instrument	Maintenance, Testing, and Inspection Activities
Dioxins & Furans/HRGC/ HRMS	Check connections. Replace disposables. Perform injection port maintenance. Clip column. Perform leak checks. Clean detector.
Asbestos/TEM	Align and check TEM scope. Calibrate for Al/Cu EDX response daily.
Silica/XRD	Check daily for Si-primary peak, displacement, and detector resolution.
Mercury/CVAFS	Check fittings, rinse and refill DDIW bottle, prepare new pretraps, blank each analytical trap. Soak bubblers in 1% KOH solution. Change traps, replace lamps, clean/charge quartz cell. Inspect tubing, replace fittings, prepare new stock standards.
PM_{10}	Annual calibration of balance by outside certification. [(1)]
$PM_{2.5}$	Annual calibration of balance by outside certification. [(1)]

[(1)]Annual calibration records will be maintained by the Quality Assurance Officer.

The maintenance responsibilities for fixed laboratory instruments will be assigned to the Laboratory Section Managers. Laboratory analysts will be responsible for daily checks and calibrations and for reporting any problems with the instruments. The maintenance schedule will follow the manufacturer's recommendations. Laboratory personnel will also be responsible for ensuring that critical parts are kept with the fixed laboratory instruments. Critical spare parts will be immediately available to reduce potential downtime. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes, and/or cannot be obtained in a timely manner.

Annual preventative maintenance service visits will involve cleaning, adjusting, inspecting, and testing procedures designed to minimize product failure and/or extend the product's life. Between visits, laboratory analysts will be responsible for performing routine operator maintenance and cleaning in accordance with the manufacturer's specifications.

13.2 Instrument/Equipment Calibration and Frequency

13.2.1 Field Equipment

All materials, including standards or standard solutions, will be dated upon receipt, and will be identified by material name, lot number, purity or concentration, supplier, recipient's name, and expiration date. All materials must be National Institute of Standard and Technology (NIST)-traceable reference materials.

Metals (TSP Filters)

Table 13-3a summarizes the calibration procedures associated with the high volume samplers used to collect metals (TSP) samples.

Table 13-3a. Calibration Requirements for High Volume Samplers

Equipment	Activity	Acceptance Criteria	Corrective Action
High volume sampler	Initial Calibration: Multipoint calibration performed before first use, quarterly thereafter, after relocation to new site, or after repairs which may affect calibration	NA	NA
	Single point flow check at normal operating flow rate on weekly basis	Within ±20% of the flow rate indicated by the high volume sampler	Service high volume sampler and perform a new multi-point calibration.
Orifice Transfer Standard	Annual calibration by manufacturer.(+)	NA	NA

(+) Calibration records maintained and tracked by Quality Assurance Officer and Field Sampling Coordinator.

Meteorological Monitoring

Calibration of the meteorological monitor will be done quarterly for the wind direction and wind speed. A yearly calibration will be performed for the voltages.

Mercury (Gaseous) Using an Ohio Lumex RA915+ Mercury Analyzer

Table 13-3b summarizes the calibration procedures associated with the mercury (gaseous) analysis using the Ohio Lumex RA915+ Mercury Analyzer.

Table 13-3b. Calibration Requirements for the Ohio Lumex RA915+ Mercury Analyzer

Equipment	Activity	Acceptance Criteria	Corrective Action
Ohio Lumex RA 915+	Factory calibration prior to purchasing unit and when unit continuously fails operating specifications(+)	NA	NA
	Calibration verification: performed prior to and after each sampling event (placed in Test mode, internal test cell containing mercury vapor placed in optical path of instrument)	± 20% of true value	Perform maintenance and/or consult manufacturer

(+) Record of calibration maintained by Quality Assurance Officer.

Asbestos Mercury, Silica and PCBs using a Personal Sampling Pump

A primary cell calibrator will be used to calibrate field sampling pumps. Calibration information (i.e., date, times, equipment make/model/serial number, and results of calibration) will be recorded in calibration logbooks.

Flow Rate Calibration – Prior to first use, or in the event that the sampling pump fails the flow rate verification, the flow rate on the pump will be calibrated by setting the flow rate to the respective set points using a suitable flow-measuring device that is NIST traceable.

PCDDs/PCDFs and PAHs using a PS-1 High Volume Sampler

The initial calibration of the PS-1 sampler will be performed using a critical orifice serving as a reference standard in concert with a water manometer. The critical orifice calibration will be performed by the manufacturer (Tisch) and is NIST traceable. The sampler will be calibrated on-site using a certified flow orifice device before and after each sample collection period to determine volumetric flow rates. All calibration measurements will be standardized to 760 mm Hg and 25^{o}C.

Table 13-3c summarizes the calibration procedures associated with the PS-1 samplers.

Table 13-3c. Calibration Requirements for PS-1 Samplers			
Equipment	**Activity**	**Acceptance Criteria**	**Corrective Action**
PS-1 sampler	Initial Calibration: Multipoint calibration performed before first use, quarterly thereafter, after relocation to new site, or after repairs which may affect calibration	NA	NA
	Single point flow check at normal operating flow rate on monthly basis	Within ± 20% of the flow rate indicated by the PS-1 sampler	Service PS-1 sampler and perform a new multi-point calibration.
Orifice Transfer Standard	Annual calibration by manufacturer and when visual inspection reveals new dents in the device.(1)	NA	NA

(+) Calibration records maintained and tracked by Quality Assurance Officer and Field Sampling Coordinator.

PM_{10} and $PM_{2.5}$ Using a Reference Sampler

Calibration procedures are as follows:

- Transfer Standard Calibration Frequency – The flow rate transfer standard should be sent back to the manufacturer annually for recalibration. Also, if any visual inspection reveals new defects in the device, then it should be sent back to the manufacturer for recalibration. The calibration records will be maintained and tracked by the Quality Assurance Officer and Field Sampling Coordinator.

- Calibration of the Samplers – A multipoint flow-rate calibration consisting of at least three (3) points must be performed before first use and quarterly thereafter. Additionally, the sampler should be calibrated after any repairs that might affect calibration; after relocation of the sampler to a different site; or if the results of a field QC flow check exceed ±10% of the samplers indicated flow rate.

PM_{10} and $PM_{2.5}$ Using a Met One E-BAM Continuous Monitor

Calibration verification is performed using two calibration plates that represent a Zero and Span factory set calibration points. Check that the serial number on calibration plates matches the serial number of the E-BAM to be calibrated. If Zero or Span tests fail, re-run the test. If failure continues, clean the detector and re-run the test. If failure persists, contact the manufacturer.

13.2.2 Analytical Laboratory Equipment

Table 13-4 details the calibration procedures associated with all fixed laboratory instruments. These calibration procedures ensure that the analytical methods and selected instrumentation meet project requirements for selectivity, sensitivity, accuracy and precision of quantitation. These calibration procedures are also discussed in the individual methods.

13.3 Inspection/Acceptance of Supplies and Consumables

13.3.1 Field Supplies/Consumables

Critical supplies and sample containers will be inspected in the following manner.

Critical Supplies and Consumables	Inspection Requirements and Acceptance Criteria	Responsible Individual
Sample bottles, media	Visually inspected upon receipt for cracks, breakage, cleanliness. Must be accompanied by certificate of analysis.	Field Sampling Coordinator
Chemicals and reagents	Visually inspected for proper labeling, expiration dates, appropriate grade Record lot numbers of reagents used for calibration.	Field Sampling Coordinator

Supplies and consumables not meeting acceptance criteria will initiate the appropriate corrective action. Corrective measures may include notification of vendor and subsequent replacement of defective or inappropriate materials. All actions will be documented in the project files.

13.3.2 Analytical Laboratory Supplies/Consumables

Critical supplies and sample containers will be inspected in the following manner.

Critical Supplies and Consumables	Inspection Requirements and Acceptance Criteria	Responsible Individual
Sample bottles, media	Visually inspected upon receipt for cracks, breakage, cleanliness. Must be accompanied by certificate of analysis.	Sample Custodian
Chemicals and reagents	Visually inspected for proper labeling, expiration dates, appropriate grade. Record lot numbers of reagents used for standard preparation.	Laboratory Analyst

Supplies and consumables not meeting acceptance criteria will initiate the appropriate corrective action. Corrective measures may include notification of vendor and subsequent replacement of defective or inappropriate materials. All actions will be documented in the project files.

Table 13-4. Summary of Calibration Procedures for Fixed Laboratory Analyses

Parameter/Instrument	Frequency of Calibration	Acceptance Criteria	Corrective Action
Metals/ICP/MS	Initial Calibration: daily, every 24 hours or every time instrument is set up	NA; monitored by ICV	Perform necessary equipment maintenance and check calibration standards.
	Initial Calibration Verification: immediately after initial calibration	90-110% of true value	
	Continuing Calibration Verification: after every 10 samples and at end of analytical sequence	90-110% of true value	
Mercury/CVAFS	Initial Calibration: prior to sample analysis	% RSD < 15 or $r^2 > 0.999$; percent recovery of each standard in curve 90-110% when calculated with curve with the exception of the lowest concentration standard which must be 75-125%	Perform necessary equipment maintenance and check calibration standards.
	Initial Calibration Verification: immediately after initial calibration	90-110% of true value	
	Continuing Calibration Verification: every 10 samples or every 12 hours, whichever is more frequent and at end of analytical sequence	90-110% of true value	
Dioxins & Furans/HRGC/HRMS	Initial Calibration: prior to sample analysis; once every 6 months or whenever indicated by continuing calibration	% RSD of RRFs must be $\leq$ 10 for unlabeled standards; % RSD of RRFs must be $\leq$ 20 for labeled standards. S/N ratio must be > 10:1 for labeled standards and > 5:1 for unlabeled standards.	Perform necessary equipment maintenance and check calibration standards.

Table 13-4. Summary of Calibration Procedures for Fixed Laboratory Analyses

Parameter/Instrument	Frequency of Calibration	Acceptance Criteria	Corrective Action
	Continuing Calibration Verification (BCS 3): beginning and end of each 12 hour shift or batch, whichever is smaller	RRFs must be within ± 20% of initial calibration mean RRF for unlabeled standards and ± 30% for labeled standards; verify GC column performance and isomer specificity. S/N ratio must be > 10:1 for labeled standards and > 5:1 for unlabeled standards.	
PAHs/GC/MS	Initial Calibration: prior to sample analysis or whenever indicated by continuing calibration	% RSD of RRFs must be ≤ 30 for all standards; S/N ratio must be ≥ 10:1 for labeled standards and ≥ 2.5:1 for unlabeled standards.	Perform necessary equipment maintenance and check calibration standards.
	Initial Calibration Verification: Immediately after the initial calibration curve	70-130% of true value	
	Continuing Calibration: prior to analysis at beginning of each 12-hour shift	RRFs must be within ± 30% of initial calibration mean RRFs; S/N ratio must be ≥ 10:1 for labeled standards and ≥ 2.5:1 for unlabeled standards.	
PCBs/GC/ECD	Initial Calibration: prior to sample analysis or whenever indicated by continuing calibration	% RSD of CFs must be ≤ 20	Perform necessary equipment maintenance and check calibration standards.
	Initial Calibration Verification: immediately after the initial calibration curve	85-115% of true value	
	Continuing Calibration: beginning of each day, every 10 samples, and at end of analytical sequence	CFs must be within 15% of initial calibration mean CFs	

Table 13-4. Summary of Calibration Procedures for Fixed Laboratory Analyses

Parameter/Instrument	Frequency of Calibration	Acceptance Criteria	Corrective Action
Asbestos/TEM	Alignment of TEM: performed daily	NA	Perform necessary equipment maintenance and check calibration standards.
	Magnification: monthly	2x SD must be < 5% cumulative mean	
	Camera Constants: monthly	2x SD must be < 5% cumulative mean	
	Chrystotile Beam Dose: quarterly	Fibrils must be visible for minimum of 15 seconds	
	Spot Diameter: quarterly	Variation of spot diameters must be < 25% of the mean	
	EDXA Resolution: quarterly	Mn K_{∞} peak has resolution $\leq$ 175 eV at full width half maximum	Perform necessary equipment maintenance and check calibration standards.
	Plasma Asher: quarterly	Used to calculate time needed to remove 10% of collapsed mixed cellulose ester filter	
	Grid Opening Measurement: performed on 2% of grid lot to determine average grid opening in mm^2	Variation of grid openings must not be > 5% of the mean	
Silica/XRD	Standard: daily analysis	80-120% of true value	Perform necessary equipment maintenance and check calibration standards.
	Initial Calibration: whenever there is a change in hardware or when a new set of calibration reference standards are prepared	Acceptable daily standard analysis results calculated using this curve; intercept value less than 5 µg for primary peak curves	
PM_{10}	Balance Calibration: daily before use and every 10 samples (200.000 mg) Calibration Verification: daily before use (100.000 mg)	$\pm$ 3 µg $\pm$ 3 µg	Perform necessary equipment maintenance and check calibration standards.

Table 13-4. Summary of Calibration Procedures for Fixed Laboratory Analyses

Parameter/Instrument	Frequency of Calibration	Acceptance Criteria	Corrective Action
$PM_{2.5}$	Balance Calibration: daily before use and every 10 samples (200.000 mg) Calibration Verification: daily before use (100.000 mg)	$\pm$ 3 µg $\pm$ 3 µg	Perform necessary equipment maintenance and check calibration standards.

The use of materials of known purity and quality will be utilized for the calibration of all instruments as part of this project. The laboratories will carefully monitor the use of all laboratory materials including solutions, standards and reagents through well documented procedures.

All solid chemicals and acids/bases used by the laboratories will be reagent grade or better. All gases will be high purity or better. All standards or standard solutions will be obtained from U.S. Environmental Protection Agency certified commercial sources.

All materials including standards or standard solutions will be dated upon receipt, and will be identified by material name, lot number, purity or concentration, supplier, receipt/preparation date, recipient/preparer's name, and expiration date.

Standards or standard solution concentrations will be validated prior to use. This validation may be restandardization for acids and bases, response factor comparison, standard curve response, comparison to other standards made at a different time and/or by a different analyst. All standards and standard materials will be checked for signs of deterioration including unusual volume changes (solvent loss), discoloration, formation of precipitates or changes in analyte response. All standards and standard solutions will be properly stored and handled and will be labeled with all appropriate information including compound/solution name, concentration, solvent, expiration date, preparation date, and the initials of the preparer.

All solvent materials or materials used as part of a given procedure will also be checked. Each new lot of solvent will be analyzed to ensure the absence of interference.

14.0 DATA MANAGEMENT

14.1 Sample Collection Documentation

This section of the QAPP describes field documentation procedures that will be followed for this project. Records of field data will be made throughout the project to document critical data that might be needed at a later time, such as during preparation of the report, or for use by other investigators who were not present when the data were collected.

Field data will be recorded on the following logs, forms, and/or notebooks.

- Daily Personnel Log
- Field Notebooks
- Field Data Forms
- Photographs
- Equipment Calibration Logs
- Health and Safety Logs

The TRC Field Sampling Coordinator has the responsibility to maintain the various logs, forms, and notebooks that document daily field activities as discussed below. Individual responsibilities will be delegated to other field staff as appropriate. Special emphasis will be placed on the completeness and accuracy of all information recorded in the field, and will contain statements that are legible, accurate, and inclusive documentation of project activities. Because the logbooks, field data forms, and chain-of-custody forms provide the basis for future reports, they must contain accurate facts and observations. The language used in recording all field data will be objective, factual, and free of personal interpretations or other terminology that may prove inappropriate.

In general, field forms will be used to record most of the daily field information including calibrations, start and stop times of pumps, sample volumes, equipment inspections, etc. These forms will be filed in the on-site trailer/office. The following sections describe how data collected in the field will be documented, tracked, and controlled.

14.1.1 Daily Personnel Log

A log may be maintained in the field trailer to record the identities of all personnel who are on-site for the duration of the project. A sign will be posted at the entrance to the site indicating that all visitors and contractors must sign-in at the field trailer. The log will record the following information.

- Names of field personnel
- Names of subcontractor personnel

- Names of visitors
- Affiliation of each person on-site
- Time of entry and exit.

14.1.2 Field Logbooks

Field logbooks will provide the means of recording the chronology of data collection activities performed during the investigation. As such, entries will be described in as much detail as possible so that a particular situation could be reconstructed without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in the project files when not in use. Each logbook will be identified by the project-specific document number. All logbooks will be water resistant and have sequentially numbered pages.

The title page of each logbook will contain the following:

- Person to whom the logbook is assigned,
- The logbook number,
- Project name and number,
- Site name and location,
- Site location by longitude and latitude, if known,
- Project start date, and
- End date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, and names of all sampling team members present will be entered. Each page of the logbook will be signed and dated by the person making the entry. All entries will be made in permanent ink, signed, and dated and no erasures or obliterations will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark which is signed and dated by the sampler. The correction shall be written adjacent to the error.

Field activities will be fully documented. Information included in the logbook may include:

- Chronology of activities, including entry and exit times,
- Names of all people involved in sampling activities and organizational affiliations,
- Level of personal protection used,
- Any changes made to planned protocol,
- Names of visitors to the site during sampling and reason for their visit,

- Sample location and identification,
- Weather conditions, including temperature and relative humidity,
- Dates (month/day/year) and times (military) of sample collection,
- Measurement equipment identification (model/manufacturer) and calibration information,
- Field screening results,
- Site observations,
- Sample collection methods and equipment,
- Sample collection date and time,
- Sample identification code,
- Tests or analyses to be performed,
- Sample preservation and storage conditions,
- QC sample collection,
- Unusual observations,
- Record of photographs,
- Sketches or diagrams, and
- Signature of person recording the information

Field logbooks will be reviewed on a daily basis by the TRC Field Sampling Coordinator. Logbooks will be supported by standardized forms.

Separate field logbooks will be issued for each field team or field task in order to preserve a contemporaneous streaming record of each field activity. Each field logbook will be numbered, and a log will be kept denoting the date each notebook was issued, and the field activity corresponding to each notebook.

Upon receipt of the field logbook for a particular activity, the designated person recording the notes will begin recording notes on a new page. The person recording the notes will sign the top of the new page and indicate the date, time, and weather conditions, prior to recording information about the field activity. The field logbook will indicate whether any Field Data Forms are used and the serial number of all forms will be recorded for reference. When the designated person recording the notes either relinquishes the field logbook to another team member or turns the book in at the end of the day, the person relinquishing the field logbook will affix a signature and date to the bottom of the last page used. If the page is not complete, a diagonal line will be struck across the blank portion of the page.

14.1.3 Field Data Forms

Forms were designed to minimize the potential for critical data loss from the field. Field personnel are instructed to utilize these forms to record critical data during the field activities for

which each form was designed. A stockpile of blank forms will be kept in the field office. As forms are completed, they will be kept in a three-ring notebook in the field office.

As with the field logbooks, all documentation will be recorded in permanent ink. Corrections to errors in documentation or recorded calculations will be made by first striking out the error with a single line so as not to obliterate the original entry. Then the replacement entry or value will be inserted where appropriate. The person originating the change will initial and date each separate change. All revisions, deletions, and changes will be made in indelible ink.

14.1.4 Photographs

Field personnel will be instructed to photo-document field activities where possible. A field logbook entry or Photograph Log may be used to record the date and time of all photographs taken at the site.

14.1.5 Equipment Calibration Log

A field logbook entry or field form will be used to record which instruments were calibrated each day (identified by manufacturer, model number and serial number), the individual who performed the calibration, and any notes regarding the maintenance of the instrument.

14.1.6 Health and Safety Log

A field logbook entry or a Health and Safety Log may be used to record any Health and Safety issues that arise during field activities. Any injuries, illnesses, use of first aid supplies, use of personal protective equipment (for levels A, B or C only, if needed), or possible work-related symptoms will be recorded in the log together with the date, the name(s) of the affected individual(s), and a description of the incident.

14.2 Field Documentation Management System

The TRC Field Sampling Coordinator will maintain an inventory of all logbooks used during the program and will be responsible for ensuring that they are archived in the project files following the completion of the investigation.

Completed standardized forms will be maintained by the TRC Field Sampling Coordinator during the duration of the program and will be archived in the project files following completion of the sampling effort.

14.2.1 Sample Handling and Tracking System

This section documents the procedures that will be followed to identify and track samples collected in the field, samples delivered or shipped to a fixed laboratory for analysis, and sample transfer throughout the laboratory.

14.2.2 Sample Identification and Labeling

The establishment of a standard sample designation/labeling protocol is essential to ensure adequate quality assurance/quality control and to allow tracking of each sample and the associated analytical data. Proper labeling allows for the tracking of samples beginning from the time of sample collection, through analysis, and following project completion should future data correlation be deemed necessary. The proper labeling of samples is also critical in ensuring that samples are analyzed within the required sample holding times.

All samples will be identified using a unique sample identification scheme suitable to the project and the sampling protocol. The numbering scheme to be used is presented in Table 14-1.

Table 14-1. Sample Numbering Scheme

Sample Locations	Numbering Scheme
Station 1	parameter - ST 1 - mmddyy
Station 2	parameter - ST 2 - mmddyy
Station 3	parameter - ST 3 - mmddyy
Station 4	parameter - ST 4 - mmddyy
Station 5	parameter - ST 5 - mmddyy
Station 6	parameter - ST 6 - mmddyy
Station 7	parameter - ST 7 - mmddyy
Station 8	parameter - ST 8 - mmddyy
Station 9	parameter - ST 9 - mmddyy
Station 10	parameter - ST 10 - mmddyy
Station 11	parameter - ST 11 - mmddyy
Station 12	parameter - ST 12 - mmddyy
Field/Trip Blanks	parameter - FBB - mmddyy
Field Duplicates	Append “a” to original sample ID and “b” to field duplicate
Cooler Temperature Blank	“Cooler Temperature Blank”
Example Sample Location ID: PAH-ST1-082205 Example Field Duplicate Pair ID: PAH-ST1a-082205/PAH-ST1b–082205	

The sample identification number will be recorded on the chain-of-custody forms accompanying each sample shipment submitted for analysis and will be recorded in the field logbooks.

14.3 Project Documentation and Records

A complete file of project-related documents will be maintained in a central file. The file will contain all contracts, work authorizations, change orders, invoices, and correspondence.

14.4 Data Deliverables

14.4.1 Field Analysis Data

14.4.1.1 Hardcopy Deliverables

For the field analyses associated with this program, which consist of the gaseous mercury analysis and PM_{10} and $PM_{2.5}$ real-time measurements, laboratory data packages are not required. All field and QC sample results, calibrations, and calibration verifications will be recorded in the field logbook, on field screening forms, and on equipment calibration forms to ensure proper verification of the sample results.

14.4.1.2 Electronic Deliverables

Real-time data (i.e., PM_{10} and $PM_{2.5}$) will be downloaded daily from data loggers using cellular telephone modems on each monitor. Ten-minute averages from each station will be transmitted to a central station. Daily plots of real-time data will be generated. Twenty-four hour averages of PM_{10} and $PM_{2.5}$ will be calculated using these data and included on the daily summaries posted on the LMDC website. Graphical presentation of PM_{10} and $PM_{2.5}$ data will be provided on a weekly basis. The gaseous mercury results will be noted on a form during the collection of data. These results will be hand-entered into the central station and included on the daily summaries posed on the LMDC website. The data from the meteorological station units will be recorded by a CSI CR510 digital data logger, and telemetered back via CDMA cellular modems.

14.4.2 Fixed Laboratory Data Package Deliverables

14.4.2.1 Hardcopy Deliverables

Data deliverables for the fixed laboratories will consist of sample and QC results. At a minimum, the data packages from the analytical chemistry laboratories will include the following:

1. Case narrative

    - summary of analytical methods used
    - correlation of field sample identifications and laboratory sample identifications
    - data qualifier definitions
    - deviations from established QA/QC procedures with corrective action

2. Sample results

    - project name

- field sample identification
- batch number
- collection/extraction/analysis dates
- sample results calculated based on the air volume sampled
- quantitation limits
- dilution factors
- TEQs (for dioxin/furan results)
- BAP-equivalent concentrations (for PAH results)

3. Sample documentation

- original chain-of-custody
- shipping documents
- cooler receipt forms

4. Quality Assurance/Quality Control

- method blanks
- spike recoveries (surrogates, MS/MSDs, LCSs, internal standards, field spikes)
- measures of precision (laboratory duplicates, LCS/LCSDs)
- summary of tune and calibration results
- control limits for accuracy and precision

Depending on the analysis, analytical results will be reported within 24 hours or three (3) to five (5) business days of receipt of samples by the laboratory.

Nondetect results must be reported down to the quantitation limit and qualified with a U.

All information related to analysis will be documented in controlled laboratory logbooks, instrument printouts, or other approved forms. All entries that are not generated by an automated data system will be made neatly and legibly in permanent, waterproof ink. Information will not be erased or obliterated. Corrections will be made by drawing a single line through the error and entering the correct information adjacent to the cross-out. All changes will be initialed, dated, and, if appropriate, accompanied by a brief explanation. Unused pages or portions of pages will be crossed out to prevent future data entry. Laboratory records will be reviewed by the Laboratory Section Leaders on a regular basis, and by the Laboratory QA Manager periodically, to verify adherence to documentation requirements.

14.4.2.2 Electronic Deliverables

Laboratory data will be received as hard copy and electronic data deliverables (EDD). EDDs associated with fixed laboratory analyses will be in Excel format. A copy of the required EDD format is provided in Attachment E. A spreadsheet will be generated using the EDDs to provide

results of the target parameters compared to the Target Air Quality Levels, 3x the Target Air Quality Levels, and the USEPA Site-Specific Trigger Levels. The laboratory will calculate all results using sample volumes provided by TRC.

A cumulative average will be generated after the first week of sampling. Results will subsequently be compared and rolled into this cumulative average. Daily summaries of all results will be posed on the LMDC's website.

The EDDs associated with dioxin/furan results will include speciated results for each dioxin/furan congener, the TEFs used, and the TEQ. The EDDs associated with PAH results will include speciated results for each target PAH, the BAP-factors used, and the BAP-equivalent concentration. The EDDs associated with PCB results will include the results for individual Aroclors as well as the result for total PCBs.

14.5 Data Handling and Management

14.5.1 Data Entry and Verification

All data entry performed by TRC or its contractors will be proofed 100% for accuracy. Verification will be carried out either by proofing a printout against the original data or by duplicate entry and comparison of the two data sets to detect discrepancies.

14.5.2 Data Transformation and Reduction

14.5.2.1 Dioxins/Furans Transformation and Reduction

The laboratory will be responsible for calculating the toxicity equivalent quotient (TEQ) for each sample. The TEQ will be calculated using toxicity equivalency factors (TEFs) from *Interim Procedures for Estimating Risks Associated With Exposure to Mixtures of Chlorinated Dibenzo-p-Dioxin and Dibenzofurans (CDDs/ CDFs)*, EPA-625/3-89-016, March 1989. Each dioxin or furan congener is multiplied by the associated TEF. The resulting values from each congener are summed to generate the TEQ. In order to remain conservative, the detection limit for nondetect results will be used and estimated maximum possible concentrations (EMPCs) will be included in the calculations. The TEFs which will be used are as follows:

Dioxin/Furan Congener	TEF
2,3,7,8-TCDD	1.00
2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDD	0.50
1,2,3,7,8-PeCDF	0.05
2,3,4,7,8-PeCDF	0.5
1,2,3,4,7,8-HxCDD	0.10
1,2,3,6,7,8-HxCDD	0.10

Dioxin/Furan Congener	TEF
1,2,3,4,7,8-HxCDF	0.10
1,2,3,6,7,8-HxCDF	0.10
2,3,4,6,7,8-HxCDF	0.10
1,2,3,7,8,9-HxCDF	0.10
1,2,3,7,8,9-HxCDD	0.10
1,2,3,4,6,7,8-HpCDF	0.01
1,2,3,4,7,8,9-HpCDF	0.01
1,2,3,4,6,7,8-HpCDD	0.01
OCDD	0.001
OCDF	0.001

14.5.2.2 PAH Transformation and Reduction

The laboratory will be responsible for calculating the benzo(a)pyrene-equivalent (BAP-equivalent) concentration for each sample. The BAP-equivalent concentration will be calculated using potency equivalency factors (PEFs) from the Office of Environmental Hazard Assessment (OEHHA). Each carcinogenic PAH is multiplied by the associated PEF. The resulting values from each carcinogenic PAH are summed to generate the BAP-equivalent concentration. In order to remain conservative, the quantitation limit for nondetect results will be used in the BAP-equivalent concentration calculation. The PEFs which will be used are as follows:

Carcinogenic PAH	PEF
Benzo(a)anthracene	0.1
Chrysene	0.01
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.1
Benzo(a)pyrene	1.0
Indeno(1,2,3-cd)pyrene	0.1
Dibenz(a,h)anthracene	1.1

14.5.2.3 PCB Reduction

The laboratory will be responsible for calculating the total PCB concentration based on the Aroclor results. If all Aroclors are reported as nondetects, the total PCB results will be equivalent to the sum of the quantitation limits of each individual Aroclor. If one or more Aroclors are detected, the total PCB concentration will be calculated by summing the detected Aroclors only.

If the PCB congener analysis is used due to exceedances of USEPA Site-Specific Trigger Levels as discussed in Section 11.1.2.5, the total PCB concentration will be calculated from the sum of all congeners detected in the analysis.

14.5.3 Data Transfer and Transmittal

Hard copy and EDDs from the laboratories will be transmitted to the TRC Project QA Officer upon completion of analysis, who will forward all deliverables to the TRC Project Manager. Copies of these transmittals will be forwarded to the TRC Project Manager for storage in the project files. Each hard-copy report and EDD will be logged in to TRC's validation tracking log. As the package proceeds through data validation, review, and data management, the status of the package will be recorded in the log. Completion of validation and final disposition of the package will also be documented.

All laboratory data will be maintained in a central file to allow easy retrieval of information and electronic transfer of the data to other parties. As laboratory analytical results are received, and validated, the results will be saved to the central file.

All laboratory data will be provided by the laboratory in both electronic and hard copy format.

After the data are validated, appropriate modifications to the data will be made to reflect the changes resulting from data validation (if any). A second quality assurance review will be performed after the validated data are entered.

14.5.4 Data Analysis and Reporting

All data reports will present summaries of all validated data collected during the field investigation.

14.6 Data Tracking and Control

Management of field data is described in Section 14.4.1. Laboratory data will be maintained as described in the laboratory's QA Manuals. TRC is the custodian of the project files and will maintain the contents of the files, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, and data reviews in a secured, limited access area.

15.0 ASSESSMENT/OVERSIGHT

15.1 Assessments

Technical system audits (TSAs) of both field and laboratory activities are conducted to verify that sampling and analysis are performed in accordance with the procedures established in the QAPP.

Field Sampling TSAs

A system audit of field activities including sampling and field measurements may be conducted and documented by the TRC Project QA Officer (or her designee) quarterly or at the start of each phase of sampling. The purpose of this audit is to verify that all established procedures are being followed as planned and documented and to allow for timely corrective action, reducing the impact of the nonconformance. The audit will ensure that all personnel have read the QAPP. The audit will cover field sampling records, field measurement results, field instrument operation and calibration records, sample collection, preservation, handling, and packaging procedures, adherence to QA procedures, personnel training, sampling procedures, review of sampling design versus the sampling plan, corrective action procedures, and chain-of-custody, etc. Follow-up surveillance will be conducted by the TRC Field Sampling Coordinator to verify that QA procedures are maintained throughout the investigation.

Upon completion of the audit, the TRC Project QA Officer will prepare a written audit report, which summarizes the audit findings, identifies deficiencies and recommends corrective actions. In addition, a verbal debriefing will also be given to the TRC Field Sampling Coordinator and TRC Project Manager at the time of the audit. The written report will be submitted to the TRC Project Manager, who will be responsible for ensuring that corrective measures are implemented.

Fixed Laboratory TSAs

Laboratory audits may be conducted by the TRC Project QA Officer or by a designated qualified individual. If data quality issues are consistently noted during data validation, this may trigger the need for a laboratory audit. The fixed laboratory TSA includes a review of the following areas:

- QA organization and procedures (including the Laboratory QA Plan),
- Personnel training and qualifications,
- Facility security
- Sample log-in procedures,
- Sample storage facilities,
- Analyst technique
- Adherence to analytical methods and the QAPP,

- Compliance with QA/QC objectives,
- Equipment, instrumentation and supplies kept on reserve,
- Instrument calibration and maintenance,
- Data recording, reduction, review, and reporting, and
- Cleanliness and housekeeping.

Preliminary results of the TSA will be discussed with the Laboratory Manager, Laboratory Project Manager, and Laboratory QA Manager during a verbal debriefing held at the facility. Assessment findings will be documented and reported as described in Section 15.2.

Data TSAs

Quarterly data audits will be performed by the TRC Project QA Officer or by a designated qualified individual. These audits will ensure all calculations are being performed properly for TEQs, BAP-equivalent concentrations, total PCBs, cumulative averages, etc. These audits will demonstrate the accuracy of the reported data and eliminate any potential global/systematic calculation errors.

15.2 Assessment Findings and Corrective Action Responses

The results of the field sampling and fixed laboratory TSAs will be documented in written reports; in addition, verbal debriefings will also be held at the conclusion of all audits. The reports will be prepared by the auditor and will describe the scope of the TSA, summarize audit findings, and recommend corrective action. The report will be distributed to the appropriate personnel for response: the TRC Field Sampling Coordinator will be responsible for responding to the field sampling TSA report, and the Laboratory Manager will be responsible for addressing the fixed laboratory TSA report. Significant issues that are discovered during the TSA and which could potentially affect data quality or usability will be brought to the immediate attention of the TRC Project Manager.

The response to the TSA reports will include a description of the corrective action(s) to be implemented, the identities of the personnel responsible for implementing the corrective action, and the schedule for implementation/completion. All responses must be completed within two weeks of issuing the TSA report. The response will be reviewed by the TRC Project QA Officer and/or TRC Project Manager and, if all issues have been addressed appropriately and in a timely manner, no further action will be required. In the event that the corrective action(s) are inadequate or inappropriate, follow-up activities, including additional audits, or discussions with the TRC Project Manager, will be conducted by the TRC Project QA Officer. The complete TSA report, including resolution of any deficiencies, will be included in the QA reports to management.

15.3 Additional QAPP Non-Conformances

15.3.1 Field Non-Conformances

Corrective action in the field may be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the QAPP), or when sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. The field team may identify the need for corrective action. The TRC Field Sampling Coordinator will approve the corrective action and notify the TRC Project Manager and TRC QA Officer. The TRC Project Manager, in consultation with the EPA Region 2 Project Manager, if necessary, will approve the corrective action. The TRC Field Sampling Coordinator will ensure that the corrective action is implemented by the field team. Corrective actions will be implemented and documented in the field logbook. Documentation will include:

- A description of the circumstances that initiated the corrective action,
- The action taken in response,
- The final resolution, and
- Any necessary approvals.

No staff member will initiate corrective action without prior communication of findings through the proper channels as described above All corrective actions will take into account the possible effect on the data. If necessary, a problem resolution audit will be conducted.

15.3.2 Laboratory Non-Conformances

Corrective action in the laboratory may occur prior to, during, and after initial analyses. A number of conditions such as broken sample media, omissions or discrepancies with chain-of-custody documentation, and potentially high concentration samples may be identified during sample log-in or just prior to analysis. Following consultation with laboratory analysts and Laboratory Section Leaders, it may be necessary for the Laboratory QA Manager to approve the implementation of corrective action. The analytical methods specify some conditions during or after analysis that may automatically trigger corrective action or optional procedures. These conditions may include dilution of samples, additional sample extract cleanup, automatic reinjection/reanalysis when certain QC criteria are not met, loss of sample through breakage or spillage, etc. If the corrective action is not clear, the Laboratory QA Manager must notify the TRC Project Manager and TRC QA Officer. All parties will decide and approve a subsequent corrective action procedure that will not adversely affect the achievement of project objectives.

The analyst may identify the need for corrective action. The Laboratory Section Leader, in consultation with the staff, will approve the required corrective action to be implemented by the laboratory staff. The Laboratory QA Manager will ensure implementation and documentation of the corrective action. If the nonconformance causes project objectives not to be achieved, the

TRC Project QA Officer will be notified. The TRC Project QA Officer will notify the TRC Project Manager, who in turn will contact all levels of project management for concurrence with the proposed corrective action.

These corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in both the laboratory's corrective action files, and the narrative data report sent from the laboratory to TRC. If the corrective action does not rectify the situation, the laboratory will contact the TRC Project QA Officer, who will determine the action to be taken and inform the appropriate personnel. If necessary, a problem resolution audit will be conducted.

15.4 Data Validation and Data Assessment Non-Conformances

The need for corrective action may be identified during either data validation or data assessment. Potential types of corrective action may include data qualification or reinjection/reanalysis of samples by the laboratory. These actions are dependent upon whether the data to be collected is necessary to meet the required QA objectives. If the data validator or data assessor identifies a corrective action situation, the TRC Project Manager will be responsible for informing the appropriate personnel. All corrective actions of this type will be documented by the TRC Project Manager and maintained in the project files.

16.0 DATA REVIEW, VERIFICATION, VALIDATION, AND USABILITY

16.1 Data Review, Verification, and Validation

All data generated through field activities, or by the laboratory operation, will be reduced and/or validated prior to reporting. No data will be disseminated by TRC or its subcontractors until it has been subjected to the procedures summarized below.

16.1.1 Field Sampling Data

Field sampling data will be verified daily by each person performing the tasks. These data will be verified for completeness and correctness. Field sampling data will also be independently reviewed daily by the TRC Field Sampling Coordinator, or designee, to ensure that records are complete, accurate, and legible and verify that the sampling procedures are in accordance with the protocols specified in the QAPP. Personnel performing the verification tasks will sign the field notes after verification. Verification will include all field logbook notes, field sampling forms, and COCs.

Sample collection information will be transcribed directly into the field logbook or onto standardized forms. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry. Each member of the field sampling team will be responsible for an internal verification of the transcribed information. Daily external verification of the field records by the TRC Field Sampling Coordinator, or designee, will ensure that:

- Logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.
- Records are legible and in accordance with good record keeping procedures, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.
- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the QAPP, and that any deviations were documented and approved by the appropriate personnel.

16.1.2 Field Analysis Data

Each member of the sampling team performing field analysis tasks will verify their own data at the conclusion of each day for completeness and correctness. Field analysis data will also be independently verified daily by the TRC Field Sampling Coordinator, or designee, to ensure that records are complete, accurate, and legible and verify that the calibration procedures are in accordance with the protocols specified in the QAPP. Personnel performing the verification tasks will sign the field notes after verification. Verification will include all field logbook notes and equipment calibration forms.

Field analysis information will be transcribed directly into the field logbook or onto standardized forms. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry. Each member of the field sampling team will be responsible for an internal verification of the transcribed information. Daily external verification of the field analysis records by the TRC Field Sampling Coordinator, or designee, will ensure that:

- Logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.
- Records are legible and in accordance with good record keeping procedures, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.
- Calibration procedures were conducted in accordance with the protocols described in the QAPP, and that any deviations were documented and approved by the appropriate personnel.

16.1.3 Fixed Laboratory Data

16.1.3.1 Internal Reviews

Prior to the release of any data from the laboratory, the data will be verified and approved by laboratory personnel. This review will consist of a tiered review by the person performing the work, a qualified peer, and by supervisory personnel. Each laboratory used in the program has a procedure in place for documenting all levels of data review.

Prior to being released as final, laboratory data will proceed through a tiered review process. Data verification starts with the analyst or technician who performs a 100 percent review of the data to ensure the work was done correctly the first time. It is the responsibility of the analyst or technician to ensure that the verification of data in his or her area is complete. The data reduction and initial verification process must ensure that:

- Sample preparation and analysis information is correct and complete,
- Results are correct and complete,
- The appropriate methods have been followed and are identified in the project records,
- Proper documentation procedures have been followed,
- All nonconformances have been documented,
- Project-specific requirements have been met.

Following the completion of the initial verification by the analyst or technician, a systematic check of the data will be performed by an experienced peer, Laboratory Section Leader, or designee. This check will be performed to ensure that initial review has been completed correctly and thoroughly. Included in this review will be an assessment of the acceptability of the data with respect to:

- Adherence of the procedure used to the referenced methods and specific instructions,
- Correct interpretation of data (e.g., mass spectra, chromatographic interferences, etc.),
- Correctness of numerical input when computer programs are used (checked randomly) and numerical correctness of calculations and formulas (checked randomly),
- Acceptability of QC data,
- Documentation that instruments were operating according to method specifications (calibrations, performance checks, etc.),
- Documentation of dilution factors, standard concentrations, etc.,
- Sample holding time assessment,
- Nonconforming events have been addressed by corrective action as defined on a nonconformance memo.

A third-level review will be performed by the Laboratory Project Manager before results are submitted to the client. This review serves to verify the completeness of the data report and to ensure that project requirements are met for the analyses performed. The items to be reviewed will include:

- Results are present for every sample in the analytical batch or reporting group,
- Every parameter or target compound requested is reported,
- The correct units and correct number of significant figures are utilized,
- All nonconformances, including holding time violations, and data evaluation statements that impact the data quality are accompanied by clearly expressed comments from the laboratory,
- The final report is legible, contains all the supporting documentation required by the project, and is in either the standard format or in the client-required format.

A narrative to accompany the final report will be finalized by the Laboratory Project Manager. This narrative will include relevant comments, including data anomalies and non-conformances.

16.1.3.2 Independent Review

An independent review of fixed laboratory data will be performed by TRC in order to determine the quality of the analytical data. Data will be validated according to *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (*EPA-540/R-99-008), October 1999, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA 540-R-04-004), October 2004, and *USEPA Contract Laboratory Program National Functional Guidelines for Chlorinated Dioxin/Furan Data Review* (EPA-540-R-02-003), August 2002, which will be modified as necessary to include method-specific criteria, as detailed throughout this QAPP and in the EPA and NIOSH methods.

All data from the Background Phase will be subjected to a limited validation, which includes, at a minimum, a completeness check, an evaluation of chain-of-custody and sample login documents, an overall evaluation of data and potential usability issues, technical holding times, and QC sample results (blanks, surrogate spikes, MS/MSDs, calibrations, matrix duplicates, and LCS, etc.). Following this, a limited validation will be performed on a subset of the data. For the first two months of the program, the validation will be performed on a weekly basis followed by a monthly basis thereafter. Completeness checks will be administered on all data to determine whether deliverables specified in the QAPP are present. The reviewer will determine whether all required items are present and will request copies of missing deliverables. Field notes will be reviewed in conjunction with the laboratory data to allow for an overall assessment.

Upon completion of the validation, a report will be prepared summarizing the elements reviewed. Validated data will be used to generate tables. Potential validation qualifiers are as follows:

U – Not detected at the specified quantitation/detection limit
UJ – Estimated nondetect
J – Estimated value
R – Unusable data point
N – Presumptively present

16.2 Data Usability

The purpose of this section is to indicate the methods by which it will be ensured that the validated laboratory data collected for this investigation are consistent with the project quality objectives established for the project, to ensure the quality of data was sufficient for its intended use, and to identify trends, relationships, and anomalies in the data. Conclusions based on the data, limitations on the use of the data, and the determination if data gaps exist will be included in the Data Validation memoranda. This will be performed on a per sample batch basis.

16.2.1 Precision

The RPD between the LCS and LCS duplicate or sample and sample duplicate, is calculated to compare to precision objectives. LCS/LCS duplicates and laboratory duplicates will be used to assess analytical precision and the field duplicates will be used to assess project precision. The RPD will be calculated according to the following formula:

$$RPD = \frac{(Amount\ in\ Sample\ 1 - Amount\ in\ Sample\ 2)}{0.5\,(Amount\ in\ Sample\ 1 + Amount\ in\ Sample\ 2)}\ x\ 100$$

The impact of analytical imprecision, project imprecision, and overall imprecision (when both analytical and project precision tests show problems) on data usability will be assessed. If the

precision results yield data which are not usable, the Data Validation memoranda will identify how this problem will be resolved.

16.2.2 Accuracy

If field or laboratory contamination exists, the impact on the data will be evaluated during the data usability assessment. The direction of bias for contamination will be identified.

Accuracy is assessed by determining percent recoveries (%Rs) for surrogate/internal standard compounds added to each field and QC sample to be analyzed for organic parameters. Accuracy for all analyses will be further assessed through determination of %Rs for LCSs, SRMs, field spikes, and calibration results, etc. If the Data Validation memoranda indicate contamination and/or analytical biases, the impact on the data will be assessed.

%R for LCSs, SRMs, field spikes, and surrogate compound results will be determined according to the following equation:

$$\%R = \frac{Experimental\ Concentration}{Known\ Amount\ Added} x100$$

Overall contamination and accuracy/bias will be reviewed for each analytical parameter. The data usability assessment will include any limitations on the use of the data, if it is limited to a particular data set, parameter, or laboratory. If the accuracy results yield data which are not usable, the Data Validation memoranda will identify how this problem will be resolved.

16.2.3 Representativeness

If field duplicates indicate spatial variability, the data usability assessment will evaluate the impact on the data. Overall sample representativeness will be evaluated for each analytical parameter. The data usability assessment will include any limitations on the use of the data, if limited to a particular, data set, parameter, or laboratory. If the results of the evaluation of representativeness yield data which are not usable, the Data Validation memoranda will identify how this problem will be resolved.

16.2.4 Sensitivity and Quantitation Limits

Overall sensitivity will be reviewed for each analytical parameter. The impact on the lack of sensitivity or the reporting of higher quantitation limits by the laboratory will be assessed. The Data Usability Assessment will include any limitations on the use of the data, if limited to a particular data set, parameter, or laboratory. If the results of the evaluation of sensitivity yield data which are not usable, the Data Validation memoranda will identify how this problem will be resolved.

16.2.5 Completeness

Completeness is the ratio of the number of valid sample results to the total number of samples analyzed or processed. Following completion of the testing, the percent completeness will be calculated by the following equation:

$$Completeness = \frac{(number\ of\ valid\ measurements)}{(number\ of\ measurements\ planned)} x 100$$

Overall completeness will be reviewed for each analytical parameter. The data usability assessment will include any limitations on the use of the data, if limited to a particular data set, parameter, or laboratory. If the results of the evaluation of completeness yield data which are not usable, the Data Validation memoranda will identify how this problem will be resolved.

16.2.6 Data Limitations and Actions

The field and laboratory data collected during this investigation will be used to achieve the objectives identified in Section 8.0 of this QAPP. The QC results associated with each analytical parameter will be compared to the objectives presented in this QAPP. Data generated in association with QC results meeting the stated acceptance criteria (i.e., data determined to be valid) will be considered usable for decision-making purposes. Limitations on the use of the data will be stated and explained, if necessary.

In addition, the data obtained may be both qualitatively and quantitatively assessed on a project-wide, location specific, and parameter-specific basis. Results of the measurement error assessments may be applied against the site as a whole; any conclusions will be documented in data validation or QA reports. Data generated in association with QC results not meeting the stated acceptance criteria may still be considered usable for decision-making purposes, depending on certain factors. This assessment will be performed by the TRC Project Manager, in conjunction with the TRC Project QA Officer. In general, qualified data will still be usable for project objectives. Qualified data exhibiting concentrations close to the project Action Levels will be evaluated further to determine if there is a potential bias caused by the QC nonconformance which may have caused a false exceedance or a false non-exceedance. Factors to be considered in this assessment of field and laboratory data will include, but not necessarily be limited to, the following.

- Conformance to the field methodologies proposed in the QAPP,
- Conformance to the EPA and NIOSH methods provided in the QAPP,
- Adherence to proposed sampling strategy,
- Presence of elevated detection limits due to matrix interferences present in background ambient air or contaminants present at high concentrations,
- Presence of analytes not expected to be present,

- Conformance to validation protocols included in the QAPP for both field and laboratory data,
- Unusable data sets (qualified as "R") based on the data validation results,
- Data sets identified as usable for limited purposes (qualified as "J") based on the data validation results,
- Effect of qualifiers applied as a result of data validation on the ability to achieve the project objectives,
- Status of all issues requiring corrective action, as presented in the QA reports to management,
- Effect of nonconformance (procedures or requirements) on project objectives,
- Adequacy of the data as a whole in meeting the project objectives,
- Identification of any remaining data gaps and need to reevaluate data needs,
- Examination of site-specific and regional meteorological data to identify the source(s) of the elevated ambient concentrations. Is the elevated concentration likely attributable to activities at 130 Liberty Street, regional background, site-specific influences or none of the above, and
- Examine collateral data collected at the site (e.g., elevated metals concentrations should coincide with elevated particulate concentrations at the same site).

Every attempt will be made to eliminate any sources of sampling and analytical error as early as possible in the program. An ongoing data assessment program throughout the program will also assist in the early detection and correction of problems, thereby ensuring that project objectives are met.

Reconciliation with the project objectives will have been considered to have been met if the measurement performance criteria from Section 8.0 are met. If the data usability indicates that the project quality objectives in Section 8.0 have not been met, then the project management team will meet to determine any additional work to be performed.

17.0 REPORTING, DOCUMENTS, AND RECORDS

QA reports will be submitted to the TRC Project Manager to ensure that any problems identified during the sampling and analysis programs are investigated and the proper corrective measures taken in response. The QA reports may include:

- All results of field and laboratory audits,
- Problems noted during data validation and assessment, and
- Significant QA/QC problems, recommended corrective actions, and the outcome of corrective actions.

QA reports will be prepared and submitted on an as-needed basis.

ATTACHMENT A

Site Location Photographs
(submitted separately)

ATTACHMENT B

Results of Background Phase
(submitted separately)

ATTACHMENT C

Operating Procedures
(submitted separately)

ATTACHMENT D

Equipment List

(submitted separately)

ATTACHMENT E

Electronic Data Deliverable Requirements

Lab EDD Specifications for 130 Liberty Street Deconstruction Project

1) Volume Unit is set as m^3.

2) If an analyte is not detected, include the quantitation limit in the concentration column with a flag '<' in the flag column and 'U' in the qualifier column. For detected analytes, the concentration is put in the Concentration column and there is no need to report the quantitation limit.

3) The result units are set differently but consistent with the parameters:

Asbetos	
PCME	f/cm^3
AHERA	S/mm^2
Silica	ug/m^3
PAHs*	ng/m^3
Metals	ng/m^3
Total Mercury	ng/m^3
Dioxins/furans*	pg/m^3
PCBs	ug/m^3

* In addition, BAP equivalent (ng/m^3) and Dioxin TEQ (pg/m^3) concentrations must be calculated and reported in the EDD.

4) Each row in the EDD will contain information for a single analytical result from a single run of an analytical method, and should be in the format specified below.

Column #/Name	Field Name	Description	Format	Required
1/A	Lab Name	The lab abbreviation that identifies the lab to provide the electronic results.	Text	Yes
2/B	Field Sample ID	The sample ID provided by TRC on the chain-of-custody form.	Text	Yes*
3/C	Sample Location	The sample location that is provided by TRC on the chain-of-custody.	Text	Yes*
4/D	Date Collected	The date that the sample was collected in the field.	Date (mm/dd/yyyy)	Yes*
5/E	Volume Collected	The sample volume that was collected. Stored as text to preserve significant figures.	Text	Yes*
6/F	Volume Unit	A unit associated with the volume collected.	Text	Yes*
7/G	Lab Sample ID	The sample ID used by the lab	Text	Yes
8/H	Date Received	The date that the sample was received by the lab.	Date (mm/dd/yyyy)	Yes*
9/I	Date Analyzed	The date that the sample was analyzed by the lab.	Date (mm/dd/yyyy)	Yes

Column #/Name	Field Name	Description	Format	Required
10/J	Analytical Method	The lab method used to test for the presence of the parameter.	Text	Yes
11/K	Parameter Name	The full name of the parameter.	Text	Yes
12/L	Concentration	The result of the lab test. Stored as text to preserve significant figures.	Text	Yes
13/M	Unit	The unit associated with the concentration.	Text	Yes
14/N	Flag	A description of the result value. '<' for non-detects; '>', '=' for detects; '~' for estimated; '?' for unreliable.	Text	Yes
15/O	Qualifier	Lab data qualifiers. 'U' for non-detects; '', 'B', 'J' for detects. There may be more than one for a particular result.	Text	Yes
16/P	Date Reported	The date that the lab generates the EDD.	Date (mm/dd/yyyy)	Yes
17/Q	Note	Additional comments that the lab provides for each individual analytical result.	Text	No

* - Optional for lab QA Samples

5) The field duplicate, field blank and lab QA samples are reported in the same format as normal samples.

6) Name each EDD file in the following format: parameter name followed by the sample collection date (e.g., PCBs8222005) or lab name followed by the sample collection date (e.g., STL8222005).