QUALITY ASSURANCE PROJECT PLAN:

PERIMETER AND AMBIENT SAMPLING AND ANALYSIS OF RELEASES FROM THE HANDLING AND BURNING OF CONSTRUCTION AND DEMOLITION (C&D) RESIDENTIAL BUILDING DEBRIS FROM HURRICANE KATRINA USING AIR-BURNER TECHNOLOGY

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A1 QUALITY ASSURANCE PROJECT PLAN

APPROVAL SHEET

EVALUATION OF ASBESTOS AND OTHER RELEASES FROM THE HANDLING AND BURNING OF RESIDENTIAL BUILDING DEBRIS USING AIR-BURNER TECHNOLOGY: HURRICANE KATRINA, NEW ORLEANS, LA

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A3 ACKNOWLEDGMENT AND DISTRIBUTION LIST

A3.1 Acknowledgment

The following individuals participated in preparation of this Quality Assurance Project Plan.

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Contractor Project Team:

Cadmus, Berger, RTI

A3.2 Distribution List

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A4 PROJECT TASK/ORGANIZATION

A4.1 Project Organization

The U.S. EPA's Office of Research and Development (ORD) and U.S. EPA Region 6 are cooperatively conducting this project. The Air Pollution Prevention and Control Division (APPCD) of EPA's National Risk Management Research Laboratory (NRMRL) will be responsible measuring the emissions directly from the Air Burner Technology (ABT) and the Sustainable Technology Division (STD) will be responsible for measuring ambient air releases from debris handling and from operation of the ABT. Note that ABT is synonymous with the term ACD which stands for Air Curtain Destructor. This Quality Assurance Project Plan (QAPP) will address the activities relating to the sampling and analysis of releases to the ambient air. (A separate QAPP has been prepared to address the activities relating to the sampling and analysis of emissions directly from the ABT plume.) Cadmus, Inc. is the prime contractor to EPA's Sustainable Technology Division and will have overall responsibility for the implementation of this Quality Assurance Project Plan (QAPP).

The roles and responsibilities of key project personnel from EPA's STD and Cadmus/Berger are summarized in Table A-1. The project structure along with the technical personnel selections are designed to provide efficient management and a high level of technical competence to accomplish this project.

Figure A-1 Project Organizational Structure

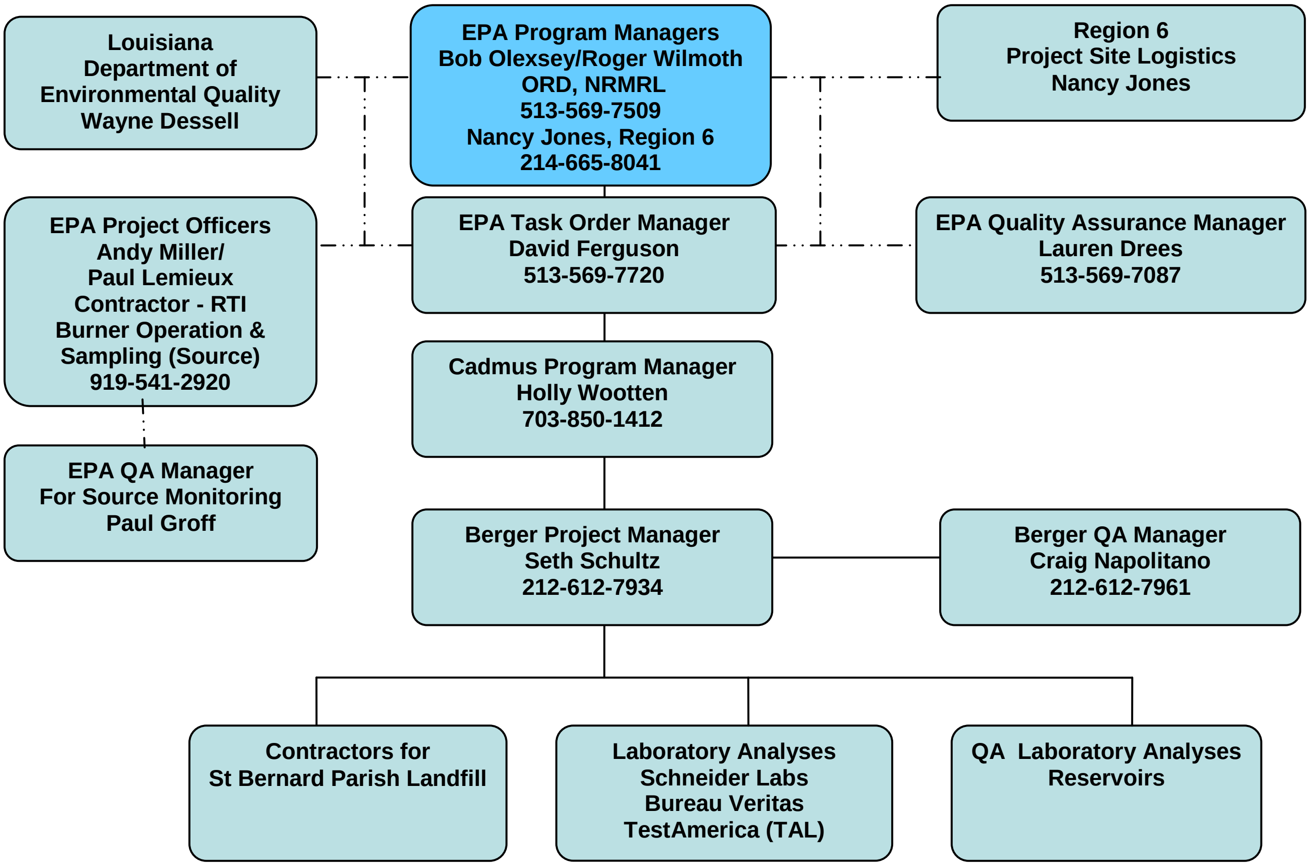

Table A-1. Roles and Responsibilities of Key Project Personnel

Personnel	**Role and Responsibility**
Fran Kremer, U.S. EPA, ORD, NRMRL	*Program Director*, will have overall coordination responsibilities for ORD.
Roger Wilmoth U.S. EPA, ORD, NRMRL	*Program Manager*, will have overall administrative and technical responsibility for this project.
David Ferguson, U.S. EPA, ORD, NRMRL	*Task Order Manager (TOM),* will direct the administrative functions of the project and ensure that it is proceeding on schedule and within budget. Point of contact for Cadmus.
Lauren Drees, U.S. EPA, ORD, NRMRL	*QA Officer*, will review and approve QAPP. Will provide QA oversight to ensure that the planning and plan implementation are in accordance with the approved QAPP. In addition, will direct a field audit and a laboratory audit.
Holly Wooten, Cadmus, Inc. Seth Schultz, Louis Berger Group Inc	*Project Manager,* will have overall administrative and technical responsibility for Cadmus/Berger and its sub-contractors to ensure that data collection and analysis and the technical report meet the planned study objectives. Maintain close communication with the EPA TOM. Ensure that the project is completed in accordance with the approved QAPP and all personnel fully understand the QAPP.
Craig Napolitano, The Louis Berger Group Inc	*QA Manager*, will review the QAPP and perform data validation.
Schneider Labs	Will provide laboratory analysis of $PM_{2.5}$, TSP/Metals samples
Bureau Veritas	Will provide primary laboratory analysis of asbestos samples
Reservoirs Inc	Will provide quality assurance (QA) secondary sample analysis for asbestos samples
TestAmerica (TAL)	Will provide laboratory analysis of Dioxin/Furan
EEG	Industrial Hygiene subcontractor to Berger. Conducted building inspection, will perform worker sampling.

A5 PROBLEM DEFINITION/BACKGROUND

A5.1 Background

On August 29, 2005, Hurricane Katrina made landfall near New Orleans, Louisiana (LA) breaching the levees that protect the city from Lake Pontchartrain. The hurricane also damaged the coastal regions of southern Louisiana, southern Mississippi, and southern Alabama. Approximately 260,000 residential buildings in the City of New Orleans were identified as structurally unfit for reoccupation.

The State of Louisiana requested assistance in this massive effort of demolition, debris handling, and ultimately volume reduction and final disposal of the waste material. Burning of the debris has been proposed as a potential means of volume reduction of the debris while minimizing potentially harmful environmental impacts.

OECA has issued a *No Action Assurance* (NAA) letter to that would allow the EPA to proceed with an evaluation of the burner technology. EPA wants to determine if potential burning activities will be protective of human health and the environment. This air monitoring plan developed by the EPA Office of Research and Development will be coordinated with OECA and LDEQ to ensure that the proposed burner activity is well integrated into the overall approach being taken regarding the NAA and will provide data of sufficient scientific quality to judge the environmental effectiveness of burner use on C&D residences. This project is being conducted to provide data that will enable EPA to evaluate the potential use of this activity for future disasters.

The project will be conducted at the Paris Road Landfill in St Bernard Parish near New Orleans, LA. Only demolition debris from buildings containing non-regulated quantities of asbestos will be used in the evaluation. The primary purpose of the Sustainable Technology Division's (ORD/NRMRL/EPA) involvement in this project is to measure the ambient air releases of asbestos from debris handling and ABT burning activities; i.e., the ABT Process. Other target analytes in the ambient air include forsterite, TSP/metals, particulate as $PM_{2.5}$, and polychlorinated dibenzodioxins (PCDDs)/ polychlorinated dibenzofurans (PCDFs).

A5.1.1 Air Burner Technology

A skid-mounted 200-Series burner manufactured by Air Burners, LLC is shown in Figure A-2. The 200-Series have a cross sectional area of approximately 8 feet wide by 8 feet high. The fire box is refractory lined (Figure A-3). The units are loaded over the top and the twin doors at the rear of the unit allow for ash removal (Figure A-2). An air disbursement manifold system is mounted on one end of the combustion vessel.

The operating principle of the ABT is that high velocity air is directed across and downwards at an angle into the combustion vessel creating the air curtain on top and a rotational turbulence with the vessel itself. In theory, the high velocity air curtain traps the unbound particulates. The rotational turbulence provides an oxygen-enriched environment within the combustion zone which accelerates the combustion process by raising the temperature within the vessel to approximately 1,000 ^{o}C (approx. 1,832 ^{o}F).

Figure A-2. ABT Unit (Model S-327, Air Burners, LLC) used in Phase I performance evaluation at Amid Landfill in New Orleans, LA (October 24-25, 2005).

Figure A-3. ABT, fire box is refractory lined. The twin doors at the rear of the unit allow for ash removal.

Chrysotile asbestos dehydroxylates partially and gradually; dehydroxlyation mainly occurs at approximately 600-650 ^{o}C followed by recrystallization to forsterite and silica at about 810-820 ^{o}C. Forsterite is difficult to positively identify and materials resembling forsterite will be noted as "forsterite-like" in the final report. The objective is to determine and quantify if any chrysotile asbestos present does convert to a non-asbestos substance. EPA's primary criterion for determining the thermal degradation of chrysotile asbestos is to maintain a temperature in the ABT of >800 ^{o}C. Theoretically, if this temperature is maintained the chrysotile asbestos will be converted to a non-asbestiform, forsterite and crystalline silica. Laboratory tests indicated that this transformation may occur at even lower temperatures than reported in the literature.

A5.2 Objectives

The goal of this study is to assess the releases to the ambient air from the use of an air Burner Technology (**ABT)** process. The scope of this assessment includes the handling and burning of Construction & Demolition (C&D) residential building debris at the burner site. While these buildings often contain asbestos, it is not in quantities that are regulated. This information will be used to support a risk assessment of the ABT Process. Measured/modeled air concentrations will be compared to identified health effects benchmarks, as well as background concentrations. The risk assessment approach is described in a separate document.

The following primary objective will guide the design and implementation of this project with appropriate consideration of the secondary objectives. These objectives all relate to measurements made during the burning of C&D material unless otherwise noted.

A5.2.1 Primary Objective

1. To determine the ambient air ***asbestos (TEM) concentrations*** released from ABT Process.

A5.2.2 Secondary Objectives

1. To determine if the ***asbestos (TEM) concentration during burning is statistically equal to or greater than the background concentration***.

2. To determine ***ambient air forsterite*[1]*, TSP/metals,*[2] *particulate (as* $PM_{2.5}$*), polychlorinated dibenzo-p-dioxins (PCDDs)/polychlorinated dibenzofurans (PCDFs), and fiber concentrations*** from the ABT Process. TSP will also be collected during the vegetative burns.

3. To determine the ***asbestos and forsterite concentrations in the settled dust (TEM)*** from the ABT Process.

4. To determine ***worker exposure asbestos concentrations (TEM), forsterite***, ***worker fiber exposure concentrations (PCM), worker lead, and worker carbon monoxide(CO) exposure concentrations*** from the ABT Process during the C&D burn. Only CO.will be monitored during the vegetative burn.

5. To determine the ***carbon monoxide profile*** around the ABT process.

6. To determine the ***background concentrations of airborne asbestos, total fibers,*** $PM_{2.5}$***, TSP/metals and dioxin/furan*** .

7. To estimate the ***volume reduction achieved*** by the burner operation

A6 PROJECT/TASK DESCRIPTION

A6.1 Technical Approach

The project will gather data on the emissions from the ABT during volume reduction of building debris from residences that have been destroyed by Hurricane Katrina. The building that will be used in the project is located in Saint Bernard Parish, LA.

The ABT field evaluation will be conducted at the Paris Road Landfill/Debris Collection Site. The site is located on Paris Road in St Bernard Parish, near New Orleans, LA.

A6.1.1 Asbestos and Lead Inspection of Buildings

*Asbestos—C*andidate residential buildings were inspected by a State of Louisiana Department of Environmental Quality (LDEQ) licensed Asbestos Consultant. The initial surveys were conducted by St. Bernard Parish contractors under their protocol, which included making

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[1] Forsterite-like structures will be identified and quantitated.

[2] Metals include antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, selenium and silver

some assumptions as to the positive asbestos content of specific materials (e.g., floor tile, transite siding, etc.). These inspections were verified by a separate EPA contractor to quantify those materials judged positive by assumption under the St. Bernard Parish contractors' protocol and to perform a QA/QC check on 15-20 percent of the surveys. The objective of the inspections was to determine the type and quantity of asbestos-containing materials present in the buildings (see Appendix A for the building Assessment QAPP). Collection of samples was conducted in accordance with EPA's Asbestos Hazard Emergency Response Act (AHERA, 40 CFR §763). The initial list of houses and their asbestos assessments was supplied to EPA by Parish Contractors.

Lead in Paint— Lead in paint film ("paint chip") samples was collected from the interior finishes (painted gypsum wallboard and millwork) and from the exterior surfaces (clapboard siding and window sash/frame) from each of the buildings.

A6.1.2 Building Debris

A contractor will transport residential building debris that is non-RACM, but does contain asbestos-containing materials (see Section A6.1.1 "*Asbestos Inspection of Buildings"*) to the site. The building material as well as vegetative debris will be weighed by the onsite contractor (Shaw) prior to feeding in the air burner and documented by The Louis Berger Group.

A6.1.3 Test Conditions

Monitoring of the ABT will occur over four days. The first two days will be a shakedown with vegetative debris to determine the operating procedures that will be used during burning of the residential building debris. NRMRL's APPCD will sample the emissions from the ABT during this period and total particulate (TSP) will be measured in the perimeter by NRMRL's STD.

Over the next two days, three four-hour test runs will be performed during which non-RACM C&D residential debris will be burned. NRMRL's APPCD will sample the emissions from the ABT plume during this period. The STD will conduct the ambient monitoring during these tests.

A6.1.4 Perimeter Air Monitoring (Asbestos and TSP/Metals)

A series of stationary air monitors will be positioned to measure the release of airborne asbestos fibers from handling and burning of C&D debris in the ABT. Total Suspended Particulate (TSP) and metals will also be monitored.

The movement of the released asbestos fibers with the prevailing winds (transport), the vertical movement of the asbestos fibers due to turbulence (dispersion), and the amount of the fibers removed due to deposition is influenced by the physical properties of the asbestos fibers, the release characteristics during debris handling, debris loading of the ABT, operation characteristics of the ABT, and by meteorological conditions.

To account for the uncertainty in the wind direction on a given test day as well as the change in wind direction during a given test day, the primary air sampling design is based on a concentric ring approach rather on an upwind to downwind approach.

The perimeter air monitoring network will consist of two concentric rings around the burner operation. The asbestos monitors will be placed in each ring at approximately 20-degree intervals measured along a radius from the center of the burner operation. The monitors for asbestos will be placed at 10-ft above the ground on the primary ring (hereafter referred to as Ring 1). During the vegetative burn, three downwind samplers for TSP will be placed at a height of 5- feet above the ground on Ring 1 & 2.

During the C&D burn, three downwind samplers for TSP/metals and for particulate matter as $PM_{2.5}$ will be placed at a height of 5- feet above the ground on Ring 1. During the C&D burn, on the secondary ring (hereafter referred to as Ring 2), all monitors will be placed at 5-ft above ground with identical number of monitors as ring 1. The asbestos samplers must be a minimum of 10 feet away from any high volume samplers (TSP, $PM_{2.5}$). See Figure A-4.

Asbestos samples will be collected at a flow rate of 8 lpm for four hours for a target air volume of 1,920 liters. In addition, low-volume samples (3 lpm for fours hours for a target air volume of 720 liters) will be collected at all sample locations in Ring 1; these samples will be archived and only analyzed if the higher volume samples are overloaded. Samples for $PM_{2.5}$ and TSP/metals will be collected at a flow rate of approximately 44 cfm for a minimum of 12 hours (as composites for the three runs) for a target air volume of 900 m^3. Six each of these samplers will be located downwind, three on each ring. Dioxin samples will be collected at a flow rate of approximately 8 cfm for a minimum of 12 hours for a target air volume of 165 m^3. The samplers will be shut down overnight. Six each of these samplers will be located downwind, three on each ring.

Ring 1 and Ring 2 will be placed approximately 100 feet and 300 feet from the ABT, respectively. Site logistics were considered in selecting the distance. The distance of the two rings was established to provide additional information about the emissions from the ABT at a significant distance from the burning activity and these data will be used to verify modeling approaches for the risk assessment activity that is separate from this QAPP.

During a performance evaluation that was conducted on October 24-25, 2005, prior to start of the air curtain, premature combustion resulted in a plume of smoke from the ABT (Figures A-5 and A-6). If such occurs during the sampling event, the resultant particulate loading on the filters could preclude the analysis for asbestos using the direct transfer technique (ISO Method 10312:1995). Therefore, the monitoring period will commence after steady-state operation of the ABT is achieved with the construction debris as determined by the attainment of "*no easily visible plume*" from the unit. Based on observations made during the performance evaluation, steady-state operation conditions may be achieved within approximately 15 minutes following startup.

In addition, separate ambient samples for asbestos, PCDDs/PCDFs, $PM_{2.5}$ and TSP/metals will be collected at various sites in and around the test site as shown in the photo below. They are:

1. West of the trailers at the URG Office compound
2. Inside the fence on the URG/Parish property west of Paris Road
3. West of the Motel on Paris Road
4. West of SDT Transfer Station
5. West of the URG Inspection tower
6. Six background sample locations for Asbestos and 3 background sample locations each for TSP/metals, $PM_{2.5}$, and PCDDs/PCDFs to be determined.
7. Downwind in boat 500-1000 feet from burner (Asbestos air only)

PCDDs/PCDFs, $PM_{2.5}$ and TSP/metals will be collected over a 12 hour period during the burning of the C&D debris. Asbestos samples will be collected during each run under the same conditions as ring 2.

Figure A-4. Sampling Sites

Paris Rd Landfill Sampling Areas

Figure A-5. Particulate emissions during charging of ABT and during vegetative debris handling at Amid Landfill (October, 25, 2005).

Figure A-6. Smoke plume generated during initial stage of startup due to premature combustion prior to start of air curtain. Amid Landfill (October, 25, 2005).

Ambient (five locations) and background air monitoring will be conducted. These samples will be collected during the ABT operation tests. These samples will be collected over the same period and at the same sampling flow rate as the main samples. Background includes six samples for asbestos and three samples each for PCDDs/PCDFs, TSP/metals, and $PM_{2.5}$. Background samples will be collected at a location to be determined to be away from the influence of the burning operation and the traffic on Paris Rd. The samples will be collected as shown in Tables A-2 and A-3.

At the end of the C&D testing, four settled dust sampling containers will be placed in the area and sample for 48 hours. The four monitors will be located approximately 100 ft from the center of the pad at a height of 5 ft as shown in Table A-4.

Table A-2. Perimeter Air Monitoring (Asbestos and TSP/Metals) During Operation of ABT Process with C&D

Ring	Sample Type	Air Volume	Number of Samples			
			Test 1	Test 2	Test 3	Total Samples
Asbestos[a] C&D Test Runs Only						
R-1 @ 10-ft above Ground	4-hr period	1,920 L	18	18	18	54
	Duplicate	1,920 L	2	2	2	6
	Field blank	0	1	1	1	3
	Total Samples		**21**	**21**	**21**	**63**
	4-hr period	720 L	18	18	18	54
	Duplicate	720 L	2	2	2	6
	Field blank	0	1	1	1	3
	Total Samples[b]		**21**	**21**	**21**	**63**
R-2 @ 5-ft above Ground	4-hr period	1,920 L	18	18	18	54
	Duplicate	1,920 L	1	1	1	3
	Field blank	0	1	1	1	3
	Total Samples		**20**	**20**	**20**	**60**
Ambient Locations	Five + 6 Background + boat		12	12	12	36
	Field Blanks		1	1	1	3
	Total Samples		**13**	**13**	**13**	**39**
Total						**225**
TSP/Metals						
			C&D	Veg Debris[d]		
R-1 @ 5-ft above Ground	12-hr period	900 m^3	3	3		6
	Duplicate	900 m^3	1	1		2
	Field blank	0	1	1		2
	Total Samples		**5**	**5**		**10**
R-2 @ 5-ft above Ground	12-hr period	900 m^3	3	3		6
	Duplicate	900 m^3	0	0		0
	Field blank	0	1	1		2
	Total Samples		**4**	**4**		**8**

Ambient Locations	Five + 3 Background		8	3	11
	Field Blank		1	1	2
	Total Samples		**9**	**4**	**13**
			Total		**31**
Ring	**Sample Type**	**Air Volume, L**	**Number of Samples**		**Total Samples**
Particulate $PM_{2.5}$					
			C&D		
R-1 @ 5-ft above Ground	12-hr period	900 m^3	3		3
	Duplicate	900 m^3	1		1
	Field blank	0	1		1
	Total Samples				**5**
R-2 @ 5-ft above Ground	12-hr period	900 m^3	3		3
	Duplicate	900 m^3	0		0
	Field blank	0	1		1
	Total Samples				**4**
Ambient Locations	Five + 3 Background		8		8
	Field Blank		1		1
	Total Samples				**9**
			Total		**18**

[a] Samples will be analyzed both for asbestos (ISO 10312:1995) and total fibers (NIOSH 7400, A Rules).
[b] Samples will also be analyzed for forsterite-like materials.
[c] These samples will only be analyzed if high volume (1,920 liter) samples are overloaded.
[d] TSP only

A6.1.5 Perimeter Air Monitoring (Particulate as $PM_{2.5}$)

$PM_{2.5}$ monitors will be placed downwind at the 6 locations in Rings 1 and 2, and at the ambient locations. The monitors will be equipped with a filter which will capture the particulate over the course of the 12-hour burn (composite of the three four-hour tests). This filter will be submitted for gravimetric analysis to provide total $PM_{2.5}$. The estimated number of particulate samples to be collected and analyzed for asbestos and TSP/metals is presented Table A-2.

A6.1.6 Perimeter Air Monitoring (PCDDs/PCDFs)

Ambient air samples for PCDDs/PCDFs will be collected downwind at the 6 locations in Ring 1 and 2 as well as the ambient and background locations. Due to the required sample volume and the relatively short test period (four hours), composite samples will be collected during the three tests. Sampling will be halted at the end of each day if the test runs are not completed in one day and re-started for the next test. The samplers will be placed at a height of five feet above ground. A sampling flow rate of approximately eight scfm will yield a target air volume of 165m^3.

The estimated number of ambient air samples that will be conducted for PCDDs/PCDFs is presented in Table A-3.

Table A-3. Air Samples on Perimeter Rings 1 and 2 for PCDDs/PCDFs During Operation of ABT Process with Asbestos-Containing Debris

Ring	Sample Type	Number of Samples
		Asbestos
R-1 @ 5-ft above ground	12-hr period	3
	Duplicate	1
	Field Blank	1
	Total Samples	**5**
R2 @ 5-ft above ground	12-hr period	3
	Field Blank	1
	Total Samples	**4**
Ambient Locations	Five + 3 Background	8
	Field Blank	1
	Total Samples	**9**
Total Table Samples		**18**

A6.1.7 Settled Dust (Asbestos)

Settled dust samples for asbestos (and forsterite-like structures) will be collected as an indicator of the amount of these particulates from the debris handling and ABT operation that may deposit onto the soil. The settled dust samplers will be placed on Rings 1 and 2 at the same locations as the 18 perimeter air asbestos samples at a five-foot height; i.e., the samplers will be evenly distributed along each at 20^o intervals. Composite samples will be collected during the three tests when C&D debris is burned yielding a total sampling time of 12 hours.

The estimated number of settled dust samples to be collected and analyzed for asbestos is presented Table A-4.

Table A-4. Settled Dust Samples on Perimeter Rings (Asbestos[a]) During Operation of ABT Process with C&D Debris

Ring	Sample Type	Number of Samples			Total Samples
		Test 1	Test 2	Test 3	
Asbestos					
R-1 @ 5-ft above ground	Settled Dust	18			18
	Duplicate	2			2
	Field Blank	1			1
	Total Samples	**21**			**21**
R-2 @ 5-ft above ground	Settled Dust	18			18
	Duplicate	1			1
	Field Blank	1			1
	Total Samples	**20**			**20**
Ambient Locations	Five + 6 Background	**11**			**11**
Monitoring after C&D burn	NE, NW, SE, SW of ACD	**4**			**4**
	Field Blank	**1**			**1**
Total Table Samples					**57**

[a] Samples will also be analyzed for forsterite-like materials.

A6.1.8 Worker Air Monitoring (Asbestos, Lead, and Carbon Monoxide)

All workers directly involved with handling of the debris and operation of the ABT will wear personal protective equipment as specified in the site-specific Health and Safety Plan (HASP). During the vegetative runs, only CO will be monitored. Each worker's personal breathing zone exposure concentration to asbestos fibers will be measured for the three C&D test runs. Each worker's personal breathing zone exposure concentration to lead will be measured for the three C&D test runs. In addition, the track hoe operator will be monitored for carbon monoxide (CO) the three C&D test runs. This monitoring will provide a reasonable characterization of concentrations in air closest to the source of any potential release. Personal samples for asbestos (including total fibers), lead, and CO will be collected to determine the eight-hour time-weighted average (TWA) concentration for comparison to the OSHA Permissible Exposure Limits (PELs). The estimated number of worker exposure samples to be collected and analyzed for asbestos (and total fibers), forsterite, lead, and CO is presented in Table A-5.

Table A-5. Worker Exposure Monitoring

Worker		Number of Samples			
	Air Volume, L	**Test 1 Day 1**	**Test 2 Day 1**	**Test 3 Day2**	**Total Samples**
Asbestos[a,b]					
Loader & Operator (2)	480	2	2	2	6
Other Workers (4)	480	4	4	4	12
Field blank	0	1	0	1	2
Duplicate		1	0	1	2
C&D Total Samples		**8**	**6**	**8**	**22**
Lead					
Excavator Operator (1)	480	2	2	2	6
Other Workers (4)	480	4	4	4	12
Field blank	0	1	0	1	2
Duplicate		1	0	1	2
Total Samples		**8**	**6**	**8**	**22**
C&D & Total					**22**
Carbon Monoxide					
Loader & Operator (2)	NA	2	2	2	6
Field blank	NA				
Total Samples		**2**	**2**	**2**	**6**
C&D & Veg Debris Total					**12**

[a] Samples will be analyzed both for asbestos (ISO 10312:1995) and total fibers (NIOSH 7400, A Rules).
[b] Samples will also be analyzed for forsterite-like materials.

A6.1.9 Carbon Monoxide Profile Around ABT

A carbon monoxide profile as a function of distance downwind from the ABT will be generated by a series of measurements using a handheld direct reading instrument. One profile will be made during each of the three test periods (burning C&D) with one duplicate. Measurements will start 50 ft downwind of the ABT and measurements will be taken every 100 feet from until 550 feet from the ABT.

A6.1.10 Water for Debris Wetting (Asbestos)

The debris to be used in the burner will be provided by Parish contractors. The debris will be visually inspected as it is received and deposited at the burning location. It will be wetted with water during the unloading process and then covered with tarps or plastic until it is used for the burning test. It will be also wetted with water during the process of loading it into and feeding the burner.

If present, samples of pooled surface water will be collected during application of the water to the debris pile and loading of debris in the air burner. The sampling of the collected surface water will be spaced over the duration of the three ABT runs. One sample will be a composite sample from the debris pile over the three test runs and another sample will be a composite of the loading or feeding area. The expected number of samples that will be collected and analyzed for asbestos presented in Table A-6.

Table A-6. Surface Water Samples (Asbestos)

Sample Type	Number of Samples			Total Samples
	Test 1	Test 2	Test 3	
Surface Water	2			2
Field Blank	1			1
Total Samples				3

The asbestos concentration of the source water applied to control the particulate emissions from the debris pile during charging of the ABT will be measured. A source sample will be collected from each truck load of water. The estimated number of source water samples to be collected for asbestos analysis is presented in Table A-7.

Table A-7. Source Water Samples for Asbestos Analysis

Sample Type	Number of Samples			Total Samples
	Test 1	Test 2	Test 3	
Source Water	2			2
Total Samples				2

A6.1.11 Site Assessment Air Sampling

Prior to conducting the shakedown tests of the ABT, the test site will be assessed by collecting samples for asbestos. Four samples were collected; one at the burner location, one each at ambient locations 1& 3, and one at an area that may be suitable for background sampling. No asbestos was detected in these samples. In addition five additional sites along Paris Rd within ½ mile will also be monitored within two days of the testing. The impact of the results for these samples will be evaluated for the burn tests.

A6.1.12 Meteorological Monitoring

Meteorological conditions will be determined and continuously monitored during sampling using an appropriate Meteorological Monitoring System. The meteorological parameters that will be measured include wind direction and speed, air temperature, relative humidity, and barometric pressure.

A6.1.13 Weather Restrictions

Monitoring will not be conducted during rain conditions. Should light rain be encountered, monitoring will cease until the rain stops. For this study, if sustained wind speeds in excess of 20 mph (60-minute average) are encountered, monitoring will pause until the wind speed is less than these conditions. The maximum limits were established to attempt to prevent the higher winds speeds from excessively modifying the micrometeorology. Operations will resume upon the winds returning to stable conditions for 15-minutes minimum allowable within the confines of the test, or will be delayed until satisfactory conditions exist. Wind conditions at the site will be continuously monitored by the onsite weather station. As an additional safety precaution, the test cannot be conducted when the wind direction is blowing toward the occupied trailers at the front of the Paris Road Landfill (wind blowing due east). Should this condition occur for longer than a 15-min period, the test will be halted until acceptable wind directions are re-established.

A6.1.14 Summary of Field Samples

The number of field samples that will be collected is summarized in Table A-9.

Table A-9. Summary of Field Samples to be Collected (including Quality Control Samples)

Source Table or QAPP Section	Air					Settled Dust	Water
	Asbestos[a,b]	TSP/Metals	PM$_{2.5}$	D/Fs	CO	Asbestos[b]	Asbestos Water
A-2: Perimeter Air	225	31[f]	18	-	-	-	-
A-3: Perimeter Air	-	-	-	18	-	-	-
A-4: Settled Dust	-	-	-	-	-	57	-
A-5: Worker	22[b]	22[e]	-	-	12	-	-
A-7: Surface Water	-	-	-	-	-	-	3
A-7: Source Water	-	-	-	-	-	-	2
A6.1.11 SiteAssesment Air	9	-			-		-
Total Samples	**256**	**53**	**18**	**18**	**12**	**57**	**5**

[a] Samples will also be analyzed for total fibers (NIOSH 7400, A Counting Rules).
[b] Samples will also be analyzed for forsterite-like materials
.[c] Samples include field blanks and duplicate (co-located) samples.
[d] 63 of these samples are low volume (720 liters) samples and will only be analyzed if high volume samples are overloaded.
[e] Lead only
[f] TSP only during vegetative burn

A6.2 Personnel

The key project personnel are identified in the project organization chart presented in Figure A-1.

A6.3 Project Schedule

The project schedule commences with Contract Award and will be completed with submission of the final report. The project schedule shows the major tasks, duration, and deliverables. Day 1 is December 11, 2007. If conditions permit, this effort may be accelerated as appropriate.

Figure A-7. Schedule

Task Description	Start	Finish	Duration
Award Contract	Day 1	Day 1	1 Day
QAPP	Day 1	Day 120	120 Days
Debris Management	Day 210	270 Day	60 Days
Site Preparation	Day 180	Day 240	60 Days
Sampling	Day 240	Day 270	30 Days
Analysis	Day 300	Day 360	60 Days
Data Validation	Day 360	Day 390	30 Days
Draft Report	Day 420	Day 510	90 Days
Final Report	Day 510	Day 600	90 Days

A7 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The overall quality assurance objective of this project is to implement procedures for field sampling, laboratory analysis, and reporting that will provide data for the development of scientifically valid conclusions and support decision making regarding the project objectives identified in Section A5.2. EPA has developed a seven-step Data Quality Objective (DQO) procedure designed to ensure that data collection plans are carefully thought out and to maximize the probability that the results of the project will be adequate to support decision-making (EPA/240/B-06/001, February 2006). This seven-step decision process has been applied to the Primary Project Objective.

A7.1 Primary Objective

> *To determine the ambient air* ***asbestos (TEM) concentrations*** *released from the ABT Process.*

A7.1.1 Step 1: State the Problem

EPA's OECA has issued a *No Action Assurance* letter to Region 6 that allows the EPA to proceed with the evaluation of the ABT technology to burn C&D residential building debris. Reportedly the temperature in the combustion zone of the ABT is approximately 1,000 ^{o}C. Chrysotile asbestos dehydroxylates at approximately 600-650 ^{o}C or lower followed by recrystallization to a non-asbestiform (forsterite) at 810-820 ^{o}C or lower. EPA's ORD will perform a controlled demonstration to determine if significant asbestos concentrations are released from the ABT Process (the handling and burning of C&D residential building debris), a potential means of volume reduction of the debris. Forsterite is difficult to analyze for and materials resembling forsterite will be noted as "forsterite-like" in the final report. The objective is to determine and quantify if any chrysotile asbestos present does convert to a non-asbestos substance.

A7.1.2 Step 2: Identify the Decision

> Has a release of asbestos occurred as a result of the ABT Process? If so, did the release cause environmental contamination that is large enough to be of potential human health concern?

A7.1.3 Step 3: Identify Inputs to the Decision

Information that is required to resolve the decision statement:

1. Accurate and representative measurements of airborne asbestos concentrations released from the ABT Process.

2. An analytical sensitivity that is sufficiently low to detect with high confidence any airborne concentration that would be of potential inhalation concern for short-term exposure of an off-site resident to airborne releases. All perimeter air samples will be analyzed using TEM (ISO 10312-1995, all structures with aspect ratio $\geq$3:1) with an analytical sensitivity of 0.0005 asbestos structures per cubic meter (s/cm^3) of air sampled.

3. Accurate and representative measurements of the wind speed and wind direction during operation of the ABT Process.

A7.1.4 Step 4: Define the Study Boundaries

1. *Spatial boundary of the decision statement*: This decision related to the air concentration of asbestos is defined as the area within the outermost ring around the ABT Process at the test site. The outermost ring is approximately 300 feet from the center of the ABT Process. Further, decisions regarding the air matrix apply to air within the breathing zone of potentially exposed individuals directly engaged in the ABT Process; e.g., excavator operator. The personal samples will allow reliable characterization of asbestos concentrations in air closest to the source of any potential releases.

2. *Temporal boundary of the decision statement*: Weather conditions may influence the transport and deposition of asbestos fibers released from the ABT Process. The study will not be conducted during rain or snow conditions. Sustained wind speeds greater than 20 mph (60-minute average) may affect the transport and dispersion of asbestos fibers; i.e., the asbestos concentration would be inversely proportional to the wind speed.

3. *Practical constraints on data collection:*

    - Loading of particulate on a single sample filter collected over the burning cycle of the ABT Process could prevent the direct preparation of the filters for asbestos analysis by TEM.[3] To minimize the probability of such an occurrence, a low volume sample will be collected concurrently over the same period. The concurrent sample will be limited to the 18 locations on Ring 1.

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[3] The direct transfer TEM method (ISO 10312:1995) should not be used if the general particulate loading of the sample collection filter exceeds approximately 10 µg/cm^2 of filter surface, which corresponds to approximately 20 percent coverage of the collection filter by particulate.

- In Ring 1, the number and placement of stationary air monitors could be affected by debris handling activities. This is particularly applicable on the side of the ABT where the excavator is located and debris loading activities will occur.

A7.1.5 Step 5: Develop a Decision Rule

If the airborne concentration of asbestos in the particulate released from the ABT Process does not result in exposure concentrations that are of potential human health concern, then it may be concluded that the ABT Process as evaluated does not pose an unacceptable human health concern and could be used as a means of reducing the volume of waste requiring disposal.

A7.1.6 Step 6: Tolerable Limits on Decision Errors

The 95-percent confidence interval for the mean number of fibers from a count is shown in the table below. These values indicate the range of counts that are expected to be observed from identical filters based upon random selection of grids 95 times out of 100 times.

Upper and Lower Confidence Limits of the Poisson 95-Percent Confidence Interval of a Count.[a]

Structure Count	Lower 95 Percent Confidence Limit[b]	Upper 95 Percent Confidence Limit[b]
0	0	3.689
1	0.025	5.572
2	0.242	7.225
3	0.619	8.767
4	1.090	10.242
5	1.624	11.669
6	2.202	13.060

[a] Source: ISO Method 10312:1995(E) Annex F, Table F.1.
[b] Two-tailed confidence interval.

ISO Method 10312:1995(E) defines the analytical sensitivity as the calculated airborne asbestos structure concentration in asbestos structure/liter, equivalent to counting of one asbestos structure in the analysis. The limit of detection is defined as the calculated airborne asbestos structure concentration per liter equivalent to counting 2.99 asbestos structures in the analysis. Annex F of ISO 10312:1995(E) indicates that the level of detection is 2.99 times the analytical sensitivity, which corresponds with the one-sided 95 percent upper confidence interval of the

Poisson distribution. As such, fiber counts below 3, which is the two-tailed 95-percent upper confidence interval for a count of zero, could be treated as non-detects. In the event the number of non-detects in this demonstration is greater than 80% in either group, the data will be analyzed using a binomial test for proportions. The binomial test will be used to evaluate the null hypothesis that the proportion of non-detects from the two populations (background and grinder) are equivalent.

A suite of background comparison tests for dealing with a set of data with a large number of non-detect (censored) data, originally developed in the early 1990s by Dr. Richard Gilbert at Pacific Northwest National Laboratory, will be used to compare the burner and background data distributions. Each test compares a somewhat different (although correlated) characteristic of the burner and background data distributions. For each test, if the *p*-value is small enough (e.g. less than a significance level of 0.05) the null hypothesis is rejected, and the conclusion is drawn that the burner data are greater than the background in the context of the characteristic tested. If the *p*-value is much greater than 0.05 then the burner and background data distributions are considered similar, or the background data are greater than burner data, which might instead indicate a comparability problem with the background data set.

The background comparison suite of inferential tests, *t*, Gehan, Quantile Q(.80) and Slippage, consists of a single parametric and three non-parametric tests. A parametric test makes assumptions about the underlying distributions, whereas a non-parametric test does not. Distributions are uniquely characterized by parameters (e.g. mean and standard deviation) and hence the name "parametric test." For example, the *t*-test, which quantifies the observed difference between the means of two distributions, is a parametric test that requires the assumption of normality. The results of the *t*-test are relatively robust to departures from normality; however for extremely skewed or bimodal distributions, the results of the *t*-test may be suspect. The non-parametric analog of the *t*-test is the Gehan test, a generalization of the Wilcoxon Rank Sum test that accommodates multiple detection limits through an ordering algorithm. The Gehan test quantifies the degree of difference between the medians of two distributions. As a non-parametric test, the Gehan test is less prone to the effects of very extreme data. Statistical tests that evaluate normality (e.g. D'Agostino & Pearson) will be used to determine the appropriateness of applying the *t*-test.

Two additional non-parametric tests will be used to assess differences that may exist in the tails of the two distributions. Specifically, the Quantile test is used here to determine if there are an anomalously large number of burner data that exceed the 80th percentile of the background distribution. This test is performed using combinatorial counting techniques under the assumption that both the burner and background data arise from the same underlying distribution. If there are an anomalously large number of burner data greater than the 80th percentile of the background distribution, then it is concluded that, with respect to statistical significance, the 80th percentile of the burner data distribution is greater than the 80th percentile of the background data distribution. Effectively this means the tail of the burner distribution is "fatter" than that of the background distribution; therefore there is a statistical difference in the tails of the distributions. The Slippage test will be used to see if there are an anomalously large number of burner data that exceed the maximum of the background data. This test is similar in function to the Quantile test. If there are an anomalously large number of burner data greater than the maximum of the background data, then it is concluded that, with respect to statistical significance, the maximum data of the burner distribution are greater than the maximum of the background distributions.

If any of the *p*-values from the four hypothesis tests are less than the nominal alpha level of 0.05, the conclusion from that test will be used for the overall result. The *t*-test will be included only if the assumptions of normality and homogeneity of variance are met. If these assumptions are not met, the conclusion for the overall result will be based on the three nonparametric inferential tests.

In addition, exploratory data analysis plots such as box plots, histograms, *q*-*q* plots and cumulative distribution plots, will be used as qualitative assessment of the form of the distributions for both burner and background data. Displays meet the need to see the behavior of the data, to reveal unexpected features, such as outliers; and confirm or disprove assumptions, such as the distributional assumptions of normality and homogeneity of variance required for the *t*-test. In the event an observation(s) is outside the main body of the data, records will be reviewed for an assignable cause(s) and the data value(s) corrected if appropriate. Even if there is no assignable cause(s), the value(s) will be included in all analyses and appropriate measures will taken to meet inferential test assumptions if necessary (i.e., data transformation to meet normality or homogeneity of variance assumptions).

Upwind to Downwind Comparison— If the meteorological conditions permit an upwind to downwind comparison, the project is designed to detect a 5-fold difference in the average concentration of asbestos (e.g., a 5-fold difference between the airborne concentrations upwind and downwind from the burner operation) with high probability if such a difference actually exists. A false positive error rate of five percent will be achieved by employing a statistical significance level of 0.05. The statistical power of the upwind to downwind comparison will depend on the number of the 18 samples in Ring 1 and Ring 2 that are actually in downwind of burner operation. An alternative to strictly upwind/downwind is to weight each sampler concentration by the number of minutes during the sampling that that individual sampler was upwind or downwind and performing statistical comparisons on those weighted data.

Sample size estimates for mean comparisons for the variables:

- coefficient of variation (CV) = 1.00, 1.50, 2.00, and 2.50 (CV = standard deviation/mean where the CV is the same for both populations),
- type I error rate = 0.05,
- mean difference = 5-fold and 10-fold (CR = (downwind-upwind)/downwind), and
- power = 0.80, 0.85, and 0.90;

are displayed in (Table A-10). The estimates were calculated using the equation,

$$n = \frac{[z_{(1-\alpha/2)} + z_{(1-\beta)}]^2 (CV)^2}{(CR)^2}[1+(1-CR)^2],$$

where *z* is the quantile of the standard normal distribution (van Belle, G. and Martin, D. (1993). Sample size as a function of variation and ratio of means. *The American Statistician,* **47**: 165-167).

Table A-10. Sample Estimates Required for Each Sample in a Two-Sample t-Test with Type I error = 0.05.

10-fold Mean Difference				
Power	**Percent Coefficient of Variation**			
	100	**150**	**200**	**250**
0.80	10	22	40	62
0.85	11	25	45	70
0.90	14	31	55	86
5-fold Mean Difference				
Power	**Percent Coefficient of Variation**			
	100	**150**	**200**	**250**
0.80	13	29	52	81
0.85	15	33	58	91
0.90	18	40	71	112

A7.1.7 Step 7: Optimize the Design for Obtaining Results

The most important factor influencing the airborne asbestos concentration measured at one of the 18 primary monitors (i.e., Ring 1) to be positioned around the ABT Process is the number of hours that monitor is downwind from the activity. Because the wind direction could vary (i.e., change directions) during a given test day, it was concluded that the primary air sampling design should be based on a concentric ring approach rather than on an upwind to downwind approach.

A7.1.8 Analytical Sensitivity

The data generated for this project must be obtained with an analytical sensitivity sufficiently low to detect with high confidence any airborne concentration that would be of potential inhalation concern for short-term exposure of an off-site resident to airborne releases. The analytical sensitivity will be 0.0005 s/cm^3 for all asbestos structures (minimum length $\geq$0.5 µm and aspect ratio $\geq$3:1).

Achieving the analytical sensitivity for asbestos in air samples is generally dependent on two factors: the volume of air collected through the filter and the area of the filter analyzed; i.e., the number of grid sections analyzed multiplied by the area of the grid sections analyzed. The required analytical sensitivity will be achieved for each collected air sample by collecting as large a volume of air as practical and by increasing the filter search areas, as needed.

A7.1.9 Data Quality Indicators (DQI)

A7.1.9.1 Sample Collection DQI

Precision is the agreement between the measurements collected by two identical devices or measures. Precision is reported as relative percent difference (RPD) between duplicate samples or sample analyses. Precision will be measured by collecting duplicate samples during the sampling events. Duplicate “co-located” samples will be collected during the morning and afternoon sampling events. These samples will also serve as a combined check on the sample collection and analysis procedures.

$$\frac{|Result\ 1 - Result\ 2|}{Mean} \times 100$$

- Completeness is defined as follows:

$$\%Completeness = \frac{V}{N} x100$$

where V is the number of measurements judged valid, and N is the number of measurements planned. An overall measure of completeness will be given by the percentage of samples specified in the sampling design that yield usable “valid” data. Although every effort will be made to collect and analyze all of the samples specified in the sample design, the sample design is robust to sample loss. The loss of a few samples, provided they are not concentrated at a set of contiguous sectors, will likely have little effect on the false-negative error rate. The project goal is to collect at least 95 percent of the samples specified in the sample design.

- Representativeness is a subjective measure of the degree that the data accurately and precisely represent the sample collection conditions of the environment. Representative sample collection depends on the expertise and knowledge of the personnel to make sure the samples are collected in a manner that reflects the true concentration in the environment. The sampling locations, sampling periods, and sampling durations have been selected to ensure reasonable representativeness.

- Comparability is a qualitative term that expresses the measure of confidence that one data set can be compared to another and combined for the decision to be made. Data collection using a standard sampling and analytical method (e.g., ISO 10312:1995, counting structures longer than and shorter than 5 µm in length, and PCM equivalent fibers[4]) maximizes the comparability of the results with both past sampling results (if such exist) and future sampling results.

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[4] A PCM (phase contrast microscopy) equivalent fiber is a fiber with an aspect ratio greater than or equal to 3:1, longer than 5 µm, and which has a diameter of >0.25 to 3 µm.

A7.1.9.2 Sample Analysis DQI

Analysis of identical image fields as measured by the primary analytical laboratory (Bureau Veritas) and the QA laboratory (Reservoirs Inc) will determine the precision data quality indicator. Precision in number of asbestos fibers and asbestos fiber dimensions from the same filters and image fields from selected tests will be measured. Filters loaded with asbestos collected by air filtration have an inherent variability that is exacerbated by the exceedingly small area analyzed by TEM. Although the variability cannot be mitigated by sampling strategies or sampling preparation strategies, it can be quantified; if factors exist that are artificially magnifying the variability, those factors can in theory be isolated and identified. The best approach to this is through inter-laboratory re-preparation and re-analysis of filters and intra-laboratory re-preparation and re-analysis of filters. Inter-laboratory re-analysis establishes that the variability is not caused by the laboratory's sample preparation and analytical techniques. If the laboratory was improperly preparing the samples and was causing the results to consistently bias high or low, then the second laboratory's analysis of numerous samples should reveal this trend. If the samples had exceedingly high variability across the filter (or if the laboratory was causing artificial variability through sample preparation and analysis techniques), then this would be revealed by re-preparation and analysis of the filter by the same laboratory. It is essential to note that the variability determined may seem subjectively high (compared to other types of instrumental analysis) when in fact it may be quite acceptable because very small sub-samples of the original filter are being examined.

Because no standards are available to assess the accuracy of the TEM measurements, the best approach is to establish consensus standards through duplicate analysis of precise sub-samples. This is accomplished through a procedure called "verified counting," which is documented in a National Institute of Standards and Technology (NIST) technical guide and used by asbestos analytical laboratories. Two laboratories (in this case the principal analytical laboratory and the QA laboratory) analyze precise identical areas of the sampling filter, and compare their results, which consist of numbers of asbestos structures and drawings and dimensions of each asbestos structure. In this fashion, they can mutually agree on the concentration of asbestos in the sub-sample, and can verify that each is following the very specific guidelines for asbestos structure counting by TEM. Any lack of precision or presence of bias can be readily established and quantified.

See Section B5 "*Quality Control Requirements*" regarding the QA/QC criteria for the analytical method data quality indicators (DQI).

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A8 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

A8.1 Field Personnel

The field sampling team will be headed by an engineer or scientist with acceptable experience in the collection, handling, and analyses of samples required in this effort. The field sampling team leader has extensive experience in conducting asbestos-related field research studies (see Figure A-1). Other field personnel will also have experience in asbestos ambient air monitoring, occupational exposure monitoring, related environmental measurements, and data recording. The field personnel will be trained in the requirements of the site-specific Health and Safety Plan (HASP).

A8.2 Laboratory Personnel

Primary Laboratories		
Schneider Labs, Inc 2512 W. Cary Street Richmond Va 23220 Contact: Melissa Kanode 804-353-6778 PM$_{2.5}$, TSP/metals	Bureau Veritas North America, Inc. 3380 Chastain Meadows Parkway, Suite 300 Kennesaw, GA 30144 Contact: **Alan M. Segrave, P.G.** (770) 499-7500 Asbestos: Bulk, Settled Dust, Air, Water	TestAmerica(TAL) 5815 Middlebrook Pike Knoxville, TN 37921 Contact: John Reynolds 865-291-3000 Dioxin/Furans
Quality Assurance Laboratory		
Reservoirs Environmental, Inc. 2059 Bryant Street Denver, CO 80211 Contact: Jeanne Spencer Orr (330) 964-1986 Asbestos, air		

A9 DOCUMENTATION AND RECORDS

A9.1 Field Operations Records

A9.1.1 Sample Documentation

The following information will be recorded on Sampling Data Forms (Figures A-8 through A-14), as applicable:

- Name(s) of person(s) collecting the sample
- Date of record
- Identification of sampling site (e.g., Ring 1)
- Description of sample
- Location of sample documented on site map with GPS coordinates, as applicable
- Type of sample (e.g., perimeter, worker, settled dust, water, duplicate, field blank)
- Unique sample number that identifies site, sample type, date, and sequence number
- Rotameter number and airflow reading (start/stop)
- Sample time (start/stop) recorded in military time
- Relevant notes describing site observations such as, but not limited to, site conditions, weather conditions, debris handling equipment, observations of visible emissions from ABT Process, equipment problems, etc.

At the end of each day, all samples and the corresponding Sampling Data Forms/Drawings will be submitted to the Team Leader. The Team Leader will verify 100% of the information recorded on the Sampling Data Form for completeness and that all samples are in custody; any discrepancy will be resolved and corrections will be noted and initialed on the form.

A9.1.2 Meteorological Measurement Records

Meteorological stations will record temperature, barometric pressure, relative humidity, wind speed, and wind direction at 5-minute averages. The data files will be downloaded by using an on-site personal computer. These same metrics will also be noted from the instrument’s visual display and recorded on a Meteorological Data Measurement Log (Figure A-14) at least hourly.

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ASBESTOS AIR SAMPLE LOG/CHAIN OF CUSTODY

PAGE 1 OF 1

PROJ. NO.:		**DATE:**	
CLIENT:	**EPA**	**TECHNICIAN:**	
SITE:		**PROJ. MANAGER:**	**Seth Schultz**

THE LOUIS BERGER GROUP, INC
TELEPHONE #: (212) 612-7900
FAX #: (212) 425-1618
ADDRESS: 199 Water Street 23rd Floor, New York, NY 10038

RESULTS FAX TO:

EMAIL TO: cnapolitano@louisberger.com
EMAIL TO: Schultz@louisberger.com

TURNAROUND TIME:
☐ 1 HR ☐ 4 HR ☐ 8 HR
☐ 24 HR ☒ **ISO 10312 TAT**

SAMPLE ID	**DESCRIPTION / LOCATION**	**TIME**		**FLOW RATE (L/MIN)**		**VOLUME (L)**
		START/END	**MINUTES**	**START/END**	**AVERAGE**	
SAMPLE # PUMP #N/A		/		/		
SAMPLE # PUMP #N/A		/		/		
SAMPLE # PUMP #N/A		/		/		
SAMPLE # PUMP #N/A		/		/		
SAMPLE # PUMP #N/A		/		/		
SAMPLE # PUMP #N/A		/		/		
SAMPLE # PUMP #		/		/		
SAMPLE # PUMP #		/		/		

TECHNICIAN'S LOG

CASSETTE	**ROTOMETER**		**TYPE OF SAMPLING**		
☐ PCM ☐ TEM	ID #	CALIB DATE ____/____/____	☐ BACKGROUND	☐ POST ABATEMENT	☐ PERIODIC
☐ ________	[ALL GIVEN FLOW RATES INCORPORATE THE CALIBRATION FACTOR]		☐ PRE-ABATEMENT	☐ AMBIENT	☐ LOT BLANK
			☐ DURING ABATEMENT	☐ OSHA	

CHAIN OF CUSTODY		**DATE**	**TIME**
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm

NOTES/COMMENTS

Figure A-8. Sampling Data Form – Stationary Air Monitors

The Louis Berger Group, Inc.
199 Water Street, 23rd Floor
New York, New York10038
Tel 212 612 7900
Fax 212 363 1618

AIR SAMPLING FIELD LOG

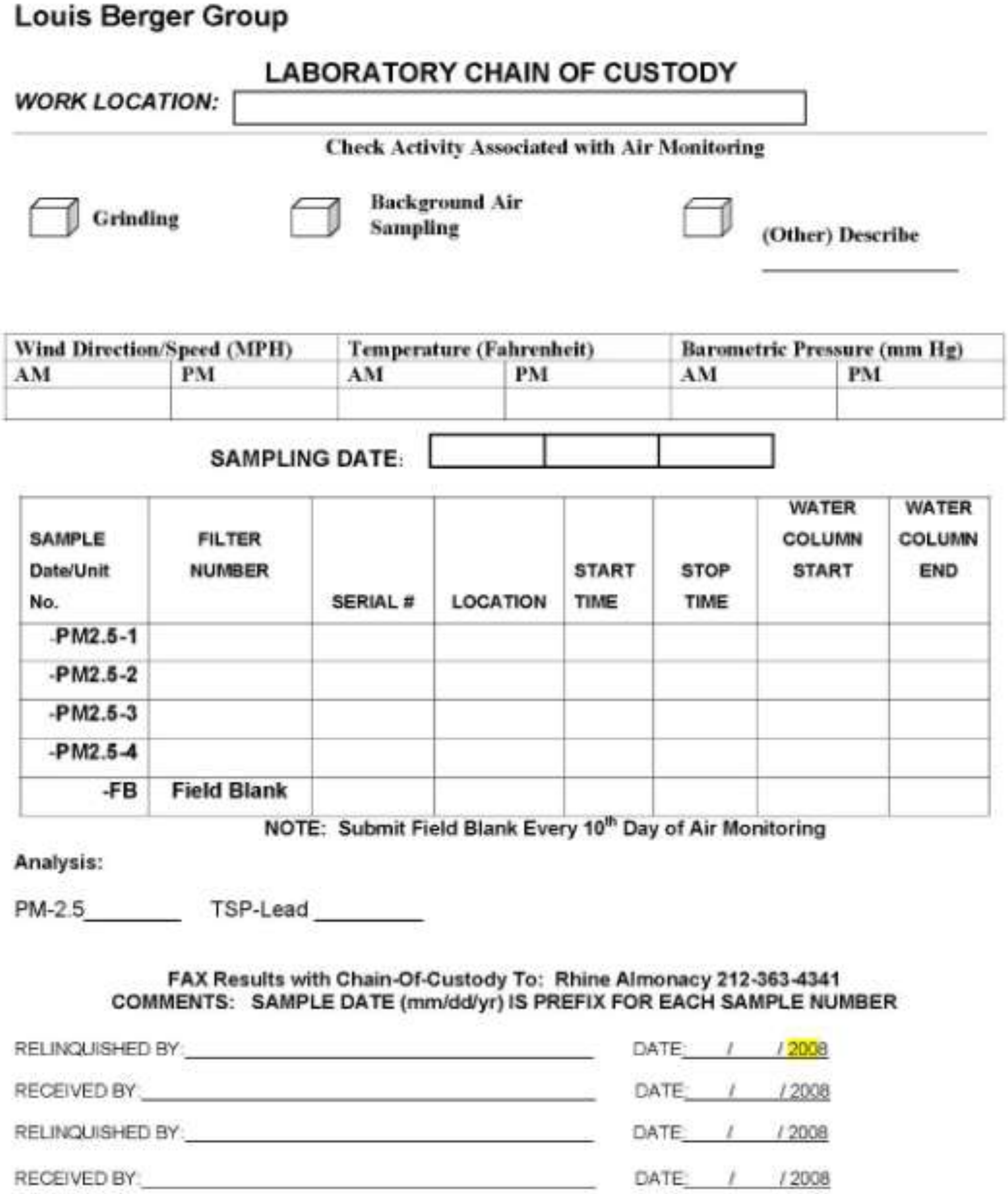
SAMPLE NUMBER		TIME ON:	
		TIME OFF:	
DATE		GPS COORDINATES	
FLOW		SAMPLE HEIGHT	
SAMPLING SESSION		PUMP NUMBER	

TIME	FLOW	NOTES
900	2.02	
1100	2.12	Change less than 10%
1300	2.35/2.02*	Change greater than 10% sample adjusted back to 2.02

NOTES: All sample time must be in milatary time
If sample flow is greater than 10% adjustment must be made back to orignally intended vol.
Rotometer correction factor MUST be applied in the field
Sample flow will be checked every 2 HOURS

Inspector's Signature:________________________

Figure A-8. (continued)



Louis Berger Group

LABORATORY CHAIN OF COSTODY

WORK LOCATION:

Check Activity Associated with Air Monitoring

☐ Grinding ☐ Background Air Sampling ☐ (Other) Describe ____________

Wind Direction/Speed (MPH)		Temperature (Fahrenheit)		Barometric Pressure (mm Hg)	
AM	PM	AM	PM	AM	PM

SAMPLING DATE:

SAMPLE Date/Unit No.	FILTER NUMBER	SERIAL #	LOCATION	START TIME	STOP TIME	WATER COLUMN START	WATER COLUMN END
-PM2.5-1							
-PM2.5-2							
-PM2.5-3							
-PM2.5-4							
-FB	Field Blank						

NOTE: Submit Field Blank Every 10th Day of Air Monitoring

Analysis:

PM-2.5________ TSP-Lead _________

FAX Results with Chain-Of-Custody To: Rhine Almonacy 212-363-4341
COMMENTS: SAMPLE DATE (mm/dd/yr) IS PREFIX FOR EACH SAMPLE NUMBER

RELINQUISHED BY:________________________ DATE:___/___/2008

RECEIVED BY:________________________ DATE:___/___/2008

RELINQUISHED BY:________________________ DATE:___/___/2008

RECEIVED BY:________________________ DATE:___/___/2008

Figure A-9. Air Sampling Data Form ($PM_{2.5}$) – Stationary Air

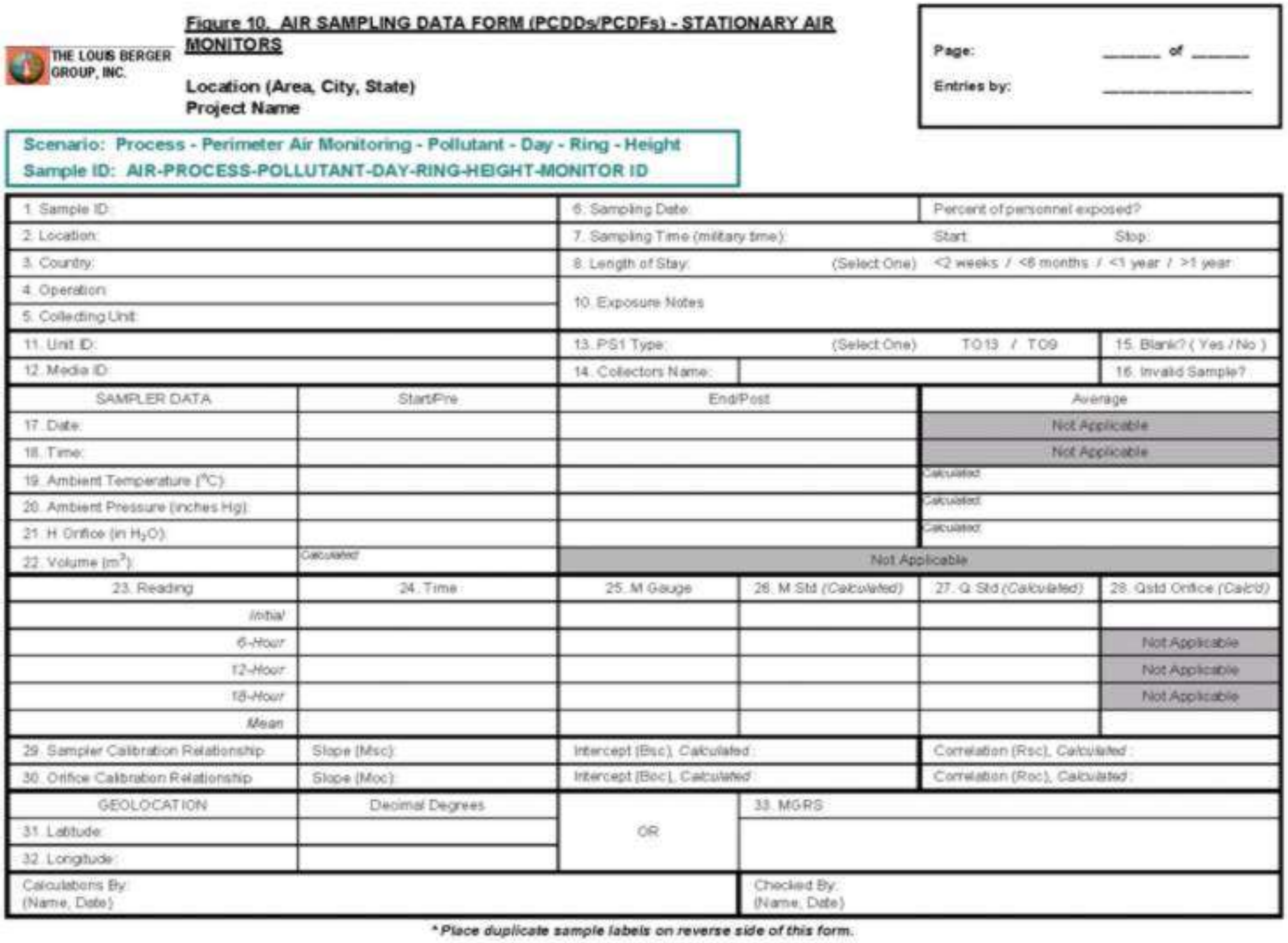


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Figure 10. AIR SAMPLING DATA FORM (PCDDs/PCDFs) - STATIONARY AIR MONITORS

Location (Area, City, State)
Project Name

Page: ______ of ______
Entries by: ______________

Scenario: Process - Perimeter Air Monitoring - Pollutant - Day - Ring - Height
Sample ID: AIR-PROCESS-POLLUTANT-DAY-RING-HEIGHT-MONITOR ID

1. Sample ID:	6. Sampling Date:	Percent of personnel exposed?
2. Location:	7. Sampling Time (military time):	Start: Stop:
3. Country:	8. Length of Stay: (Select One)	<2 weeks / <6 months / <1 year / >1 year
4. Operation:	10. Exposure Notes	
5. Collecting Unit:		
11. Unit ID:	13. PS1 Type: (Select One) TO13 / TO9	15. Blank? (Yes / No)
12. Media ID:	14. Collectors Name:	16. Invalid Sample?

SAMPLER DATA	Start/Pre	End/Post	Average
17. Date:			Not Applicable
18. Time:			Not Applicable
19. Ambient Temperature (°C):			Calculated
20. Ambient Pressure (inches Hg):			Calculated
21. H Orifice (in H_2O):			Calculated
22. Volume (m^3):	Calculated	Not Applicable	Not Applicable

23. Reading	24. Time	25. M Gauge	26. M Std *(Calculated)*	27. Q Std *(Calculated)*	28. Qstd Orifice *(Calc'd)*
Initial					
6-Hour					Not Applicable
12-Hour					Not Applicable
18-Hour					Not Applicable
Mean					

29. Sampler Calibration Relationship	Slope (Msc):	Intercept (Bsc), *Calculated*:	Correlation (Rsc), *Calculated*:
30. Orifice Calibration Relationship	Slope (Moc):	Intercept (Boc), *Calculated*:	Correlation (Roc), *Calculated*:

GEOLOCATION	Decimal Degrees		33. MGRS
31. Latitude:		OR	
32. Longitude:			

Calculations By: (Name, Date)	Checked By: (Name, Date)

***Place duplicate sample labels on reverse side of this form.**

Figure A-10. Air Sampling Data Form (PCDDs/PCDFs) – Stationary Air Monitor

THE LOUIS BERGER GROUP, INC.

ASBESTOS AIR/CHAIN OF CUSTODY-OSHA-Worker

PAGE 1 OF 1

PROJ. NO.:		**DATE:**	
CLIENT:	**EPA**	**TECHNICIAN:**	
SITE:		**PROJ. MANAGER:**	**Seth Schultz**

THE LOUIS BERGER GROUP, INC.
TELEPHONE #: (212) 612-7900
FAX #: (212) 425-1618
ADDRESS: 199 Water Street 23rd Floor, New York, NY 10038

RESULTS FAX TO:

EMAIL TO: cnapolitano@louisberger.com
EMAIL TO: Schultz@louisberger.com

TURNAROUND TIME:
☐ 1 HR ☐ 4 HR ☐ 8 HR
☐ 24 HR ☒ **ISO 10312 TAT**

SAMPLE ID	DESCRIPTION / LOCATION	TIME		FLOW RATE (L/MIN)		VOLUME (L)
		START/END	MINUTES	START/END	AVERAGE	
SAMPLE # PUMP # N/A						
SAMPLE # PUMP # N/A						
SAMPLE # PUMP # N/A						
SAMPLE # PUMP # N/A						
SAMPLE # PUMP # N/A						
SAMPLE # PUMP # N/A						
SAMPLE # PUMP #						
SAMPLE # PUMP #						

TECHNICIAN'S LOG

CASSETTE	ROTOMETER		TYPE OF SAMPLING		
☐ PCM ☐ TEM	ID #	CALIB DATE ____/____/____	☐ BACKGROUND	☐ POST ABATEMENT	☐ PERIODIC
☐ __________	[ALL GIVEN FLOW RATES INCORPORATE THE CALIBRATION FACTOR]		☐ PRE-ABATEMENT	☐ AMBIENT	☐ LOT BLANK
			☐ DURING ABATEMENT	☐ OSHA	

CHAIN OF CUSTODY		DATE	TIME
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm

NOTES/COMMENTS

Figure A-11. Air Sampling Data Form – Worker – Personal Monitor

THE LOUIS BERGER GROUP, INC.

ASBESTOS SETTLED DUST CHAIN OF CUSTODY

PAGE OF

PROJ. NO.:		**DATE:**	
CLIENT:	EPA	**TECHNICIAN:**	
SITE:		**PROJ. MANAGER:**	Seth Schultz

THE LOUIS BERGER GROUP, INC.
TELEPHONE #: (212) 612-7900
FAX #: (212) 425-1618
ADDRESS: 199 Water Street 23rd Floor, New York, NY 10038

RESULTS FAX TO:
EMAIL TO: cnapolitano@louisberger.com
EMAIL TO: sschultz@louisberger.com

TURNAROUND TIME:
☐ 1 HR ☐ 4 HR ☐ 8 HR
☐ 24 HR ☒ OTHER

SAMPLE ID	DESCRIPTION / LOCATION	TIME				TOTAL AREA
		START/END	START/END	START/END	TOTAL MIN.	
SAMPLE #						
SAMPLE #						
SAMPLE #						
SAMPLE #						
SAMPLE #						
SAMPLE #						
SAMPLE #						
SAMPLE #						

TECHNICIAN'S LOG

CASSETTE	ROTOMETER		TYPE OF SAMPLING		
☐ PCM ☐ TEM	ID #	CALIB. DATE: ___/___/___	☐ BACKGROUND	☐ POST ABATEMENT	☐ PERIODIC
☒ OTHER	[ALL GIVEN FLOW RATES INCORPORATE THE CALIBRATION FACTOR]		☐ PRE-ABATEMENT	☐ AMBIENT	☐ LOT BLANK
			☐ DURING ABATEMENT	☐ OSHA	

CHAIN OF CUSTODY

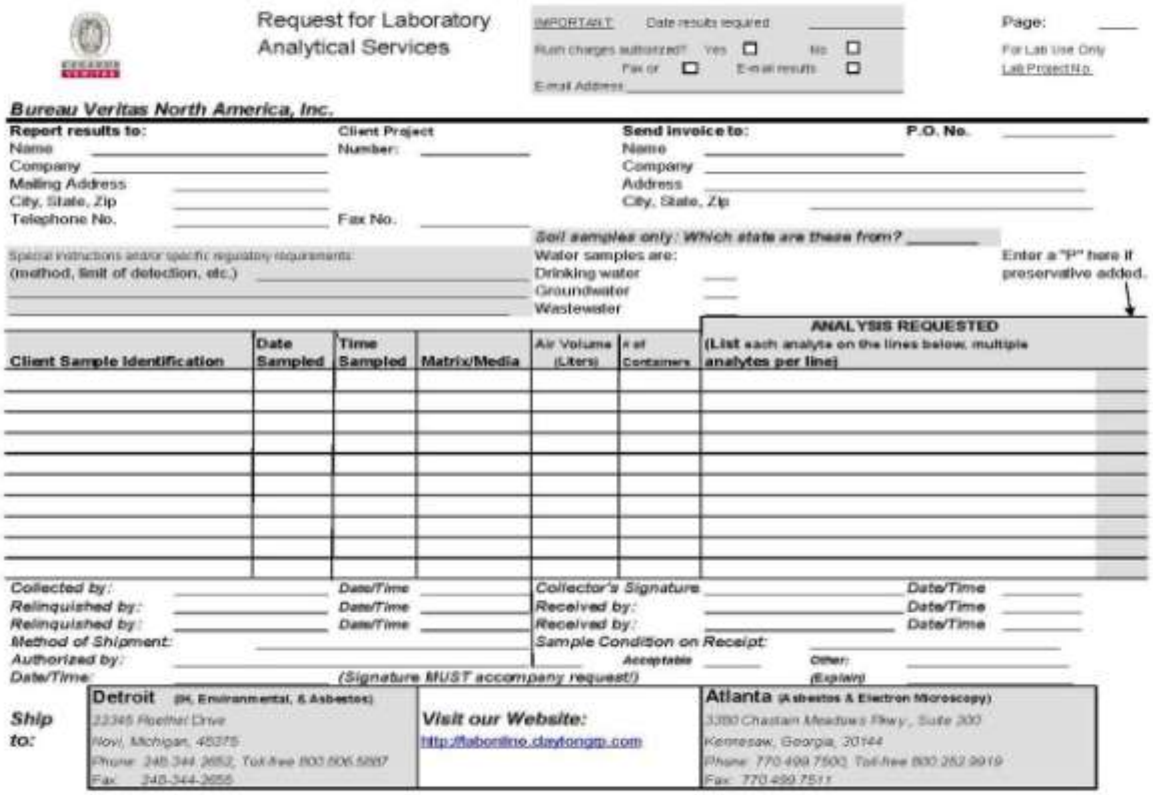
		DATE	TIME
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm

NOTES/COMMENTS

Only Analyze as per QAPP. Modified ASTM D5755-03 Settled Dust. Target Analytical Sensitivity 250 s/cm2. All structures (minimum length of 0.5 um; aspect ratio greater than or equal to 3:1).

Stopping rule: see page 65 of QAPP., Total time listed for reference only, not needed for sample analysis.

Figure A-12. Sampling Data Form – Settled Dust



Request for Laboratory
Analytical Services

IMPORTANT: Date results required ________
Rush charges authorized? Yes ☐ No ☐
Fax or ☐ E-mail results ☐
E-mail Address ________

Page: ____
For Lab Use Only
Lab Project No.

Bureau Veritas North America, Inc.

Report results to:
Name ________
Company ________
Mailing Address ________
City, State, Zip ________
Telephone No. ________

Client Project
Number: ________
Fax No. ________

Send invoice to:
Name ________
Company ________
Address ________
City, State, Zip ________

P.O. No. ________

Soil samples only: Which state are these from? ________

Special instructions and/or specific regulatory requirements:
(method, limit of detection, etc.) ________

Water samples are:
Drinking water ____
Groundwater ____
Wastewater ____

Enter a "P" here if preservative added.

Client Sample Identification	Date Sampled	Time Sampled	Matrix/Media	Air Volume (Liters)	# of Containers	ANALYSIS REQUESTED (List each analyte on the lines below, multiple analytes per line)

Collected by: ________ *Date/Time* ________
Relinquished by: ________ *Date/Time* ________
Relinquished by: ________ *Date/Time* ________
Method of Shipment: ________
Authorized by: ________
Date/Time: ________ *(Signature MUST accompany request!)*

Collector's Signature ________ *Date/Time* ________
Received by: ________ *Date/Time* ________
Received by: ________ *Date/Time* ________
Sample Condition on Receipt: ________
Acceptable ________ *Other:* ________
(Explain) ________

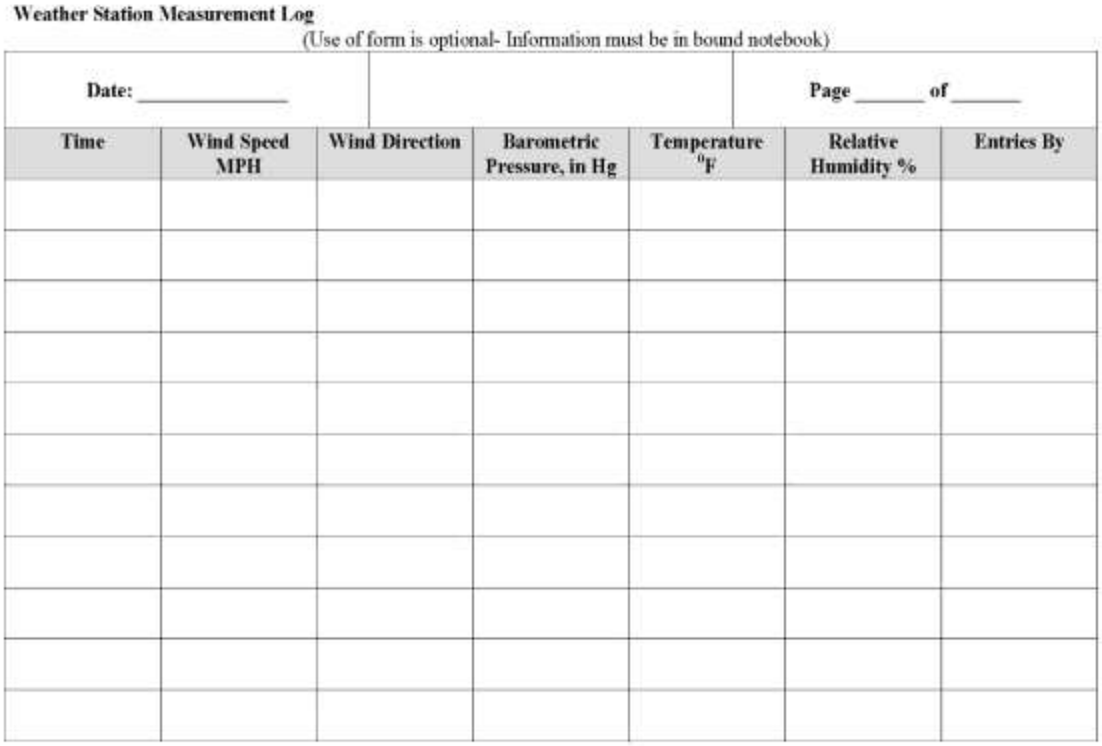
Ship to:

Detroit (IH, Environmental, & Asbestos)
22345 Roethel Drive
Novi, Michigan, 48375
Phone: 248.344.2652, Toll-free 800 806 5887
Fax: 248-344-2655

Visit our Website:
http://labonline.claytongrp.com

Atlanta (Asbestos & Electron Microscopy)
3380 Chastain Meadows Pkwy., Suite 300
Kennesaw, Georgia, 30144
Phone: 770 499 7500, Toll-free 800 252 9919
Fax: 770 499 7511

Figure A-13. Sampling Data Form – Water



Weather Station Measurement Log

(Use of form is optional- Information must be in bound notebook)

Date: ______________

Page ______ of ______

Time	Wind Speed MPH	Wind Direction	Barometric Pressure, in Hg	Temperature ^{0}F	Relative Humidity %	Entries By

Figure A-14. Meteorological Measurement Log

THE LOUIS BERGER GROUP, INC.

TSP/PM10 Sampling Form

PAGE 1 OF 1

PROJ. NO.:		**DATE:**	
CLIENT:	EPA	**TECHNICIAN:**	
SITE:		**PROJ. MANAGER:**	Seth Schultz

THE LOUIS BERGER GROUP, INC.
TELEPHONE #: (212) 612-7900
FAX #: (212) 425-1618
ADDRESS: 199 Water Street 23rd Floor, New York, NY 10038

RESULTS FAX TO:

EMAIL TO: cnapolitano@louisberger.com
EMAIL TO: Schultz@louisberger.com

TURNAROUND TIME:
☐ 1 HR ☐ 4 HR ☐ 8 HR
☐ 24 HR ☒ ISO 10312 TAT

SAMPLE ID	DESCRIPTION / LOCATION	TIME		FLOW RATE (L/MIN)		VOLUME (L)
		START/END	MINUTES	START/END	AVERAGE	
SAMPLE # PUMP # N/A						
SAMPLE # PUMP # N/A						
SAMPLE # PUMP # N/A						
SAMPLE # PUMP # N/A						
SAMPLE # PUMP # N/A						
SAMPLE # PUMP # N/A						
SAMPLE # PUMP #						
SAMPLE # PUMP #						

TECHNICIAN'S LOG

CASSETTE	ROTOMETER		TYPE OF SAMPLING		
☐ PCM ☐ TEM	ID #:	CALIB. DATE ____/____/____	☐ BACKGROUND	☐ POST ABATEMENT	☐ PERIODIC
☐ __________	[ALL GIVEN FLOW RATES INCORPORATE THE CALIBRATION FACTOR]		☐ PRE-ABATEMENT	☐ AMBIENT	☐ LOT BLANK
			☐ DURING ABATEMENT	☐ OSHA	

CHAIN OF CUSTODY		DATE	TIME
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm
Relinquished by (print)	(Sign)	/ /	Am/Pm
Received by (print)	(Sign)	/ /	Am/Pm

NOTES/COMMENTS

Figure A-15. TSP Form

A9.1.3 Photo Documentation

Digital photographic images will be taken as necessary to document the site conditions and activities.

A9.2 Chain-of-Custody Records

Berger sample traceability procedures described in Section B3, *"Sample Custody Requirements,"* will be used to ensure sample traceability.

A9.3 Laboratory Records

Complete data packages will be submitted for all sample analyses for all matrices. This information will be submitted in sufficient detail to allow the subsequent verification of the reported analyses. Alternative forms routinely used by the laboratories may be substituted for those forms specified in the referenced methods. The laboratory data package will meet the guidelines in *Laboratory Documentation Requirements for Data Evaluation* (R9QA/004.2), EPA, August 2001.

A9.3.1 TEM Reporting (Air)

Specifically for TEM analysis, the following is required:

- Structure counting data shall be recorded on forms equivalent to the example shown in ISO 10312:1995.

- The test report shall contain items (a) to (p) as specified in Section 11, "Test Report," of ISO 10312:1995. In addition, the files containing the raw data (in Microsoft Excel format) shall be submitted. The format of these files shall be as directed by the Project Manager, but shall contain the following items:

  1. Laboratory Sample Number
  2. Project Sample Number
  3. Date of Analysis
  4. Air Volume
  5. Active Area of Sample Filter
  6. Analytical Magnification
  7. Mean Grid Opening Dimension in mm^2
  8. Number of Grid Openings Examined
  9. Number of Primary Structures Detected

10. One line of data for each structure, containing the following information as indicated in Figure 7 “Example of Format for Reporting Structure Counting Data” of ISO 10312:1995, with the exception that the lengths and widths are to be reported in millimeters as observed on the screen at the counting magnification:

    - Grid Opening Number
    - Grid Identification
    - Grid Opening Identification/Address
    - Structure or Sub-structure Number
    - Asbestos Type (Chrysotile or Amphibole)
    - Morphological Type of Structure
    - Length of Structure in 1-mm increments (e.g., 32)
    - Width of Structure in 0.1-mm increments (e.g., 3.2)
    - Any Other Comments Concerning Structure (e.g., partly obscured by grid bar)

B MEASUREMENT/DATA ACQUISITION

B1 PRELIMINARY MODELING OF ABT OPERATION

B1.1 Air Dispersion Modeling

This section presents the modeling approach used to assist in the placement of ambient air monitors that will be used to measure the concentration of potential airborne asbestos fibers during the operation of the ABT at the Paris Road landfill/Debris Collection Site. Results of the modeling were used as a predictive tool to evaluate possible locations for monitors surrounding the ABT Process.

B1.1.1 Source Identification

The modeling was conducted to determine the extent of impact to the general public resulting from emissions generated by the operation of the ABT unit and to evaluate optimal placement of air monitors for the ABT pilot evaluation. Additionally, based on Phase 1 preliminary testing of the ABT using dry vegetative debris, it was also observed that considerable fugitive dust was generated during the handling of the debris when loading debris to the ABT. This operation will be occurring simultaneously and has the potential to release dust and other airborne particulate matter to the atmosphere as well. For purposes of this modeling scenario, the ABT source was modeled to determine the approximate distance from the ABT operation for the placement of air monitors. However, both the ABT source and associated fugitive source operations should be included in subsequent modeling analyses to account for their potential contributions. The following describes in further detail the characterization of the ABT source.

B1.1.1.1 Source Description: ABT

Figure B-1 is a photograph of the type of ABT unit that will be used in the emission evaluation program. The fire box of the ABT unit is approximately 8.5 feet wide, 27 feet long, and 8 feet high; further details are contained in Section A5.1.1.

A demolition grappler will be used to load the debris in to the ABT unit. The source and associated emissions defined and explicitly modeled in this case apply only to the operation of

Figure B-1. Configuration of a Typical Air Burner (ABT) Unit

the ABT unit to determine the extent of monitor placement for assessing impact to the general public. Potential fugitive emissions were not modeled here, but were considered and based on other modeling studies conducted for similar types of fugitive source operations, additional monitors will be placed in close proximity to the ABT and loading areas.

B1.1.1.2 Fugitive Sources: Transfer of Debris Into ABT Unit

Based on Phase 1 preliminary testing of the ABT using dry vegetative debris, it was observed that considerable fugitive dust was generated during the handling of the debris when loading debris into the ABT. This operation also has the potential to release dust and other airborne particulate matter to the atmosphere. The source defined in this case is associated with the potential emissions resulting from the handling and transfer of debris into the fire box of the ABT unit. Fugitive emissions from this transfer operation were not modeled here, but based on other modeling studies conducted for similar types of transfer operations, additional monitors will be placed in close proximity to the ABT and loading areas. This is explained in further detail in future sections of this document.

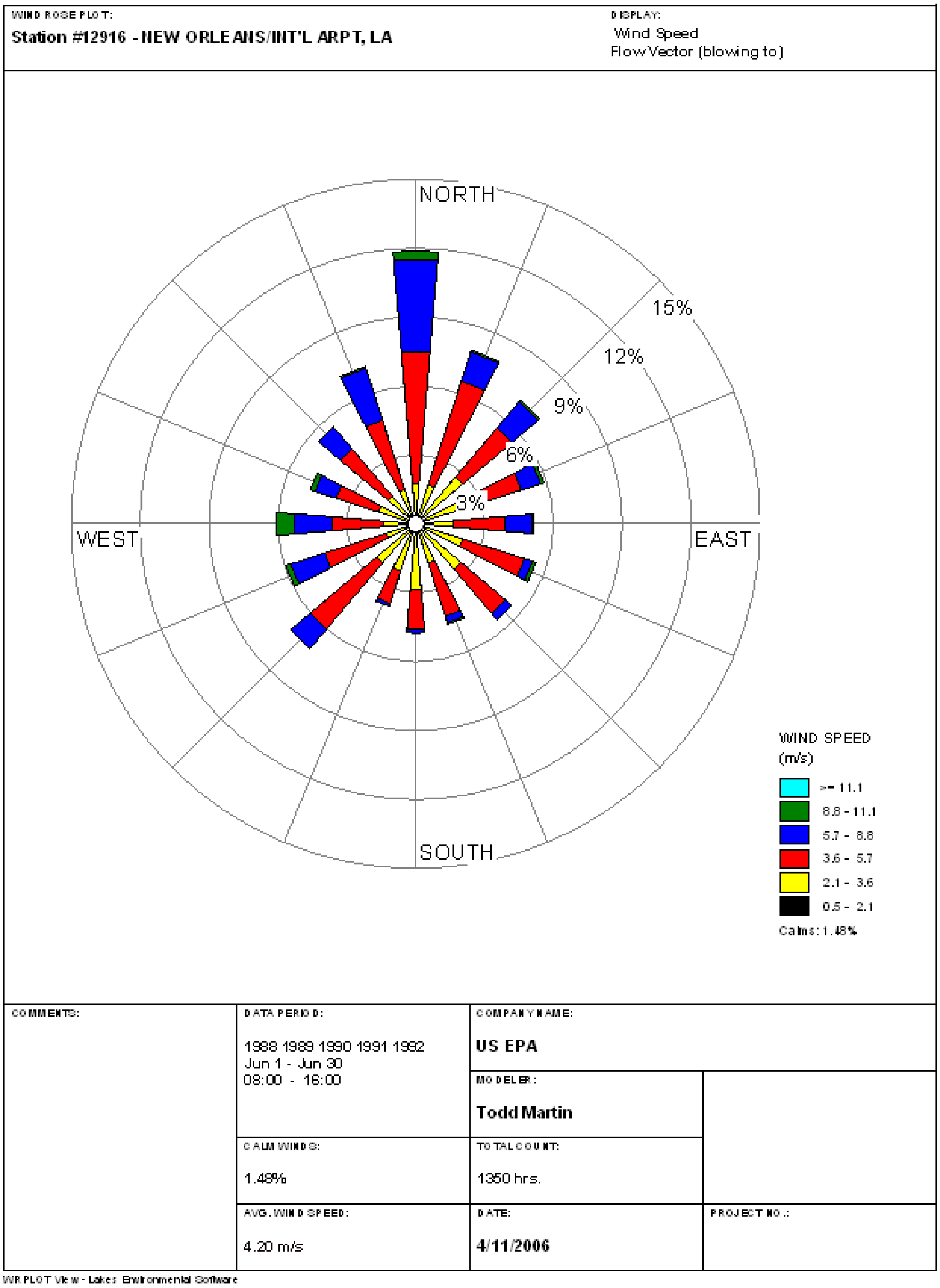
B1.1.1.3 Model Selection

The Industrial Source Complex Model, Version 3, in its short-term mode (ISCST3), was considered for use in this analysis. This model is based on a steady-state Gaussian plume algorithm, and is applicable for estimating ambient impacts from point, area, and volume sources out to a distance of about 50 kilometers.

B1.1.1.4 Meteorological Data

Meteorological data from the closest National Weather Service (NWS) Station was obtained and used for this analysis. Surface meteorological data was retrieved from the NWS meteorological station located at the New Orleans International Airport (Station ID No. 12916). The five most recent years of surface data (1988-1992) available from the U.S. EPA's SCRAM (Support Center for Regulatory Air Models) website (USEPA, 1992) were used for the modeling analysis. Mixing height data was obtained from the NWS Station in Slidell, LA (Station ID No. 53813). The surface and mixing height data were preprocessed using U.S. EPA's PCRAMMET program (USEPA, 1992). The mixing height data for 1989 (the only year available) was used for processing with all five years of the surface data (1988-1992). The resulting processed meteorological data files generated by PCRAMMET consisted of hourly meteorological files for the years 1988 through 1992. A subset of this dataset (data for the time period of 8:00 am to 4:00 pm for the month of June) was extracted in order to approximate the conditions of the upcoming test (under the assumption that the test would be conducted during these hours). A wind rose depicting the meteorological conditions during this subset of time (8:00 am through 4:00 pm) is shown in Figure B-2. A summary of the average conditions for this subset of data are given in Table B-1. The distribution of stability classes for the data subset is given in Table B-2. Stability classes D (neutral), E (stable), and F (stable) are the only significant stability classes exhibited in the data subset.

The wind rose depicted in Figure B-2 for the period 1988-1992 shows that the wind is almost evenly distributed in all directions. However the wind did have a slight tendency to blow towards the North. This data represents the month of June for all years evaluated (1988-1992) and is representative of the daily time frame of 0800 hours (8:00 am) through 1600 hours, the period during which the trial burn will be conducted.



WIND ROSE PLOT:
Station #12916 - NEW ORLEANS/INT'L ARPT, LA

DISPLAY:
Wind Speed
Flow Vector (blowing to)

COMMENTS:

DATA PERIOD:
1988 1989 1990 1991 1992
Jun 1 - Jun 30
08:00 - 16:00

COMPANY NAME:
US EPA

MODELER:
Todd Martin

CALM WINDS:
1.48%

TOTAL COUNT:
1350 hrs.

AVG. WIND SPEED:
4.20 m/s

DATE:
4/11/2006

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure B-2. Wind Rose for the Period 1988 through 1992

Table B-1. Average Conditions for the Month of June During Years 1988-1992 from the Hours of 8:00 am through 4:00 pm.

Windspeed	**Temperature**	**Rural mixing height**	**Urban mixing height**
m/s	K	m	m
4.20	302.6	1161	1097

Table B-2. Distribution of Stability Classes for the Month of June During the Years 1988 through 1992 from the Hours of 8:00 am to 4:00 pm

Stability class	Frequency
A	0%
B	0%
C	0%
D	50%
E	36%
F	13%
G	1%

B1.1.1.5 Source Characterization

In order to characterize the ABT emission source, a monitored test burn was performed on April 20, 2006. Debris consisting of trees and brush was burned using an Air Burners Air Burner Technology (which appeared identical to the one previously observed at the Amid Landfill in the New Orleans area). The site was monitored for carbon monoxide (CO) and carbon dioxide (CO_2). Both carbon monoxide and carbon dioxide are products of combustion from the burning of the woody debris from the land clearing operation and will be present in the resulting plume emanating from the activity. Two concentration monitoring trials were conducted.

The carbon monoxide and carbon dioxide concentrations as a function of downwind distance and receptor height (up to a maximum downwind distance of 75 ft) are given in Figure B-3. The average concentrations (averaged over both trials and over all the receptor heights up to a maximum downwind distance of 1000 ft) are given in Figure B-4. In general, the highest recorded concentrations occurred at the closest downwind monitoring location (25 ft). This indicates that the plume does not behave like a buoyant point source and would be more appropriately modeled as an area source. However, the majority of the maximum monitor

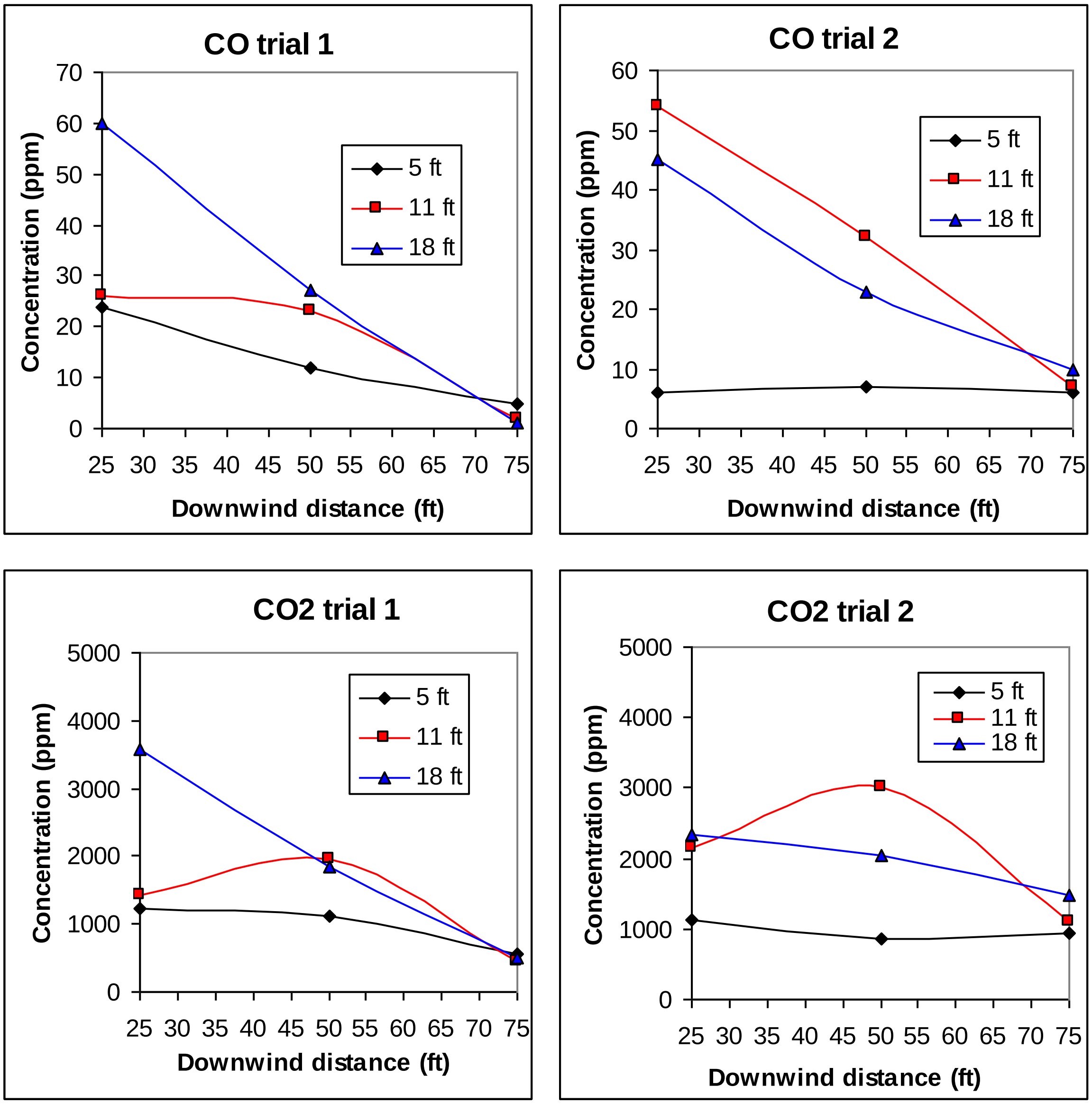


Figure B-3. Monitor concentration vs. receptor height and downwind distance for the two monitoring trials

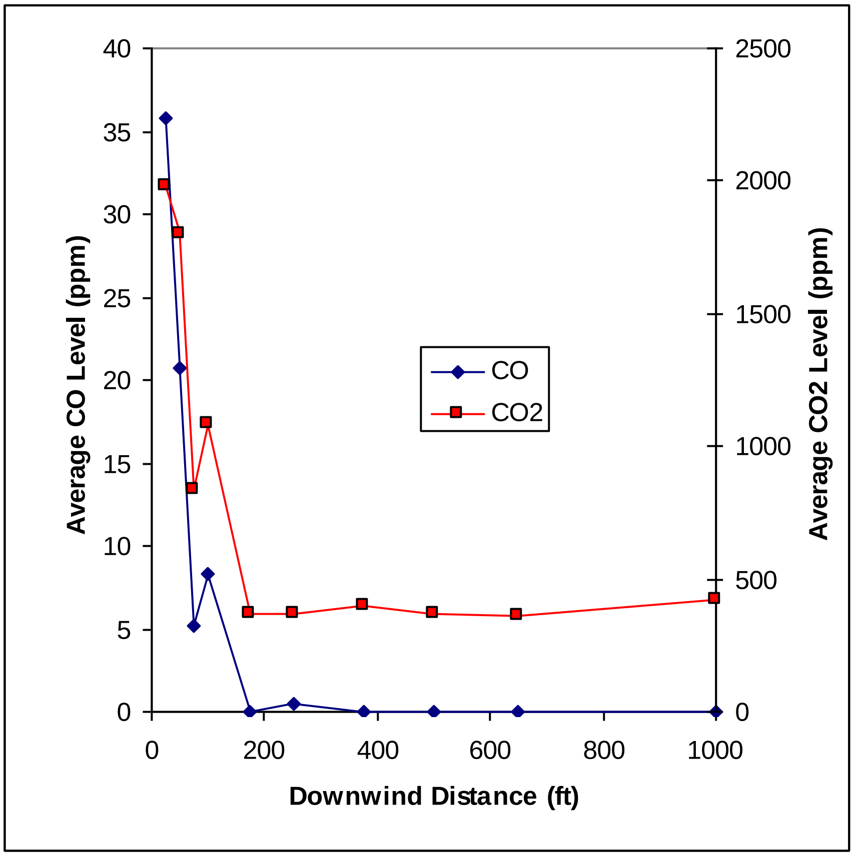


Figure B-4. Average monitor concentration vs. downwind distance

concentrations occurred at a receptor height of 18 ft which indicates there is some degree of plume rise (the unit is about ten feet tall). Figure B-4 illustrates that the monitor concentrations reached background levels at a distance of 250 ft.

The emissions from the air Burner Technology (ABT) unit were modeled using the ISCST3 (Industrial Source Complex Short Term) Gaussian dispersion model. The emissions were modeled as a point source then as an area source. The source parameters for modeling the ABT emissions unit are summarized in Tables B-3 and B-4. These parameters were based on technical specifications for the S-327 ABT unit. The land use type for the model (used to determine which dispersion coefficients will be used in the ISCST3 Model) was set to urban based on the population density the nearby metropolitan area (New Orleans).

Table B-3. Summary of Point Source Modeling Parameters for the Proposed ABT Unit

Parameter	Value	Source
Emission rate	1 g/m^2-s	Arbitrary value
Release Height	9’7” (2.92 m)	Height of S-327 unit (Air_Burners_LLC, 2005)
Diameter	17.1 ft (5.21 m)	Area of ABT firebox (Air_Burners_LLC, 2005)
Temperature	692°F (640 K)	Average value (Miller and Lemieux, 2005)
Velocity	2.74 ft/s (0.835 m/s)	Based on actual gas flow rate of 37666 CFM and area of firebox (Miller and Lemieux, 2005)

Table B-4. Summary of Area Source Modeling Parameters for the Proposed ABT Unit

Parameter	Value	Source
Emission rate	1 g/m^2-s	Arbitrary value
Release Height	9’7” (2.92 m)	Height of S-327 unit (Air_Burners_LLC, 2005)
Length of Area	27’2’ (8.28 m)	Length of ABT firebox (Air_Burners_LLC, 2005)
Width of Area	8’5” (2.57 m)	Width of ABT firebox (Air_Burners_LLC, 2005)

B1.1.1.6 ISCST3 Model

The emissions from an ABT are modeled in order to aid in the determination of the optimal placement of air monitors for a future test burn. The calculations were performed using the ISCST3 Model. The ISCST3 model is a more refined model (as compared to SCREEN3) and utilizes actual hourly meteorological data that have been preprocessed using U.S. EPA’s PCRAMMET program for compiling National Weather Service (NWS) meteorological data. As discussed previously, preprocessed meteorological data from the New Orleans area consisting of representative surface meteorological observations from the New Orleans International Airport (Station ID No. 12916) and mixing height data obtained from the NWS Station in Slidell, LA (Station ID No. 53813) were used. Figure B-2 shows a wind rose depicting the wind patterns for this area.

Based on this data, the ISCST3 Model was run using the average conditions in Table B-1. The ISCST3 point source prediction of the air concentration profile (for stability class D, the commonly observed stability class) is given in Figure B-5. The maximum concentration is predicted to occur at a downwind distance of about 1000 ft, which clearly does not match the observed concentration profiles in Figures B-3 and B-4. The area source prediction of the area concentration (for a release height of 9.58 ft) yields concentration profiles that are more in line with the observed concentration profiles (see Figure B-6). The ISCST3 model indicates that the largest concentration is observed at about 30 ft for a receptor height of 11 ft. The area source model incorrectly characterizes the dependence of the concentration on the receptor height (the predicted concentration at 11 ft high > concentration at 5 ft > concentration at 18 ft). The bottom graph in Figure B-6 illustrates that the concentration drops by 3 orders of magnitude out at a distance of 1000 ft. This indicates that it is probably not necessary to monitor the air concentration at a downwind distance of 1000 ft.

In order to improve the correlation of the predicted and observed concentration profiles, the area source calculations were redone with an effective release height of 15 ft in order to account for the small observed amount of plume rise (see Figure B-7). The model now gives the correct dependence of the concentration on the receptor height (the predicted concentration at 18 ft high > concentration at 11 ft > concentration at 5 ft). The results of the monitoring study and the area source modeling indicate that in order to capture the maximum concentration of pollutants, the receptors should be elevated (at about 12 ft) and should be placed as close to the emission source as possible (about 50 ft downwind).

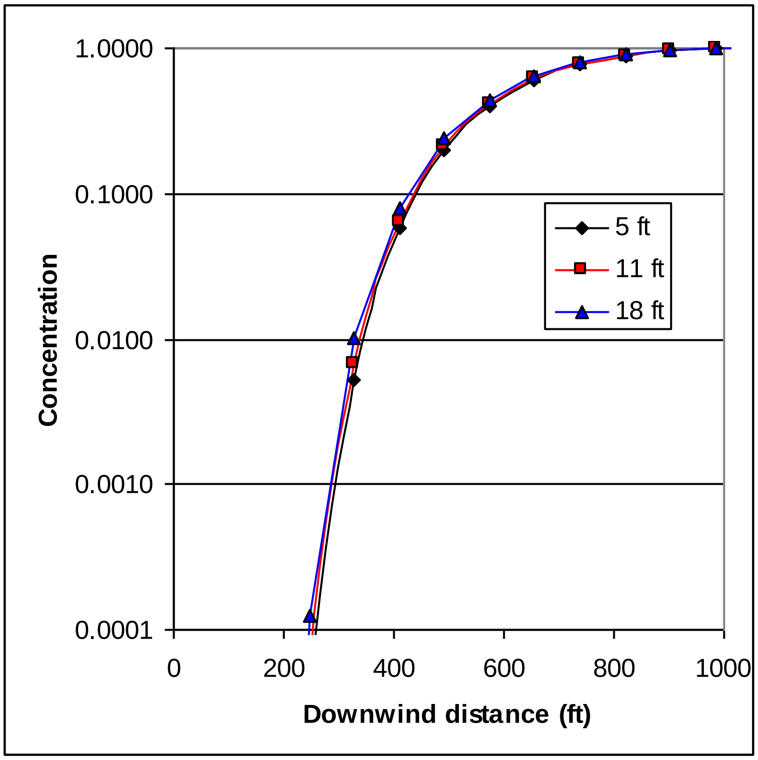


Figure B-5. Point source prediction of concentration vs. downwind distance and receptor height

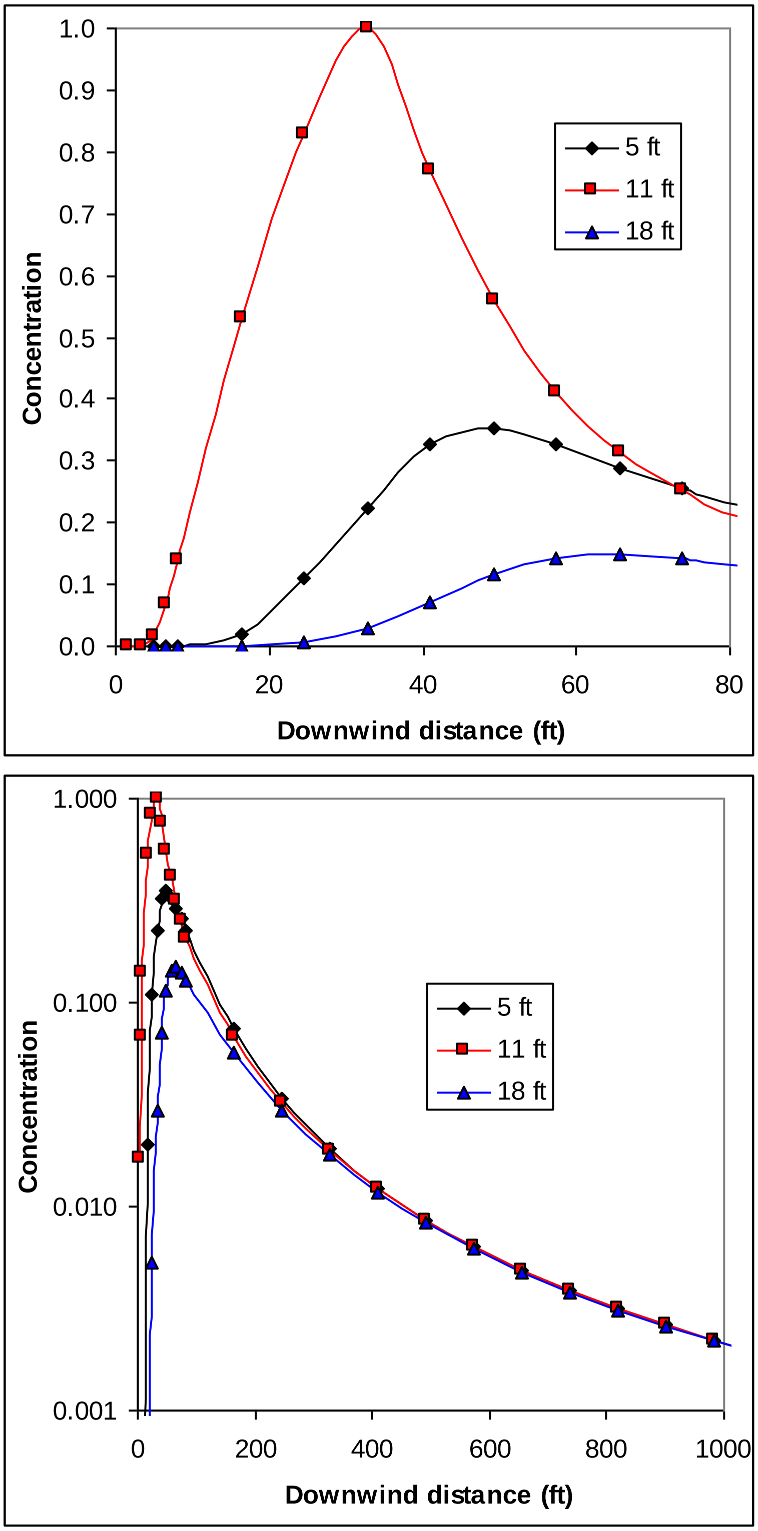


Figure B-6. Area source predictions for a release height of 9.6 ft

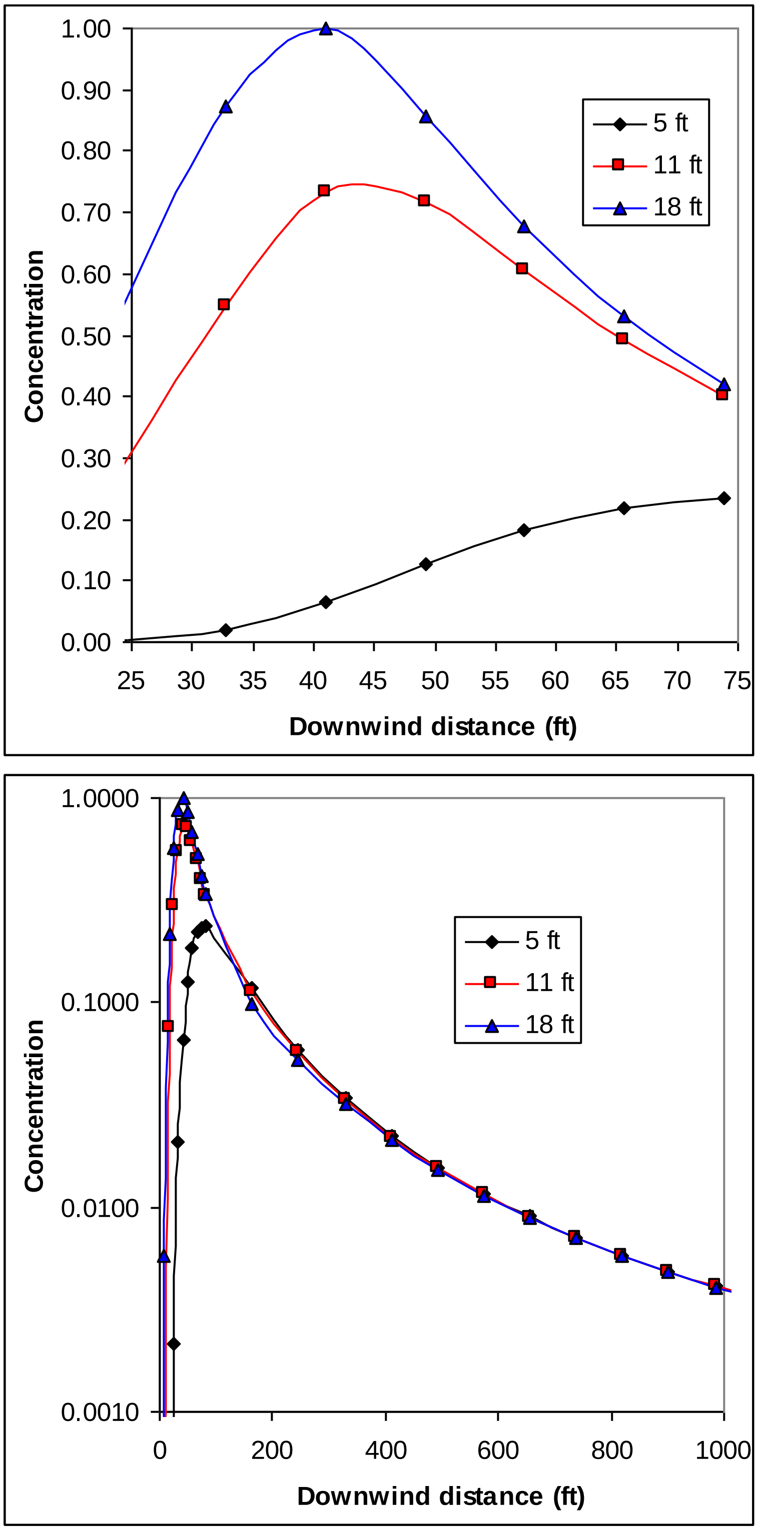


Figure B-7. Area source predictions for a release height of 15 ft

B2 SAMPLING METHOD REQUIREMENTS

B2.1 Air Sampling

B2.1.1 Perimeter Air Sampling (Asbestos)

The samples for asbestos analysis will be collected on an open-face, 25-mm-diameter 0.45-µm pore size mixed cellulose ester (MCE) filters with a 5-µm pore size MCE diffusing filter and cellulose support pad contained in a three-piece cassette with a 50-mm conductive cowl. This design of cassette has a longer cowl than the design specified in ISO 10312:1995, but it has been in general use for many years for ambient and indoor air sampling. Disposable filter cassettes with shorter conductive cowls, loaded with the appropriate combination of filter media of known and consistent origin, do not appear to be generally available. The filter cassettes for Ring 1 will be positioned on a pole at 10 feet above ground while the filter cassettes for Ring 2 will be positioned on a tripod that will accommodate cassette placement at 5 feet above ground.

High-Volume Samples (1,920 liters)—The filter assembly will be attached with flexible Tygon® tubing (or an equivalent material) to an electric-powered [110 volts alternating current (VAC)] 1/10-horsepower vacuum pump operating at an airflow rate of approximately eight liters per minute yielding a target air volume of 1,920 liters. Portable 15-20 amp (1.0 or 3.5 kw) gasoline-powered generators will be used to power the sampling pumps.

Low-Volume Samples (720 liters)—The filter assembly will be attached with flexible Tygon® tubing (or an equivalent material) to an electric-powered [110 volts alternating current (VAC)] 1/10-horsepower vacuum pump operating at an airflow rate of approximately three liters per minute yielding a target air volume of 720 liters. *Note: The low-volume air samples will be archived and will only be analyzed if the primary samples are overloaded.*

B2.1.2 Perimeter Air Sampling (TSP/Metals)

The High Volume Sampler for TSP will be used to collect Particulate Matter during burning operations using EPA Method IO-2.1 “Sampling of Ambient Air for Total Suspended Particulate Matter (SPM) and $PM_{2.5}$ Using High Volume (HV) Sampler”. The filters will also be subjected to metals analyses for samples collected during the C&D burn tests. The monitoring stations will be operated until burning operations and subsequent cleanup procedures are completed. All monitors will be fully operational prior to start of burning activities; and remain in operation until the burning is completed. At the completion of the sampling, all sampling instruments will be turned off and each filter in each sampler removed.

TSP glass fiber pre-weighed filters will be utilized and recorded for each sampling station. At the start of burning operations, high volume sampling start-up information (including initial pressure or water column readings, ambient temperature and barometric pressure, start time, and date) will be recorded. After burning activities are completed, a final recording of pressure or water column, ambient temperature and barometric pressure, and time will be made. Filters will be removed and placed in envelopes as soon as possible to avoid additional deposition of wind-borne particulate matter.

B2.1.3 Perimeter Air Sampling (Particulate as $PM_{2.5}$)

The procedure identified for TSP, modified to collect $PM_{2.5}$ particulate, will be used to collect Particulate Matter during burning operations. The monitoring stations will be operated until burning operations are completed. All monitors will be fully operational prior to start of burning activities; and remain in operation until all burning is completed. At the completion of the sampling, all sampling instruments will be turned off and each filter in each sampler removed.

$PM_{2.5}$ quartz pre-weighed filters will be utilized and recorded for each sampling station. At the start of burning operation, high volume sampling start-up information (including initial pressure or water column readings, ambient temperature and barometric pressure, start time, and date) will be recorded. After burning activities are completed, a final recording of pressure or water column, ambient temperature and barometric pressure, and time will be made. Filters will be removed and placed in envelopes as soon as possible to avoid additional deposition of wind-borne particulate matter.

Figure B-8. Particulate Sampler

B2.1.4 Perimeter Air Sampling (PCDDs/PCDFs)

Method TO-9A from EPA’s Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air will be used for sampling PCDDs/PCDFs. The method uses a high volume air sampler equipped with a quartz-fiber filter and polyurethane foam (PUF) adsorbent for sampling 165-200 m^3 ambient air in a 12-hour sampling period (at a flow rate of approximately 8 standard cubic feet per minute, scfm). The sampler will be calibrated using a calibrated orifice flow rate transfer standard. The data will be recorded on an Orifice Calibration Data Sheet.

Prepared sampling cartridges will be obtained from Test America Laboratories. In the laboratory, quartz-fiber filters and glass adsorbent cartridges are pre-cleaned with appropriate solvents and dried in a clean atmosphere. The PUF adsorbent plugs are subjected to 4-hour Soxhlet extraction using an oversized extractor to prevent distortion of the PUF plug. The PUF plugs are then air dried in a clean atmosphere and installed in the glass cartridges. The cartridges are then wrapped in aluminum foil to protect from light, capped with Teflon® end caps, placed in a cleaned labeled shipping container, and tightly sealed with Teflon® tap until needed.

For sampling, the quartz-fiber filter and glass cartridge containing the PUF are installed in the high-volume air sampler. A General Metal Works Model GPS-1 PUF (polyurethane foam) will be used. It contains a by-pass blower motor and cooling fan designed for continuous sampling rates of up to 280 liters per minute (10 scfm). It is housed in an anodized aluminum shelter for outdoor service in any type of climate. The sampler requires 110 volt, 15 amp service.

The high-volume sampler will be put into operation during the three four-hour tests during which C&D residential debris are burned. The total amount of ambient air sampled is recorded at the end of the sampling session. Sample recovery involves placing the filter on top of the PUF. The glass cartridge is then wrapped with the original aluminum foil, capped with Teflon® end caps, placed back into the original shipping container, identified, and shipped to the analytical laboratory for sample processing.

After sampling, the sample module will be removed from the PS-1 sampler and stored in a cooler at about 5° C (41° F). Samples will be shipped in a cooler at about 5° C (41° F) to the laboratory for analysis via one-day courier service, after which the samples will be refrigerated at less than or equal to about 5° C (41° F). Extraction will be performed within seven days of sample collection and analysis will be performed within 40 days after extraction.

B2.2 Settled Dust Sampling (Asbestos)

Settled dust samples for asbestos analysis will be passively collected by using EPA-modified ASTM Method D 1739-98 *“Method for Collection and Measurement of Dustfall (Settleable Particulate Matter.”* The collection container is an open-topped cylinder approximately six inches in diameter with a height of 12 inches. The container will not be equipped with a wind shield. The container will be fastened to the same sampling pole as the air samples at a height of five feet above the ground. The dust collection container will be capped at the end of the day and reopened the next day if the test runs are not completed. Upon completion of sampling, the dust collection container will be capped and sealed for shipment to the laboratory.

B2.3 Worker Exposure Monitoring (Asbestos, Lead, and CO)

Asbestos—Personal breathing samples will be collected on open-face, 25-mm-diameter 0.8-µm pore size MCE filters with a cellulose support pad contained in a three-piece cassette with a 50-mm conductive cowl.[5] The filter assembly will be attached to a constant-flow, battery-powered vacuum pump operating at a flow rate of two liters per minute.

Lead—Personal breathing samples will be collected on closed-face, 37-mm diameter 0.8-µm pore size MCE filters with a cellulose support pad contained in a three-piece cassette in accordance with NIOSH Method 7300. The filter assembly will be attached to a constant-flow, battery-powered vacuum pump operating at a flow rate of two liters per minute.

Carbon Monoxide—A calibrated Industrial Scientific Corporation (ISC) T82 single-gas monitor with a carbon monoxide sensor will be worn by the workers to establish personal breathing concentration of CO. A NIST traceable calibration certificate will be provided for each monitor. Each monitor will be programmed to record a one-minute average concentration during the exposure period. At the conclusion of the monitoring period the information stored in each data-logger will be downloaded into a personal computer utilizing ISC DataLink Software Version 1.3.0. The 8-hour time-weighted average concentration and other descriptive statistics (mean, minimum, and maximum concentrations) will be reported for each monitoring period.

B2.4 Water Sampling (Asbestos)

The sample container will be an unused, 1-liter pre-cleaned, screw-capped glass bottle. Prior to sample collection the bottle will be rinsed with sample water. Two bottles will be collected for each sample taken. For source water, the sample will be collected directly from the hose into the sample container. For surface waters, samples will be collected by scooping water from any pooled areas. Approximately 800 milliliters of source water will be collected. An air space will be left in the bottle to allow efficient redispersal of settled material before analysis.

The samples will be transported to the analytical laboratory and filtered by the laboratory within 48 hours of each sample collection. No preservatives or acids will be added. At all times after collection, the samples will be stored in the dark at about 5° C (41° F) in order to minimize

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[5] Although both 0.8-µm pore size and 0.45-µm pore size MCE filters are acceptable for sampling, the 0.45-µm pore size MCE filter is preferred when also performing TEM analysis of the sample because the particulate deposit closer to the filter surface. However, the higher pressure drop through the

bacterial and algal growth. The samples will not be allowed to freeze because the effects on asbestos fiber dispersions are not known. On the same day of collection, the samples will be shipped in a cooler at about 5° C (41° F) to the laboratory for analysis via one-day courier service.

B.2.5 Meteorological Monitoring

A portable meteorological station will be used to record five-minute average wind speed and wind direction data, as well as temperature, barometric pressure, and relative humidity. A meteorological station will be installed at the Paris Road Landfill/debris collection site. The data files will be downloaded and archived by using an on-site personal computer. At least hourly direct readout of the data will be recorded on a Meteorological Measurement Log (Figure A-14).

Selecting an appropriate site for the weather station is critical for obtaining accurate meteorological data. The instrument will be sited away from the influence of obstructions such as buildings and trees, and in such a position that it can make measurements that are representative of the general state of the atmosphere in the area of interest. Wind sensors (wind speed and direction) will be located over open level terrain. Open terrain is defined as an area where the distance between the instrument and any obstruction is at least ten times the height of that obstruction (EPA-450/4-87-013, June1987).

B2.6 Air Sampling for Carbon Monoxide

A hand-held battery-powered Thermo Gastech Model GT201 gas monitor will be used to determine the carbon monoxide profile around the ABT. A NIST traceable calibration certificate will be provided for the monitor.

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filter normally precludes their use with personal sampling pumps.

B3 SAMPLE CUSTODY REQUIREMENTS

Berger's chain-of-custody procedures emphasize careful documentation of constant secure custody of samples during the field, transport, and analytical stages of environmental measurement projects. The sample custodian (and alternate) responsible for the proper chain-of-custody during this project is:

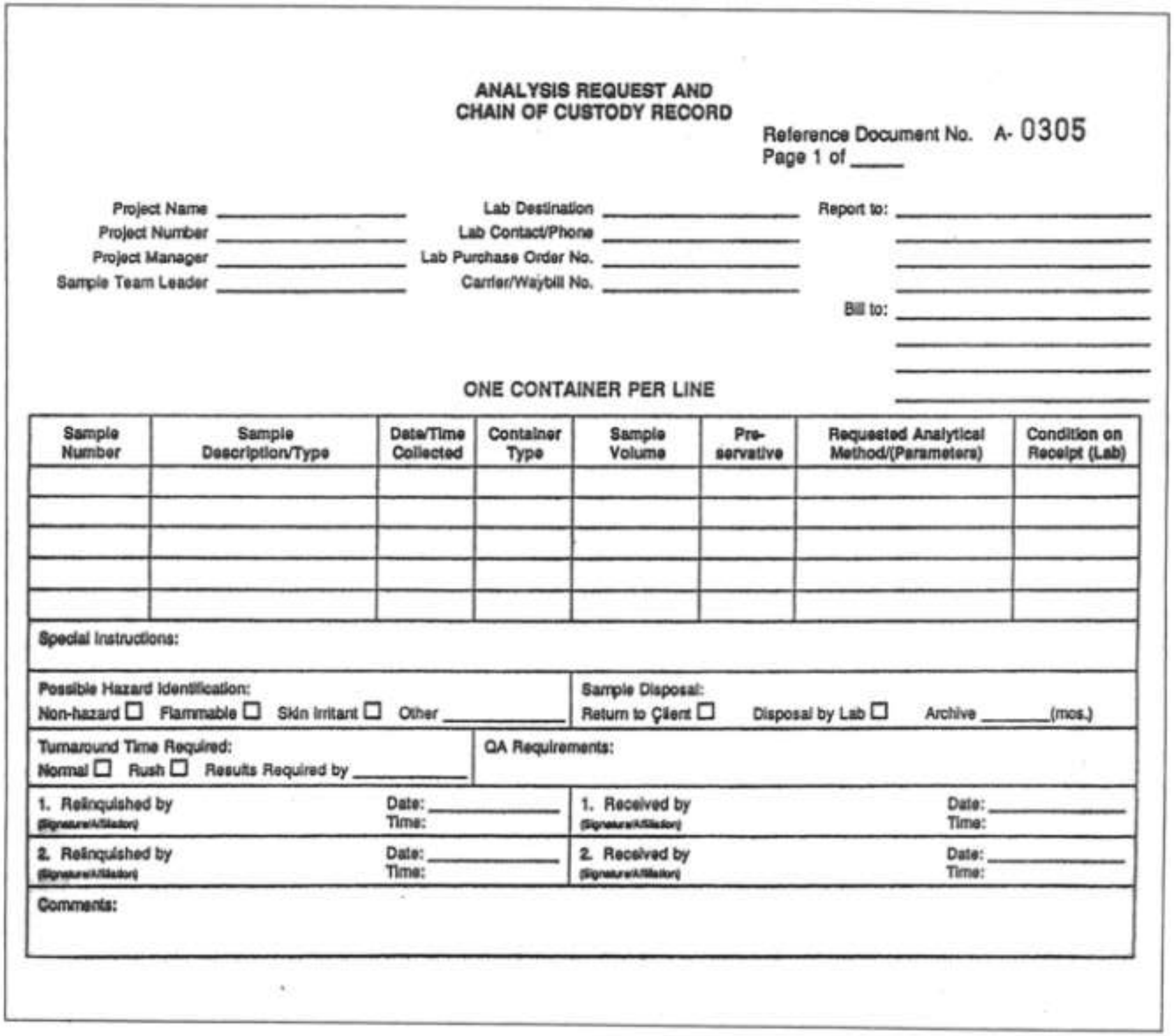
Craig Napolitano or Seth Schultz
The Louis Berger Group Inc

B3.1 Field Chain-of-Custody

Each sample will have a unique project identification number. A unique sample identification system will be developed for the samples. This identification number will be recorded on a Sampling Data Form along with the other information specified on the form. After the labeled sample cassettes and containers are inspected, the sample custodian will complete an Analysis Request and Chain-of-Custody Record (Figure B-10). This form will accompany the samples, and each person having custody of the samples will note receipt of the same and complete an appropriate section of the form. Samples will be sent to the appropriate Laboratory (see Section A8.2, "*Laboratory Personnel*) via Federal Express Standard Overnight Service.

B3.2 Analytical Laboratory

The laboratory's sample clerk will examine the shipping container and each sample cassette or container to verify sample numbers and check for any evidence of damage or tampering. Any changes will be recorded on the original chain-of-custody form. The sample clerk will log in all samples and assign a unique laboratory sample identification number to each sample and sample set.



**ANALYSIS REQUEST AND
CHAIN OF CUSTODY RECORD**

Reference Document No. A- 0305
Page 1 of ____

Project Name ____________
Project Number ____________
Project Manager ____________
Sample Team Leader ____________

Lab Destination ____________
Lab Contact/Phone ____________
Lab Purchase Order No. ____________
Carrier/Waybill No. ____________

Report to: ____________

Bill to: ____________

ONE CONTAINER PER LINE

Sample Number	Sample Description/Type	Date/Time Collected	Container Type	Sample Volume	Pre-servative	Requested Analytical Method/(Parameters)	Condition on Receipt (Lab)

Special Instructions:

Possible Hazard Identification:
Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Other ____________

Sample Disposal:
Return to Client ☐ Disposal by Lab ☐ Archive ______(mos.)

Turnaround Time Required:
Normal ☐ Rush ☐ Results Required by ____________

QA Requirements:

1. Relinquished by (Signature/Affiliation) Date: ____________ Time:

1. Received by (Signature/Affiliation) Date: ____________ Time:

2. Relinquished by (Signature/Affiliation) Date: ____________ Time:

2. Received by (Signature/Affiliation) Date: ____________ Time:

Comments:

Figure B-9. Analytical Request and Chain-of-Custody Form

B4 ANALYTICAL METHOD REQUIREMENTS

B4.1 Air Samples (Asbestos – TEM)

Perimeter Samples—The 0.45-µm pore size mixed-cellulose ester (MCE) air sampling filters will be prepared and analyzed by using ISO Method 10312:1995 (1st Ed.), *Ambient Air - Determination of Asbestos Fibres - Direct-Transfer Transmission Electron Microscopy Method.*" Note: After TEM analysis, a sector from the same filter will then be analyzed using PCM (see Section B4.2 "*Air Samples (PCM)*").

> Note: If a high density of particulate is present on the surface of the filter (i.e., more than approximately 20% coverage of the collection filter by particulate), the sample will be analyzed using ISO Method 13794:1999, "*Ambient Air – Determination of Asbestos Fibres – Indirect Transfer Transmission Electron Microscopy Method*." That is, if a high density of particulate is present on the both the high (1,920 liters) and low (720 liters) volume air samples, the high volume sample will be analyzed using the indirect transfer method.

Personal Samples— The 0.8-µm pore size mixed-cellulose ester (MCE) air sampling filters will be prepared and analyzed by using ISO Method 10312:1995, *Ambient Air - Determination of Asbestos Fibres - Direct-Transfer Transmission Electron Microscopy Method.*" Note: After TEM analysis, a sector from the same filter will then be analyzed using PCM (see Section B4.2 "*Air Samples (PCM)*").

B4.1.1 TEM Specimen Preparation

TEM specimens will be prepared from the air filters by using the dimethylformamide (DMF) collapsing procedure of ISO 10312:1995, as specified for cellulose ester filters. DMF will be used as the solvent for dissolution of the filter in the Jaffe washer. For each filter, a minimum of three TEM specimen grids will be prepared from a one-quarter sector of the filter by using 200-mesh indexed copper grids. The remaining part of the filter will be archived, in the original cassette in clean and secure storage, to be possibly selected for quality assurance analyses.

B4.1.2 Measurement Strategy

1. The minimum aspect ratio for the analyses shall be 3:1, as permitted by ISO 10312:1995.

2. Table B-5 presents the size ranges of structures that will be evaluated, and target analytical sensitivities and stopping rules.

3. The structure counting data shall be distributed approximately equally among a minimum of two specimen grids prepared from different parts of the filter sector.

4. The TEM specimen examinations will be performed at approximately 20,000 magnification.

5. PCM-equivalent asbestos fibers (as defined in ISO 10312:1995) will also be determined.

6. The type of fiber, including non-asbestos amphiboles will be specified. Such fibers will be reported separately. In addition to classifying fibers as one of the six NESHAP-regulated asbestos varieties, all other amphibole mineral particles meeting the aspect ration of ≥3:1 and lengths >0.5 µm) will be recorded. This includes non-NESHAP-regulated asbestos amphiboles (e.g., winchite, richterite). Reference to or implication of either use of the term cleavage fragments and/or discriminatory counting shall not apply.

Table B-5.
Target Analytical Sensitivity and Stopping Rules
(Direct-Transfer Preparation of TEM Specimens)

Size Range	Target Analytical Sensitivity, s/cc	Approximate Magnification for Examination	Stopping Rule
TEM (ISO 10312:1995) All Structures (minimum length of 0.5 µm; aspect ratio ≥3:1)	0.0005	20,000	Count a minimum of four grid openings. If ≥100 structures are identified, counting is stopped. If <100 structures are identified, count until 100 structures are identified or the required number of grid openings to achieve an analytical sensitivity of 0.0005 asbestos structures/cm^3. Always complete the structure count for the last grid opening evaluated.

B4.1.3 Determination of Stopping Point

The analytical sensitivity and detection limit of microscopic methods (such as TEM and PCM) are a function of the volume of air drawn through the filter and the number of grid openings or field counted. In principle, any required analytical sensitivity or detection limit can be achieved by increasing the number of grid openings or field examined. Likewise, statistical uncertainty around the number of fibers observed can be reduced by counting more fibers. Because of the open-ended nature of this situation, stopping rules are needed to identify when a microscopic examination should end, both at the low end (zero or very few fibers observed) and at the high end (many fibers observed).

B4.2 Air Samples (Total Fibers – PCM)

Perimeter Samples—The 0.45-µm pore size MCE air sampling filters (described in Section B4.1 "Air Samples (TEM)") will be prepared and analyzed for total fibers by using NIOSH Method 7400 "*Asbestos Fibers by PCM*" (A Counting Rules). Fibers greater than 5 µm in length and with an aspect ratio greater than 3:1 will be counted.

Personal Samples—0.8-µm pore size MCE air sampling filters will be prepared and analyzed for total fibers by using NIOSH Method 7400 "*Asbestos Fibers by PCM*" (A Counting Rules). Fibers greater than five µm in length and with an aspect ratio greater than 3:1 will be counted.

B4.3 Air Samples (TSP/Metals)

The high volume air sampling filters will be weighed (see section B4.4), prepared and analyzed using the following: Digestion will be conducted using EPA Method IO-3.1 "*Selection, Preparation and Extraction of Filter Material".* Digestates will be analyzed for metals using Inductively Coupled Plasma (ICP) Spectroscopy as described in EPA Method IO-3.4 "*Determination of Metals in Ambient Particulate Matter Using Inductively Coupled Plasma (ICP) Spectroscopy".*

B4.4 Air Samples (Particulate as TSP and $PM_{2.5}$)

Each filter is weighed to a constant weight (after moisture equilibration) before and after use to determine the net weight (mass) gained. The total volume of air sampled, corrected to EPA reference conditions (25 C, 101.3 kPa), is determined from the measured flow rate and the sampling time. The mass concentration of particulate in the ambient air is computed as the total mass of particulate divided by the volume of air sampled, and is expressed in micrograms per standard cubic meter (µg/std m3).

B4.5 Air Samples (PCDDs/PCDFs)

The glass sample cartridge containing the PUF plug and quartz fiber is extracted in a Soxhlet extractor. The extract is cleaned up as necessary as described in Method TO-9A. The final extract is analyzed to determine the presence of dioxin/furans by High Resolution Gas Chromatography-High Resolution Mass Spectrometry as described in Method TO-9A. The target detection limit is 10-100 picograms (pg). The specific isomers to be analyzed are presented in Table B-6.

Table B-6. Polychlorinated Dibenzodioxins And Polychlorinated Dibenzofurans

Compound	
2,3,7,8-TCDD	2,3,4,7,8-PeCDF
1,2,3,7,8-PeCDD	1,2,3,4,7,8-HxCDF
1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDF
1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDF
1,2,3,7,8,9-HxCDD	2,3,4,6,7,8-HxCDF
1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF
OCDD	1,2,3,4,7,8,9-HpCDF
2,3,4,7,8-TCDF	OCDF
1,2,3,7,8-PeCDF	

B4.6 Settled Dust Samples (Asbestos)

B4.6.1 Asbestos

The analytical sample preparation and analysis for asbestos will follow ASTM Standard D5755-03 "*Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading"* as modified with the following exceptions:

- Section 8 - Sampling Procedure for Microvacuum Technique: The section is replaced with ASTM D 1739-98 sample collection procedure.
- Section 10.4.1 through 10.4.3: Rinse the sample collection container with approximately 100ml of 50/50 mixture of particle-free water and reagent alcohol using a plastic wash bottle. Pour the suspension through a 1.0 by 1.0 mm opening screen into a pre-cleaned 500 or 1000 ml specimen bottle. All visible traces of the sample contained in the collection device shall be rinsed through the screen into the specimen bottle. Repeat the washing procedure three times. Discard the screen and bring the volume of the suspension in the specimen bottle up to 500ml with particle free water only.
- Section 16.2 Recording Data Rules – ISO 10312:1995 counting rules will be followed. The required analytical sensitivity is 250 s/cm^2.

The presence of forsterite will also be determined and quantified. This will include the analysis of "forsterite-like" materials. Using engineering judgment, assumptions such as the lack of asbestos fibers could lead to a conclusion that the asbestos fibers have converted to forsterite.

B4.7 Water Samples (Asbestos)

The asbestos content of the water samples will be determined by using EPA Method 100.2 "*Analytical Method Determination of Asbestos in Water.*" All fibers greater than 0.5 μm in length and with an aspect ratio of greater than or equal to 3:1 will be counted. The required analytical sensitivity is 0.05 million s/L for the source water samples and 2 million s/L for the surface water samples.

B5 QUALITY CONTROL REQUIREMENTS

The overall quality assurance objective is to provide defensible data of known quality meeting quality assurance objectives. To that end, procedures are developed and implemented for field sampling, chain-of-custody, laboratory analysis, reporting, and audits that will provide results which are scientifically valid and defensible.

B5.1 Field Quality Control Checks

Quality control checks for the field sampling aspects of this project will include, but not be limited to, the following:

- Use of standardized forms to ensure completeness, traceability, and comparability of the data and samples collected.
- The air flow rate of the sampling pump will be set to the target value and measured at the beginning, then every two hours with adjustments as necessary, and at the end of the sampling period. If the flow rate deviates more than ten percent, the impact to the results will be evaluated and the sample will be adjusted to its intended volume. All adjustments and readings will be recorded and factored in to a TWA over the sampling period of time to achieve the sample total volume
- Calibration of air sampling equipment including pre- and post-sample calibrations.
- Proper handling of sampling media to prevent cross contamination.
- Collection of field blanks and field duplicate samples.
- Field cross-checking of data forms to ensure accuracy and completeness.

B5.1.1 Field QC for Air Samples for Asbestos and Total Fibers

B5.1.1.1 Field Blanks

Field blank samples are used to determine if any contamination has occurred during sample handling. Field blanks will be collected each day of sampling. Field blanks are filter cassettes that have been transported to the sampling site, opened for a short-time ($\leq$ 30 seconds) without any air having passed through the filter, and then sent to the laboratory.

B5.1.1.2 Field Duplicates

A duplicate sample is a second sample collected concurrently at the same location as the original sample.

B5.1.2 Field QC for Air Samples for TSP/Metals and PM$_{2.5}$

B5.1.2.1 Field Blanks

Field blank samples are used to determine if any contamination has occurred during sample handling. Field blanks are pre-weighed filters that have been transported to the sampling site, opened, placed in the sampler and removed immediately and placed in a clean envelope without any air having passed through the filter, and then removed and sent to the laboratory. For metals, these same filters will be digested and analyzed.

B5.1.2.2 Field Duplicates

A duplicate sample is a second sample collected concurrently at the same location as the original sample.

B5.1.3 Field QC for Air Samples for PCDDs/PCDFs

B5.1.3.1 Field Blanks

Field blank samples are used to determine if any contamination has occurred during sample handling. Field blanks will be collected each day of sampling. Field blanks are sample cartridges that have been brought to the field and returned to the laboratory with no air having been drawn through them.

B5.1.3.2 Field Spikes

All sample cartridges are spiked with $_{13}$C -1,2,3,4-TCDD prior to shipment to the field.

B5.1.3.3 Field Duplicates

A duplicate sample is a second sample collected concurrently at the same location as the original sample.

B5.1.4 Settled Dust Field QC

B5.1.4.1 Field Blanks

A field blank is prepared by placing a collection device in the field, removing the lid, and then immediately replacing the lid.

B5.1.4.2 Field Duplicates

A duplicate sample is a second sample collected concurrently at the same location as the original sample.

B5.1.5 Water Field QC

B5.1.5.1 Field Blanks

A field blank is an empty clean glass container. The container will be opened in the field for approximately 30 seconds.

B5.1.5.2 Field Duplicate

A duplicate sample is a second sample collected concurrently at the same location as the original sample, but is collected after the original sample is collected.

B5.2 Asbestos Laboratory Quality Control Checks

B5.2.1 Air

B5.2.1.1 Lot Blanks

Before air samples are collected, a minimum of two percent of unused filters from each filter lot of 100 filters will be analyzed to determine the mean asbestos structure count. The lot blanks will be analyzed for asbestos structures by using ISO 10312:1995. If the mean count for all types of asbestos structures is found to be more than ten structures/mm^2, the filter lot will be rejected.

B5.2.1.2 Laboratory Blank

Laboratory blanks are unused filters (or other sampling device or container) that are prepared and analyzed in the same manner as the field samples to verify that reagents, tools, and equipment are free of the subject analyte and that contamination has not occurred during the analysis process. The laboratory will analyze at least one blank for every 10 samples or one blank per prep series. Blanks are prepared and analyzed along with the other samples. If the blank control criteria (Section B5.2.1.1) are not met, the results for the samples prepared with the contaminated blank are suspect and should not be reported (or reported and flagged accordingly). The preparation and analyses of samples should be stopped until the source of contamination is found and eliminated. Before sample analysis is resumed, contamination-free conditions shall be demonstrated by preparing and analyzing laboratory clean area blanks (see Section B5.2.1.3) that meet the blank control criteria. Laboratory blank count sheets should be maintained in the project folder along with the sample results.

B5.2.1.3 Laboratory Clean Area Blanks

Clean area blanks are prepared whenever contamination of a single laboratory prep blank exceeds the criteria specified in Section B.5.2.1.1or whenever cleaning or servicing of equipment has occurred. To check the clean area, an used filter is left open on a bench top in the clean area for the duration of the sample prep process. The blank is then prepared and analyzed by using ISO Method 10312:1995. If the blank control criteria (see Section B.5.2.1.1) are not met, the area is cleaned by using a combination of HEPA-filter vacuuming and a thorough wet-wiping of all surfaces with amended water. In addition, air samples should be taken in the sample prep room to verify clean air conditions. At least 2,500 liters of air should be drawn through a 25-mm-diameter 0.45-µm pore size MCE filter by using a calibrated air sampling pump. The samples should then be analyzed by using ISO Method 10312:1995. If blank control criteria are not met, sample preparation shall stop until the source of contamination is found and eliminated. Clean area sample results shall be documented.

B5.2.1.4 Replicate Analysis

The precision of the analysis is determined by an evaluation of repeated analyses of randomly selected samples. A replicate analysis will be performed on a percentage of the samples analyzed to assess the precision of the counting abilities of the individual analysts. A replicate analysis is a second analysis of the same preparation, but not necessarily the same grid openings, performed by the same microscopist as in the original analysis. The conformance expectation for the replicate analysis is that the count from the original analysis and the replicate analysis will fall within an acceptable analytical variability as shown in Table B-8.

B5.2.1.5 Duplicate Analysis

A duplicate sample analysis is also performed on a percentage of the samples analyzed to assess the reproducibility of the analysis and quantify the analytical variability due to the filter preparation procedure. A duplicate analysis is the analysis of a second TEM grid preparation prepared from a different area of the sample filter performed by the same microscopist as the original analysis. The conformance expectation for the duplicate analysis is that the counts from the original and duplicate analyses will fall within the acceptable analytical variability shown in Table B-8.

Table B-7. Analytical Methods and Quality Assurance (QA)/Quality Control (QC) Checks

Matrix	Analyte	Method and Analytical Sensitivity	QA/QC Checks	Frequency	Acceptance Criteria	Corrective Action if Acceptance Criteria Not Met
Perimeter Air	Asbestos by TEM	EPA-modified ISO Method 10312:1995; 0.0005 s/cm^3	Lot Blanks	2% of unused filters	<10 asbestos s/mm^2	Reject filter lot
			Laboratory Blanks	Each sample batch	<10 asbestos s/mm^2	Collect and analyze clean area blanks; re-prep filter samples
			Laboratory Clean Area Blanks	Whenever laboratory blanks do not meet criteria	<10 asbestos s/mm^2	Find and eliminate source of contamination
			Replicate Analysis (recount by same analyst)	12 samples (two samples per ring per test run)	Acceptable Analytical Variability from Table B-8	Re-examine grids to determine cause of variation
			Verification Counting (intralab and interlab)	6 samples (two samples from Ring 1 per test run)	>80% true positives, <20% false negatives, <20% false positives	Re-examine grids to determine cause of variation
			Duplicate Analysis (reprep and analysis by same analyst)	12 samples (two samples per ring per test run)	Acceptable Analytical Variability from Table B-8	Re-examine grids to determine cause of variation; re-prep filter samples
			Interlaboratory Duplicates	6 samples (two samples from Ring 1 per test run)	Acceptable Analytical Variability from Table B-8	Re-examine grids to determine cause of variation; re-prep filter samples

Table B-7. (continued)

Matrix	Analyte	Method and Analytical Sensitivity	QA/QC Checks	Frequency	Acceptance Criteria	Corrective Action if Acceptance Criteria Not Met
	Total Fibers by PCM	NIOSH Method 7400; 0.01 f/cm^3	Blind recounts on reference slides	Daily	Per laboratory control charts	Investigate source of imprecision; re-count reference slides
			Blind recounts on filter samples	10%	See Step 13 of Method 7400	Investigate source of imprecision; re-count filter sample
Worker Air	Total Fibers by PCM	NIOSH Method 7400; 0.01 f/cm^3	Blind recounts on reference slides	Daily	Per laboratory control charts	Investigate source of imprecision; re-count reference slides
			Blind recounts on filter samples	10%	See Step 13 of Method 7400	Investigate source of imprecision; re-count filter sample
	Asbestos by TEM	EPA-modified ISO Method 10312:1995; 0.005 s/cm^3	Lot Blanks	2% of unused filters	<10 asbestos s/mm^2	Reject filter lot
			Laboratory Blanks	Each sample batch	<10 asbestos s/mm^2	Collect and analyze clean area blanks; re-prep filter samples
			Laboratory Clean Area Blanks	Whenever laboratory blanks do not meet criteria	<10 asbestos s/mm^2	Find and eliminate source of contamination
			Replicate Analysis	Three samples (one per test run)	Acceptable Analytical Variability from Table B-8	Re-examine grids to determine cause of variation
			Verification Counting	Three samples (one per test run)	>80% true positives, <20% false negatives, <20% false positives	Re-examine grids to determine cause of variation

Table B-7. (continued)

Matrix	Analyte	Method and Analytical Sensitivity	QA/QC Checks	Frequency	Acceptance Criteria	Corrective Action if Acceptance Criteria Not Met
Worker Air			Duplicate Analysis (reprep and analysis by same analyst)	Three samples (one per test run)	Acceptable Analytical Variability from Table B-8	Re-examine grids to determine cause of variation; re-prep filter samples
	Lead	5 µg/m3 NIOSH 7300	Laboratory Blank	1/batch or 1/10 samples, whichever is greater	<3 µg/sample	Investigate source of contamination; evaluate impact on sample results
			Spiked Blank Filters/Spiked Blank Filter Duplicates	1/batch or 1/10 samples, whichever is greater	75-125%; 20% RPD	Investigate source of error; evaluate impact on sample results

Table B-7. (continued)

Matrix	Analyte	Method and Analytical Sensitivity	QA/QC Checks	Frequency	Acceptance Criteria	Corrective Action if Acceptance Criteria Not Met
Settled Dust	Asbestos by TEM	EPA-modified ASTM D5755-03 ; 250 str/cm^2	Lot Blanks	2% of unused filters	<10 asbestos s/mm^2	Reject filter lot
			Laboratory Blanks	1 per 10 samples or each sample batch	<10 asbestos s/mm^2	Collect and analyze clean area blanks; re-prep filter samples
			Laboratory Clean Area Blanks	Whenever laboratory blanks do not meet criteria	<10 asbestos s/mm^2	Find and eliminate source of contamination
			Replicate Analysis	4 samples (two per ring)	Acceptable Analytical Variability from Table B-8	Re-examine grids to determine cause of variation
			Duplicate Analysis	4 samples (two per ring)	Acceptable Analytical Variability from Table B-8	Reprepare and re-examine sample to determine cause of variation; re-prep filter samples
Water	Asbestos by TEM	EPA 100.2; 0.05 million str/liter source 2 million str/ liter runoff	Lot Blanks	2% of unused filters	<10 asbestos s/mm^2	Reject filter lot
			Laboratory Blanks	1 per 10 samples or each sample batch	<10 asbestos s/mm^2	Collect and analyze clean area blanks; re-prep filter samples
			Laboratory Clean Area Blanks	Whenever laboratory blanks do not meet criteria	<10 asbestos s/mm^2	Find and eliminate source of contamination

Table B-7. (continued)

Matrix	Analyte	Method and Analytical Sensitivity	QA/QC Checks	Frequency	Acceptance Criteria	Corrective Action if Acceptance Criteria Not Met
Water	Asbestos by TEM	EPA 100.2; 0.05 million str/liter source 2 million str/ liter runoff	Replicate Analysis	1 sample	Acceptable Analytical Variability from Table B-8	Re-examine grids to determine cause of variation
			Duplicate Analysis	1 sample	Acceptable Analytical Variability from B-8	Reprepare and re-examine sample to determine cause of variation

Table B-7. (continued)

Matrix	Analyte	Method and Analytical Sensitivity	QA/QC Checks	Frequency	Acceptance Criteria	Corrective Action if Acceptance Criteria Not Met
Ambient Air	TSP, $PM_{2.5}$	EPA Method IO-3.1 0.01 mg	Analysis of S-Class certified weights	Daily	3 gram NIST standard weight 2.9995-3.0005	Recalibrate balance and repeat QC check of S-class weights
			Duplicates (second analyst)	10% of the filters	Difference between the weights is less than 1.0 mg for tare and 2.0 mg for final weights	Reweigh 100% of that lot and use the last reweigh weight
	Metals	EPA Method IO-3.4 1-50 ng/m^3	Method Blank	Each sample batch or with every ten filters, whichever is greater.	< 5 times the instrument detection limit	Find and eliminate source of contamination

Matrix	Analyte	Method and Analytical Sensitivity	QA/QC Checks	Frequency	Acceptance Criteria	Corrective Action if Acceptance Criteria Not Met
			Matrix Spike	Each sample batch or with every ten filters, whichever is greater.	75-125% Recovery	Investigate source of error; evaluate impact on sample results
			Duplicate	Each sample batch or with every ten filters, whichever is greater.	20 RPD	Investigate source of error; evaluate impact on sample results
	PCDDs/PCDFs	TO-9A 0.05-0.5 pg/m^3	Method Blanks	Each batch of samples, or for every 10 samples, whichever is greater	Free of contamination that impacts analysis	Investigate source of error; evaluate impact on sample results
			Internal Standards	All samples, blanks, and quality control samples	50 to 120 percent recovery	Investigate source of error; evaluate impact on sample results

Matrix	Analyte	Method and Analytical Sensitivity	QA/QC Checks	Frequency	Acceptance Criteria	Corrective Action if Acceptance Criteria Not Met
			Lab Control Samples/Lab Control Sample Duplicates (LCS/LCSD)	Each batch of samples, or for every 10 samples, whichever is greater	70-130 percent recovery; precision <30 RPD	Investigate source of error; evaluate impact on sample results

Table B-8. Accepted Analytical Variability for Sample Re-Analysis[a][b]

Type of Sample		Accepted Variability
Air Samples	Replicate	1.96
	Duplicate	2.24
	Interlab duplicate	2.24
Non-Air Samples	Replicate	2.24
	Duplicate	2.50

[a] Analytical Variability = $\frac{|(\text{Analysis A}) - (\text{Analysis B})|}{\sqrt{(\text{Analysis A} + \text{Analysis B})}}$

[b] Asbestos only

This variability is the absolute value of the difference of the two analyses, divided by the square root of the sum, which is an estimate of the standard deviation of the difference based on a Poisson counting model. For replicate air samples, for which the simple Poisson model is most directly applicable, the value 1.96 is chosen so that the criterion will flag approximately 1 replicate pair out of 20 for which the difference is due only to analytical variability, i.e., it has a "false positive" rate of 5%. For the other types of analyses, where greater natural variability is expected than indicated by a pure Poisson model, the criterion value has been increased from 1.96 in order to avoid flagging too many cases where the difference between the values is due only to normal variation, and not to any problem with either analysis. The values 2.24 and 2.50 were selected as targeting false positive rates of 2.5% (1/40) and 1.125% (1/80) for the Poisson model.

<u>Example 1</u>: For replicate air samples where A = 0 fiber and B = 3 fibers, the variation is considered acceptable, while A = 0 and B = 4 would be flagged for further investigation. Likewise A = 1 and B = 6 is acceptable, while A = 1 and B = 7 is flagged. At higher levels, A = 20 and B = 34 is acceptable, but A = 10 and B = 24 is flagged.

<u>Example 2</u>: For interlab duplicate non-air samples, A = 0 and B = 6 is acceptable, but A = 0 and B = 7 is flagged. Likewise, A = 1 and B = 8 is acceptable, but A = 1 and B = 9 is flagged.

B5.2.1.6 Verification Counting

Due to the subjective component in the structure counting procedure, it is necessary that recounts of some specimens be made by a different microscopist (i.e., a microscopist different than the one that performed the original analysis) in order to minimize the subjective effects. Verification counting will be done by more than one analyst in the initial laboratory and also by the QA laboratory. Counting will involve re-examination of the same grid openings by the participating analysts. Such recounts provide a means of maintaining comparability between counts made by different microscopists. Repeat results should result in a level of consensus between laboratories such that both laboratories have >80% true positives, <20% false negatives, and <20% false positives in their verified counting analysis of asbestos structures.

B5.2.1.7 Interlaboratory Duplicates

The QA laboratory will analyze a percentage of the air samples (TEM) as an independent check of the results of the primary laboratory. These analyses will be performed on a separate sector of the filter. The filter will be provided by the primary laboratory to the QA laboratory. The conformance expectation for interlaboratory QC checks is that the counts from the original analysis and the interlaboratory QC check will fall within the acceptable analytical variability.

B5.2.2 Settled Dust

B5.2.2.1 Laboratory Blanks

A laboratory blank is prepared by filtering water through the same type of filter used to prepare TEM grids. A sample blank should be prepared each time a new batch of filters is opened and each time the filtering unit is cleaned. Blanks will be considered contaminated if they have greater than or equal to 10 asbestos structures per square millimeter. The source of the contamination must be found before any further analysis can be performed. Reject samples that are processed along with the contaminated blank samples and prepare new samples after the source of the contamination is found.

B5.2.2.2 Laboratory Duplicates

A duplicate sample analysis is also performed on a percentage of the samples analyzed to assess the reproducibility of the sample preparation and analysis. A duplicate analysis is the analysis of a second aliquot of the original dust samples aqueous suspension.

B5.2.2.3 Replicate Analysis

Replicate analysis will be performed on a percentage of the samples as described for the air samples in Section B5.2.1.4 “*Replicate Analysis.”*

B5.2.3 Worker

B5.2.3.1 Laboratory Blanks

A laboratory blank is prepared by filtering water through the same type of filter used to prepare TEM grids. A sample blank should be prepared each time a new batch of filters is opened and each time the filtering unit is cleaned. Blanks will be considered contaminated if they have greater than or equal to 10 asbestos structures per square millimeter. The source of the contamination must be found before any further analysis can be performed. Reject samples that are processed along with the contaminated blank samples and prepare new samples after the source of the contamination is found.

B5.2.3.2 Laboratory Duplicates

A duplicate sample analysis is also performed on a percentage of the samples analyzed to assess the reproducibility of the sample preparation and analysis. A duplicate analysis is the analysis of a second TEM grid preparation prepared from a different area of the sample filter performed by the same microscopist as the original analysis.

B5.2.3.3 Replicate Analysis

Replicate analysis will be performed on a percentage of the samples as described for the air samples in Section B5.2.1.4 "*Replicate Analysis.*"

B5.2.4 Water

B5.2.4.1 Laboratory Blanks

A laboratory blank is prepared by filtering 100 mL of water through the same type of filter used to prepare TEM grids. A sample blank will be prepared with each sample set.

B5.2.4.2 Laboratory Duplicates

A duplicate sample analysis is also performed on one of the samples analyzed to assess the reproducibility of the sample preparation and analysis. A duplicate analysis is the analysis of a second aliquot of the original water sample.

B5.2.4.3 Replicate Analysis

Replicate analysis will be performed on one of the samples as described for the air samples in Section B5.2.1.4 "*Replicate Analysis*."

B5.3 Metals Laboratory QC

B5.3.1 Laboratory Blanks

A laboratory blank is prepared by adding the same quantity of acid to digest a filter to an empty glass beaker. A sample blank should be prepared with each sample batch or with every 10 filters, whichever is greater. Blank concentrations should be less than 5 times the instrument detection limit.

B5.3.2 Matrix Spikes

A second filter strip will be spiked with the target metals. These spiked samples should be prepared with each sample batch or with every ten filters, whichever is greater. Recoveries should fall within 75-125 percent.

B5.3.3 Duplicates

A second filter strip will be prepared as a duplicate. These duplicate samples should be prepared with each sample batch or with every ten filters, whichever is greater. Precision should be less than 20 RPD.

B5.4 PCDDs/PCDFs Laboratory Quality Control Checks

B5.4.1 Method Blanks

A method blank is analyzed with each batch of samples, or for every 10 samples, whichever is greater. Method blank should be free of contamination that would interfere with test sample results.

B5.4.2 Internal Standards

All samples, blanks, and quality control samples are spiked with $13C_{12}$-labeled internal standards prior to extraction. Recoveries should fall within 50 to 120 percent. These results are used in the sample calculations.

B5.4.3 Lab Control Samples/Lab Control Sample Duplicates (LCS/LCSD)

With each sample batch, all target PCDDs/PCDFs are spiked into LCS/LCSD and extracted and cleanup up as done for the samples. Recoveries should fall within 70-130 percent and precision should be less than 30 percent RPD.

B5.5 TSP/PM$_{2.5}$ Laboratory QC

B5.5.1 Balance Check

The balance calibration should be checked daily with two weights.

B5.5.2 Duplicate Weighing

A second analyst should reweigh 10% of the filters. For initial filter tare weights, if the difference in weight is less than 1 mg, the results are acceptable. For the final filter weights, if the difference in weight is less than 2 mg, the results are acceptable. If the differences are greater than these differences, wait another 24 hours and reweigh the filters.

A summary of quality assurance/quality control (QA/QC) checks and associated acceptance criteria is presented in Table B-7.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

B6.1 Field Instrumentation/Equipment

Field equipment/instruments (e.g., sampling pumps, meteorological instrumentation) will be checked and calibrated before they are shipped or carried to the field. The equipment and instruments will be checked and calibrated at least daily in the field before and after use. Spare equipment such as air sampling pumps, precision flow meters, and flow control valves will be kept on site to minimize sampling downtime. Backup instruments (e.g., meteorological instrumentation) will be available within one day of shipment from a supplier.

B6.2 Laboratory Equipment/Instrumentation

As part of the Laboratory's QA/QC Program, a routine preventive maintenance program is performed to reduce instrument failure and other system malfunctions of transmission and scanning electron microscopes. The laboratory has an internal group and equipment manufacturers' service contract to perform routine scheduled maintenance, and to repair or to coordinate with the vendor for the repair of the electron microscope and related instruments. All laboratory instruments are maintained in accordance with manufacturer specifications and the requirements of ISO Method 10312:1995.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

B7.1 Field Instrument/Equipment Calibration

B7.1.1 Air Sampling Pumps

The air sampling pumps with a flow control valve will be evaluated to ensure that they are capable of maintaining a stable flow rate for a given static pressure drop; i.e., the pumps can maintain an initial volume flow rate of within +/- 10% throughout the sampling period. Prior to use, the sampling pumps will be tested against the pressure drop created by a 25-mm-diameter 0.45-µm pore size MCE filter with a 5-µm pore size MCE backup diffusing filter and cellulose support pad contained in a three-piece cassette with 50-mm cowl at a flow rate of approximately 3 and 8 liters per minute at standard temperature and pressure (STP).

B7.1.2 Airflow Calibration Procedure

Fixed-Station Electric Powered—Each pump will be calibrated by using a primary standard airflow calibrator (Gilabrator electronic flow meter or equivalent). These calibrations will be performed initially, after every two hours, and at the end of the sampling period.

A detailed written record will be maintained of all calibrations. The record will include all relevant calibration data, including the following elements:

- Gilabrator model (or equivalent) and serial number
- Sampling train (pump, flow control valve, and filter)
- X- and Y- coordinate calibration data
- Intercept, slope, and correlation coefficient from a linear regression analysis of the calibration data, and resulting linear regression equation that will be used to determine the sampling flow rate
- Relevant calculations
- Dry bulb temperature
- Name of person/affiliation that performed the calibration and linear regression analysis

Constant-Flow Personal Sampling Pumps—Each sampling pump will be calibrated by using a primary standard airflow calibrator (Gilabrator electronic flow meter or equivalent). A detailed written record will be maintained of all calibrations, as described above. The air flow rate will be measured immediately before and after collection of each sample.

B7.1.3 TSP/PM$_{2.5}$ Calibration

The following is a step-by-step procedure for calibrating the pumps. These samplers are calibrated once upon being placed in the sampling positions.

1. Record the calibration location, date, time, technician’s name, the sampler type (e.g. PM$_{2.5}$ Pump Number Assigned), and the unit serial number.

2. Record the make, model, and serial number for the orifice transfer standard.

Record the Slope (m), y-Intercept (b), and correlation coefficient from the transfer standard's orifice certification form.

3. Examine the monitoring unit and document any damage, missing parts, or equipment malfunctions.
4. Ensure the base of the unit is secure, tilt shelter lid back.
5. Loosen the four plastic thumb nuts that clamp the filter cartridge together and remove the upper portion of the filter cartridge. Place the Variflow Orifice Transfer Standard on the threaded section of the faceplate and secure firmly with the plastic flange nuts. Set the Variflow Orifice Standard to the close position.
6. Connect the transfer standard orifice to the inlet of the sampler. Connect the orifice manometer to the orifice pressure tap. Verify there are no leaks between the orifice unit and the sampler (ORIFICE MANOMETER).
7. Connect the second manometer to the venturi pressure tap located beneath the filter housing. This manometer will be utilized to read the stagnation pressure (e.g. vacuum) beneath the filter housing; Be certain to convert units read on the SAMPLER Manometer from inches of water to mm Hg in order to maintain the consistency of units required for the calculations. The conversion formula is as follows: mm Hg= 25.4 (inches H_2O/13.6)
8. Verify that the flow indicator or recorder is properly connected to the pressure tap on the lower side of the high volume sampler motor housing. Install a clean flow chart in the recorder and adjust the recorder pen to read zero.
9. Operate sampler for five minutes to establish thermal equilibrium prior to calibration.
10. Insert the appropriate resistance plate to achieve desired flow rate; indicate in column labeled orifice (Figure I Appendix B), the resistance plate utilized (e.g. 18 hole, 13 hole, 10 hole, 7 hole, 5 hole). As an alternate to using the resistance plates, employ the VariFlow Orifice device.
11. Allow the sampler to run for at least 2 minutes to re-establish the run-temperature conditions.
12. Read and record the differential pressure reading (e.g. Water Column Differential) across the transfer standard (Orifice Manometer) and the corresponding Water

Column Differential across the Sampler Manometer.

13. Repeat this process for the remaining resistance plates, or four (4) additional points utilizing the Variflow calibrator.

14. Upon completion of the 5-point calibration, turn sampler off, and remove Orifice Transfer Standard and Manometer. Place a filter on the cassette, turn sampler back-on and record Sampler Manometer deflection only. This reading will be recorded in the "Sampler Section", as a sixth point, on the Calibration field sheet.

15. Calculate the orifice Qa (actual volumetric flow rate in m3/min) for each calibration point utilizing the following equation. The slope and y-intercept for VFC units are to be taken from the Qa section of the Orifice Calibration Worksheet:

Equation No. 5.2-1 (VFC)

Orifice $Q_a = \{[\text{Delta } H_2O\ (T_a/P_a)]^{1/2} - b\}/m$

Where: **Qa = Actual volumetric flow rate**
Delta H2O = Pressure drop across orifice (mm or inches of H_2O)
P_a = Ambient barometric pressure during use, mm Hg
Ta = Ambient temperature during use, degrees Kelvin
P_2 = Ambient Pressure in mm Hg
T_2 = Ambient Temperature (Converted to Kelvin)
b = y - intercept from transfer standard orifice certification
m = slope from transfer standard orifice certification

16. Calculate and record the absolute stagnation pressure, P1, for each sampling point utilizing the following formula:

Equation No. 5.2-2 (VFC)

P1 = Pa – DeltaPstg

P1 = absolute stagnation pressure, mm Hg (e.g. will need to convert from water column)

Pa = ambient barometric pressure

DeltaPstg= relative stagnation pressure

17. Calculate and record the stagnation pressure ratio, as follows:

Equation No. 5.2-3 (VFC)

Stagnation Pressure Ratio = P1/Pa

18. Plot the orifice Qa (x-axis) vs. the stagnation pressure ratios (y-axis) on graph paper.
19. Calculate the linear regression slope (m), intercept (b), and correlation coefficient (r). For the general linear regression model y = mx + b, let y = Pl/Pa (i.e. stagnation pressure ratio) and let x = Qa (orifice)/[Ta]"2 + b.

20. Utilizing "Look-up Table", which comes with sampler calibration kit, compare Qa (orifice measurements) for several points on the calibration curve with Qa (sampler measurements) determined from the factory calibration at actual temperature. Calculate the percentage difference between the values. If agreement is +/- 3 to 4 %, the factory calibration is validated and can be used for subsequent sampling periods.

21. For subsequent sample periods, the sampler's average actual operating flow rate:

Equation No. 5.2-4 (VFC)

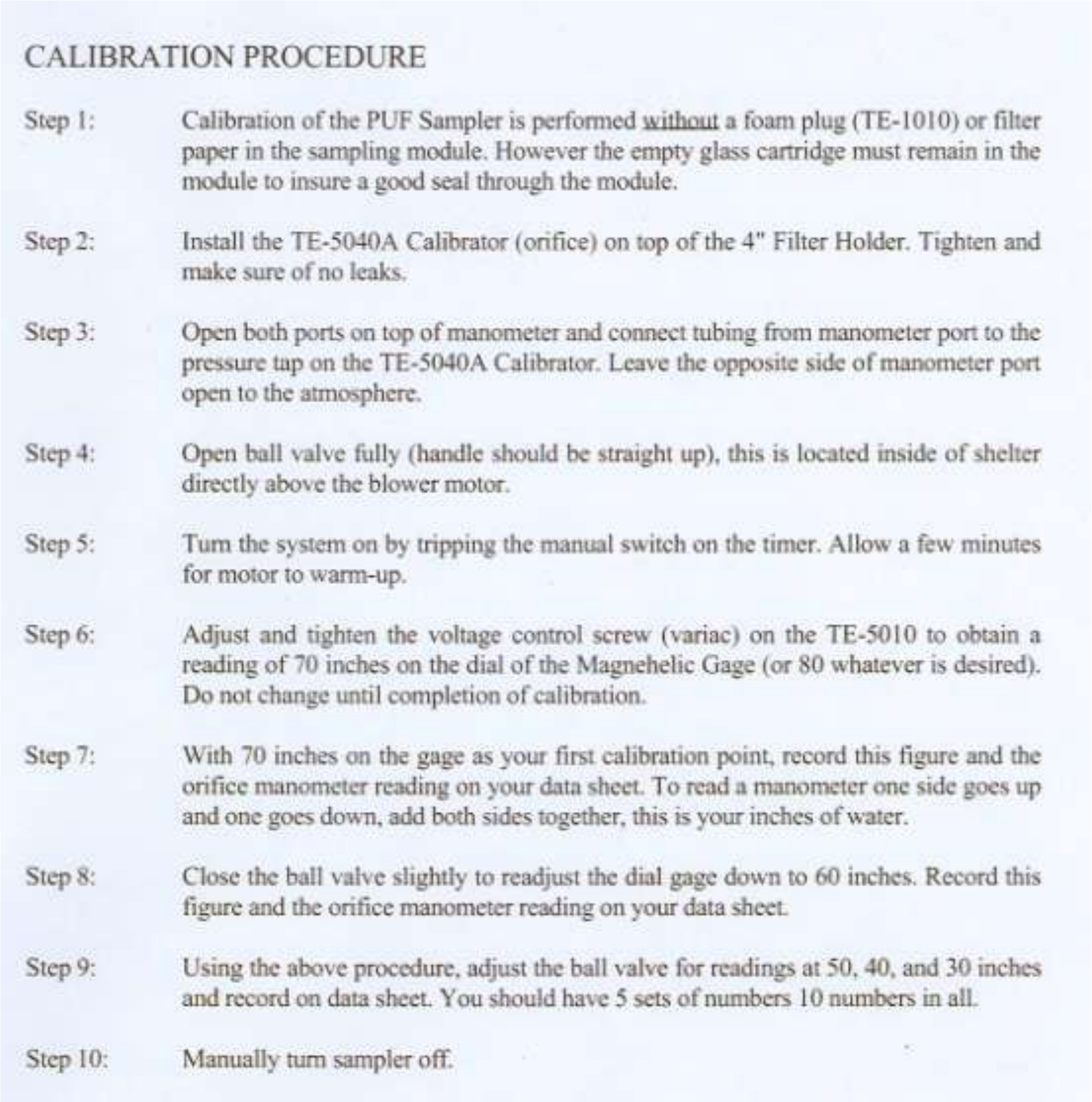
$$Qa\ (sampler) = \{[(P1/Pav) - b]\ [Tav]^{1/2}\}/m$$

Where: Qa (sampler) = Sampler's average actual flow rate, m3/min;

Pl/Pav = Average stagnation pressure ratio for the sampling period;
Tav = Average ambient temperature for the sampling period in degrees Kelvin (i.e. Degrees K = Degrees Celsius + 273);
b = Intercept of the sampler calibration relationship;
m = Slope of the sampler calibration relationship.

B7.1.4 PCDDs/PCDFs Sampler Calibration

Each sampler should be calibrated before and after each sampling event using a calibrated orifice flow rate transfer standard as described in Method TO-9A. This flow should be within ±10 percent of the sampler set point. The calibration procedure is as follows:



CALIBRATION PROCEDURE

Step 1: Calibration of the PUF Sampler is performed without a foam plug (TE-1010) or filter paper in the sampling module. However the empty glass cartridge must remain in the module to insure a good seal through the module.

Step 2: Install the TE-5040A Calibrator (orifice) on top of the 4" Filter Holder. Tighten and make sure of no leaks.

Step 3: Open both ports on top of manometer and connect tubing from manometer port to the pressure tap on the TE-5040A Calibrator. Leave the opposite side of manometer port open to the atmosphere.

Step 4: Open ball valve fully (handle should be straight up), this is located inside of shelter directly above the blower motor.

Step 5: Turn the system on by tripping the manual switch on the timer. Allow a few minutes for motor to warm-up.

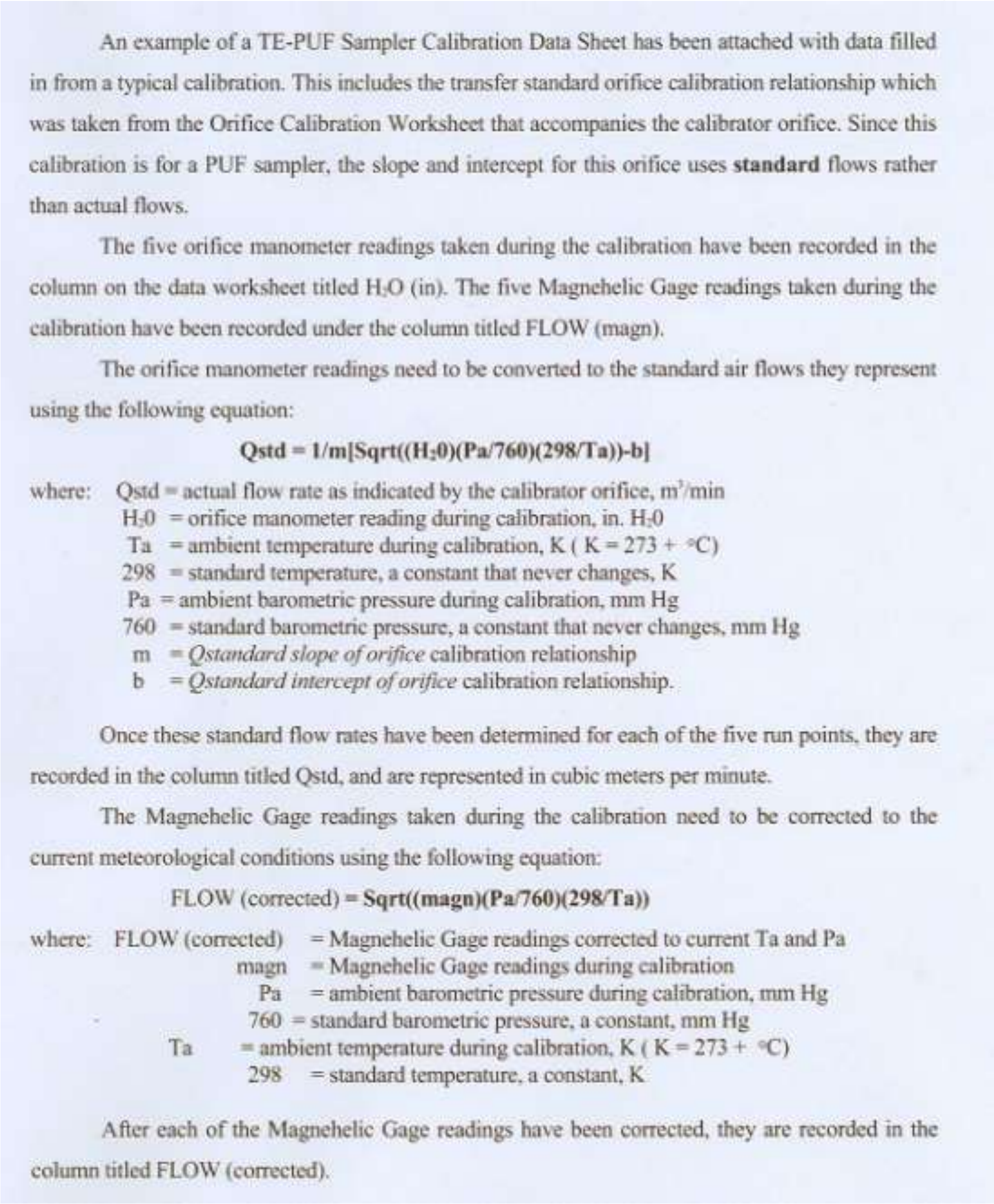
Step 6: Adjust and tighten the voltage control screw (variac) on the TE-5010 to obtain a reading of 70 inches on the dial of the Magnehelic Gage (or 80 whatever is desired). Do not change until completion of calibration.

Step 7: With 70 inches on the gage as your first calibration point, record this figure and the orifice manometer reading on your data sheet. To read a manometer one side goes up and one goes down, add both sides together, this is your inches of water.

Step 8: Close the ball valve slightly to readjust the dial gage down to 60 inches. Record this figure and the orifice manometer reading on your data sheet.

Step 9: Using the above procedure, adjust the ball valve for readings at 50, 40, and 30 inches and record on data sheet. You should have 5 sets of numbers 10 numbers in all.

Step 10: Manually turn sampler off.



An example of a TE-PUF Sampler Calibration Data Sheet has been attached with data filled in from a typical calibration. This includes the transfer standard orifice calibration relationship which was taken from the Orifice Calibration Worksheet that accompanies the calibrator orifice. Since this calibration is for a PUF sampler, the slope and intercept for this orifice uses **standard** flows rather than actual flows.

The five orifice manometer readings taken during the calibration have been recorded in the column on the data worksheet titled H_2O (in). The five Magnehelic Gage readings taken during the calibration have been recorded under the column titled FLOW (magn).

The orifice manometer readings need to be converted to the standard air flows they represent using the following equation:

$$\mathbf{Qstd = 1/m[Sqrt((H_20)(Pa/760)(298/Ta))-b]}$$

where: Qstd = actual flow rate as indicated by the calibrator orifice, m^3/min
H_20 = orifice manometer reading during calibration, in. H_20
Ta = ambient temperature during calibration, K (K = 273 + °C)
298 = standard temperature, a constant that never changes, K
Pa = ambient barometric pressure during calibration, mm Hg
760 = standard barometric pressure, a constant that never changes, mm Hg
m = *Qstandard slope of orifice* calibration relationship
b = *Qstandard intercept of orifice* calibration relationship.

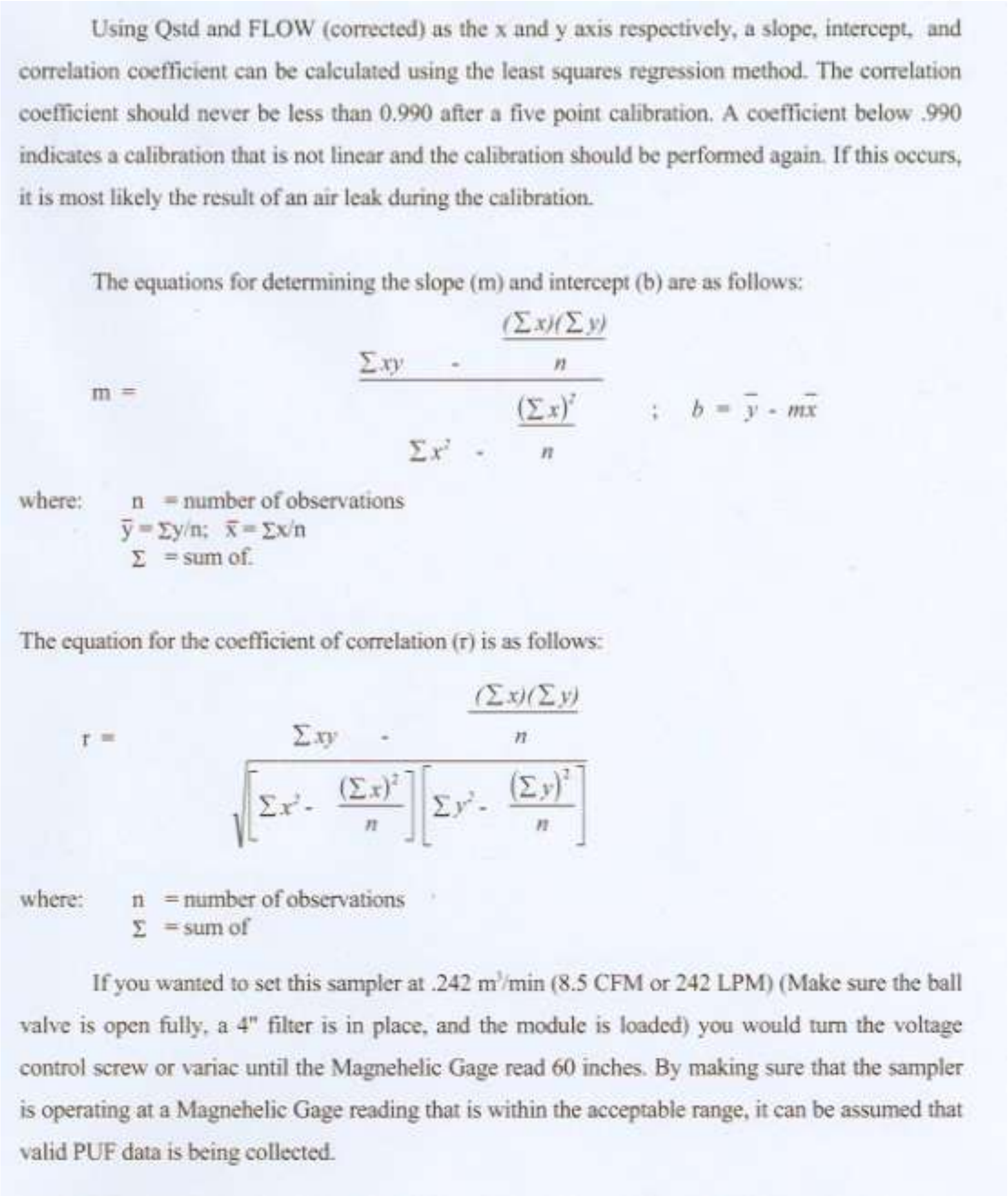
Once these standard flow rates have been determined for each of the five run points, they are recorded in the column titled Qstd, and are represented in cubic meters per minute.

The Magnehelic Gage readings taken during the calibration need to be corrected to the current meteorological conditions using the following equation:

$$\text{FLOW (corrected)} = \mathbf{Sqrt((magn)(Pa/760)(298/Ta))}$$

where: FLOW (corrected) = Magnehelic Gage readings corrected to current Ta and Pa
magn = Magnehelic Gage readings during calibration
Pa = ambient barometric pressure during calibration, mm Hg
760 = standard barometric pressure, a constant, mm Hg
Ta = ambient temperature during calibration, K (K = 273 + °C)
298 = standard temperature, a constant, K

After each of the Magnehelic Gage readings have been corrected, they are recorded in the column titled FLOW (corrected).



Using Qstd and FLOW (corrected) as the x and y axis respectively, a slope, intercept, and correlation coefficient can be calculated using the least squares regression method. The correlation coefficient should never be less than 0.990 after a five point calibration. A coefficient below .990 indicates a calibration that is not linear and the calibration should be performed again. If this occurs, it is most likely the result of an air leak during the calibration.

The equations for determining the slope (m) and intercept (b) are as follows:

$$m = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}} \quad ; \quad b = \bar{y} - m\bar{x}$$

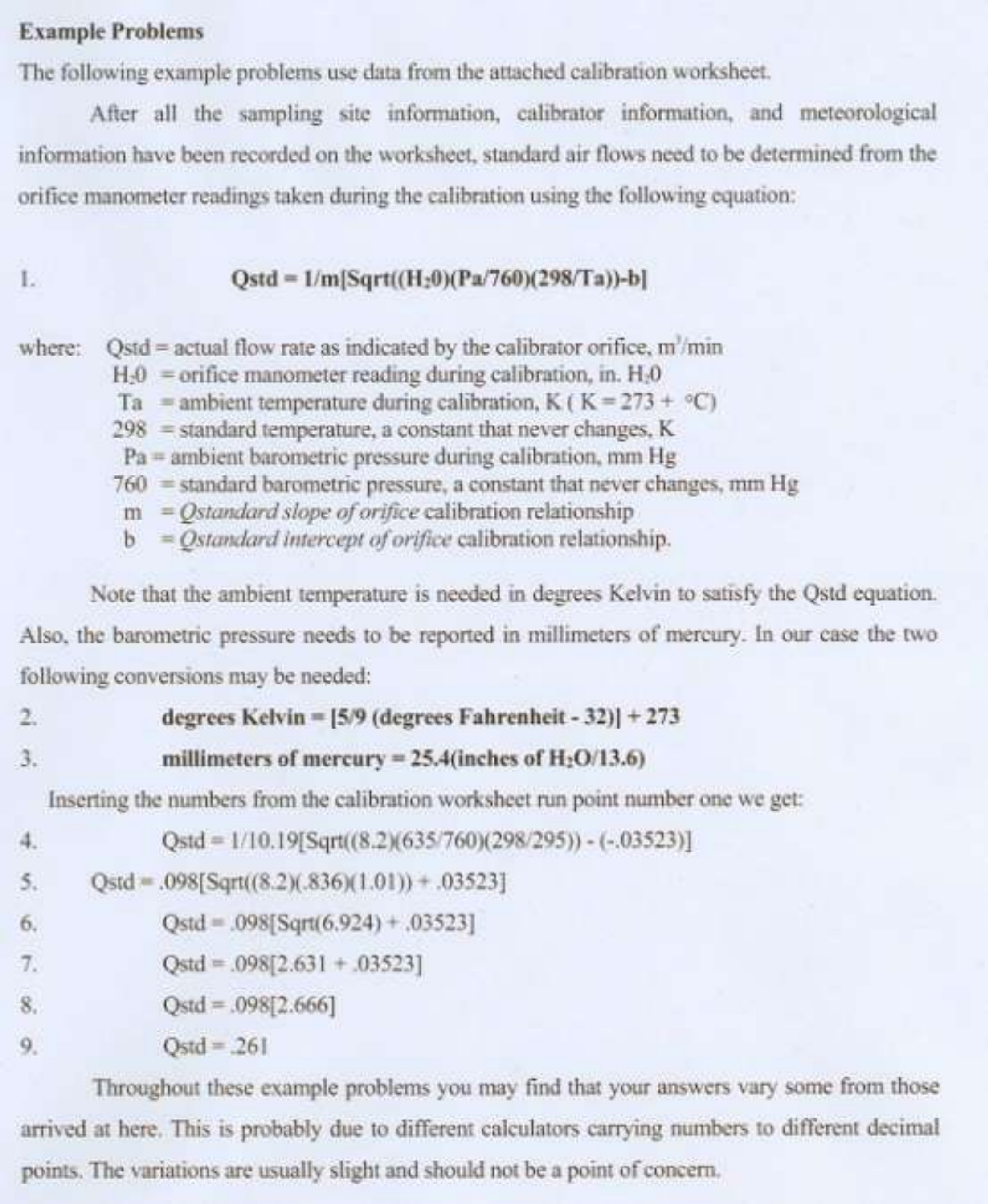
where: n = number of observations
$\bar{y} = \Sigma y/n$; $\bar{x} = \Sigma x/n$
Σ = sum of.

The equation for the coefficient of correlation (r) is as follows:

$$r = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sqrt{\left[\sum x^2 - \frac{(\sum x)^2}{n}\right]\left[\sum y^2 - \frac{(\sum y)^2}{n}\right]}}$$

where: n = number of observations
Σ = sum of

If you wanted to set this sampler at .242 m^3/min (8.5 CFM or 242 LPM) (Make sure the ball valve is open fully, a 4" filter is in place, and the module is loaded) you would turn the voltage control screw or variac until the Magnehelic Gage read 60 inches. By making sure that the sampler is operating at a Magnehelic Gage reading that is within the acceptable range, it can be assumed that valid PUF data is being collected.



Example Problems

The following example problems use data from the attached calibration worksheet.

After all the sampling site information, calibrator information, and meteorological information have been recorded on the worksheet, standard air flows need to be determined from the orifice manometer readings taken during the calibration using the following equation:

1. **Qstd = 1/m[Sqrt((H_20)(Pa/760)(298/Ta))-b]**

where: Qstd = actual flow rate as indicated by the calibrator orifice, m^3/min
H_20 = orifice manometer reading during calibration, in. H_20
Ta = ambient temperature during calibration, K (K = 273 + °C)
298 = standard temperature, a constant that never changes, K
Pa = ambient barometric pressure during calibration, mm Hg
760 = standard barometric pressure, a constant that never changes, mm Hg
m = *Qstandard slope of orifice* calibration relationship
b = *Qstandard intercept of orifice* calibration relationship.

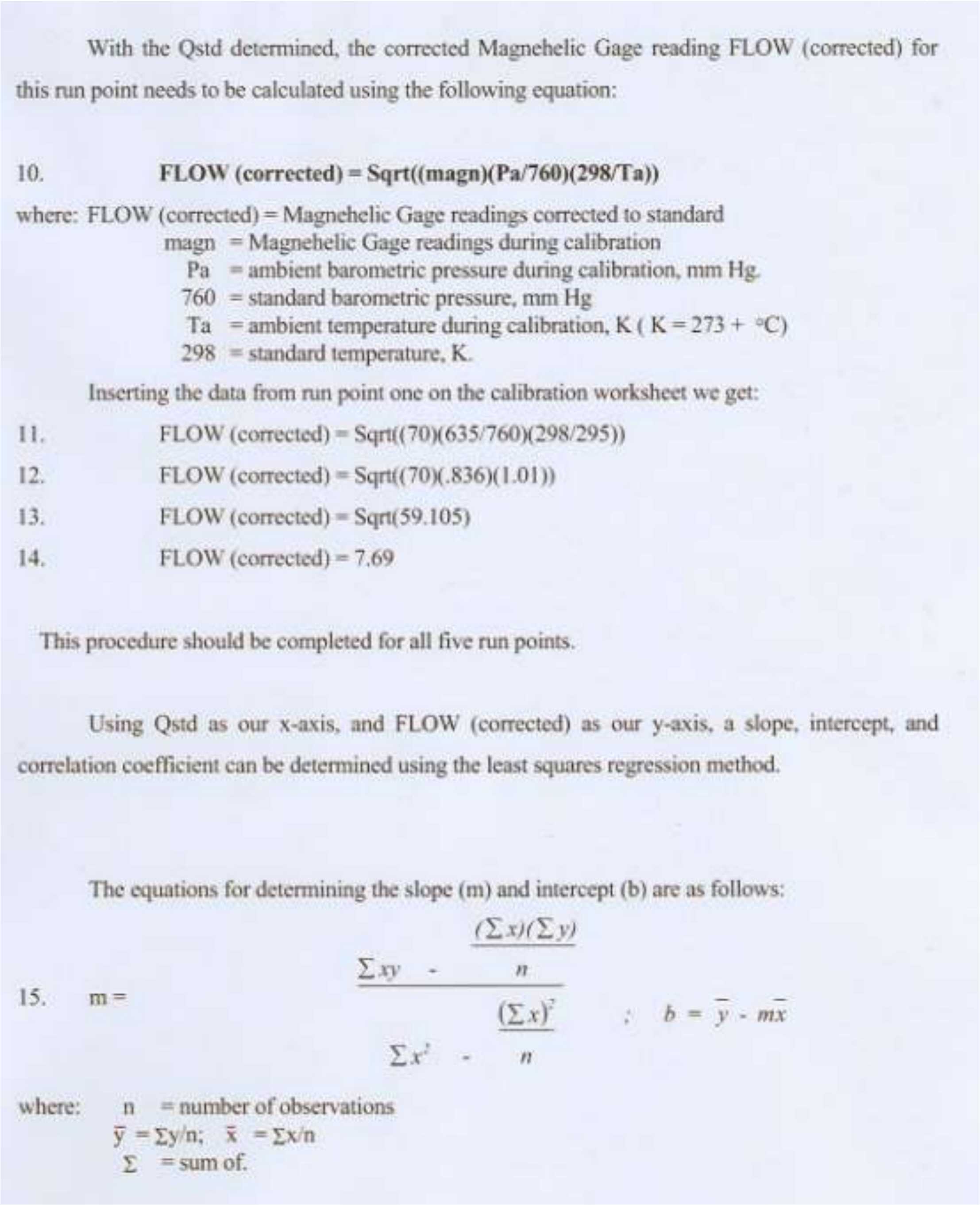
Note that the ambient temperature is needed in degrees Kelvin to satisfy the Qstd equation. Also, the barometric pressure needs to be reported in millimeters of mercury. In our case the two following conversions may be needed:

2. **degrees Kelvin = [5/9 (degrees Fahrenheit - 32)] + 273**
3. **millimeters of mercury = 25.4(inches of H_2O/13.6)**

Inserting the numbers from the calibration worksheet run point number one we get:

4. Qstd = 1/10.19[Sqrt((8.2)(635/760)(298/295)) - (-.03523)]
5. Qstd = .098[Sqrt((8.2)(.836)(1.01)) + .03523]
6. Qstd = .098[Sqrt(6.924) + .03523]
7. Qstd = .098[2.631 + .03523]
8. Qstd = .098[2.666]
9. Qstd = .261

Throughout these example problems you may find that your answers vary some from those arrived at here. This is probably due to different calculators carrying numbers to different decimal points. The variations are usually slight and should not be a point of concern.



With the Qstd determined, the corrected Magnehelic Gage reading FLOW (corrected) for this run point needs to be calculated using the following equation:

10. **FLOW (corrected) = Sqrt((magn)(Pa/760)(298/Ta))**

where: FLOW (corrected) = Magnehelic Gage readings corrected to standard
magn = Magnehelic Gage readings during calibration
Pa = ambient barometric pressure during calibration, mm Hg.
760 = standard barometric pressure, mm Hg
Ta = ambient temperature during calibration, K (K = 273 + °C)
298 = standard temperature, K.

Inserting the data from run point one on the calibration worksheet we get:

11. FLOW (corrected) = Sqrt((70)(635/760)(298/295))

12. FLOW (corrected) = Sqrt((70)(.836)(1.01))

13. FLOW (corrected) = Sqrt(59.105)

14. FLOW (corrected) = 7.69

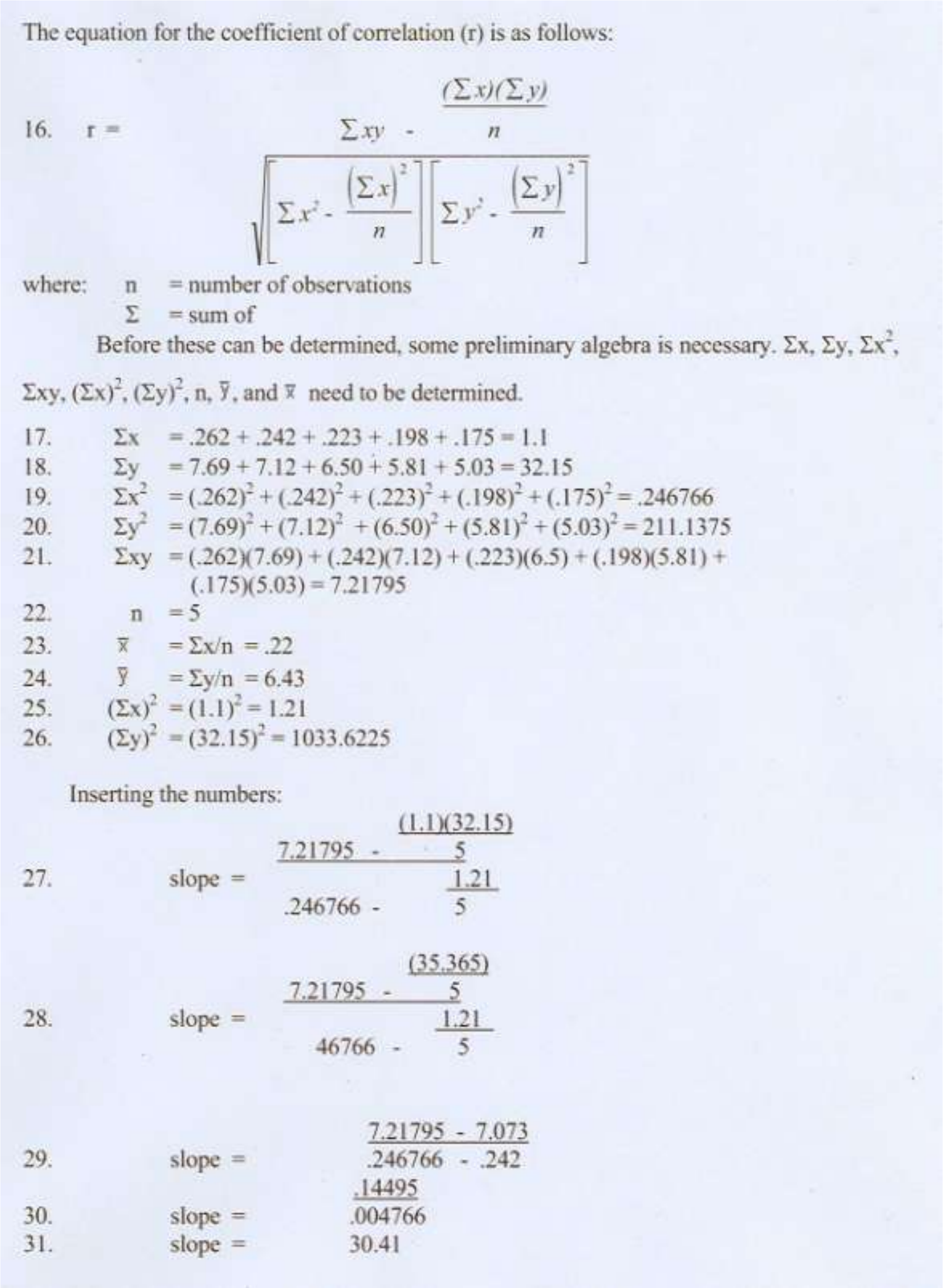
This procedure should be completed for all five run points.

Using Qstd as our x-axis, and FLOW (corrected) as our y-axis, a slope, intercept, and correlation coefficient can be determined using the least squares regression method.

The equations for determining the slope (m) and intercept (b) are as follows:

15. $$m = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}} \quad ; \quad b = \bar{y} - m\bar{x}$$

where: n = number of observations
$\bar{y} = \Sigma y/n$; $\bar{x} = \Sigma x/n$
Σ = sum of.



The equation for the coefficient of correlation (r) is as follows:

16. $$r = \frac{\sum xy \;-\; \frac{(\sum x)(\sum y)}{n}}{\sqrt{\left[\sum x^2 - \frac{\left(\sum x\right)^2}{n}\right]\left[\sum y^2 - \frac{\left(\sum y\right)^2}{n}\right]}}$$

where: n = number of observations
Σ = sum of

Before these can be determined, some preliminary algebra is necessary. Σx, Σy, Σx^2, Σxy, $(\Sigma x)^2$, $(\Sigma y)^2$, n, $\bar{y}$, and $\bar{x}$ need to be determined.

17. $\Sigma x = .262 + .242 + .223 + .198 + .175 = 1.1$
18. $\Sigma y = 7.69 + 7.12 + 6.50 + 5.81 + 5.03 = 32.15$
19. $\Sigma x^2 = (.262)^2 + (.242)^2 + (.223)^2 + (.198)^2 + (.175)^2 = .246766$
20. $\Sigma y^2 = (7.69)^2 + (7.12)^2 + (6.50)^2 + (5.81)^2 + (5.03)^2 = 211.1375$
21. $\Sigma xy = (.262)(7.69) + (.242)(7.12) + (.223)(6.5) + (.198)(5.81) + (.175)(5.03) = 7.21795$
22. $n = 5$
23. $\bar{x} = \Sigma x/n = .22$
24. $\bar{y} = \Sigma y/n = 6.43$
25. $(\Sigma x)^2 = (1.1)^2 = 1.21$
26. $(\Sigma y)^2 = (32.15)^2 = 1033.6225$

Inserting the numbers:

27. $$\text{slope} = \frac{7.21795 \;-\; \frac{(1.1)(32.15)}{5}}{.246766 \;-\; \frac{1.21}{5}}$$

28. $$\text{slope} = \frac{7.21795 \;-\; \frac{(35.365)}{5}}{46766 \;-\; \frac{1.21}{5}}$$

29. $$\text{slope} = \frac{7.21795 - 7.073}{.246766 - .242}$$

30. $$\text{slope} = \frac{.14495}{.004766}$$

31. $\text{slope} = 30.41$

32. intercept = $6.43 - (30.41)(.22)$

33. intercept = $6.43 - 6.69$

34. intercept = -0.26

35. correlation coeff. = $$\frac{7.21795 - \frac{(1.1)(32.15)}{5}}{\sqrt{\left[.246766 - \frac{(1.1)^2}{5}\right]\left[211.1375 - \frac{(32.15)^2}{5}\right]}}$$

36. correlation coeff. = $$\frac{7.21795 - \frac{(35.365)}{5}}{\sqrt{[(.246766 - .242)]\ [(211.1375 - 206.7245)]}}$$

37. correlation coeff. = $$\frac{(7.21795 - 7.073)}{\sqrt{[(.246766 - .242)][(211.1375 - 206.7245)]}}$$

38. correlation coeff. = $$\frac{.14495}{\sqrt{(.004766)(4.413)}}$$

39. correlation coeff. = $$\frac{.14495}{\sqrt{.0210323}}$$

40. correlation coeff. = $$\frac{.14495}{.1450251}$$

41. correlation coeff. = $.999$

A calibration that has a correlation coefficient of less than .990 is not considered linear and should be re-calibrated. Since the correlation coeff. is > .990 , we have a good calibration.

B7.2 Calibration of TEM

The TEM shall be aligned according to the specifications of the manufacturer. The TEM screen magnification, electron diffraction (ED) camera constant, and energy dispersive X-ray analysis (EDXA) system shall be calibrated in accordance with the specifications in ISO Method 10312:1995, Annex B.

B8 INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

B8.1 Air Sampling Filter Media

See Section B5.2.1.1 regarding the quality control check of the filter media.

B9 NON-DIRECT MEASUREMENTS

No data are needed for project implementation or decision making that will be obtained from non-measurement sources such as computer data bases, programs, literature files, or historical data bases.

B10 DATA MANAGEMENT

Commercially available computer hardware and software are used to manage measurement data to ensure the validity of the data generated. Controls include system testing to ensure that no computational errors are generated and evaluation of any proposed changes to the system before they are implemented. Commercially available software does not require testing, but validation of representative calculations is required by using alternative means of calculations.

B10.1 Data Assessment

Sample data will be reviewed by the laboratory during the reduction, verification, and reporting process. During data reduction, all data will be reviewed for correctness by the microscopist or analyst. A second data reviewer will also verify correctness of the data. Finally, the Laboratory Director at each primary laboratory (as applicable) will provide one additional data review to verify completeness and compliance with the project QAPP. Any deficiencies in the data will be documented and identified in the data report.

B10.2 Data Management

Field and laboratory data will be entered into a Microsoft Excel spreadsheet to facilitate organization, manipulation, and access to the data. Field data will include information such as sampling date, sample number, sampling site, sample description and location, sample type, air volume, and sampling period. Laboratory data will include information such as sample number, date sample received and analyzed, type of analysis, magnification, grid location, grid square area, filter type, number of grids examined, number of asbestiform structures counted, structure type (fiber, bundle, cluster, or matrix), and structure length and width. An example format for reporting the structure counting data is contained in Figure 7 of ISO Method 10312:1995.

C ASSESSMENT/OVERSIGHT

C1 ASSESSMENT AND RESPONSE ACTIONS

C1.1 Performance and System Audits

C1.1.1 Field Audit

EPA-ORD (or its representative) will audit the field sampling and data collection activities at the Paris Road site. The audit will include, but not be limited to, the examination of sample collection and equipment calibration procedures, sample labeling, sampling data and chain-of-custody forms, and other sample collection and handling requirements specified in the QAPP. The auditor will document any deviations from the QAPP so that they can be corrected in a timely manner.

Prior to leaving the site, the auditor will debrief the EPA-ORD Task Order Manager, EPA-ORD Quality Assurance Manager, and the Cadmus/Berger Project Manager regarding the results of the audit and any recommendations, if necessary. The results of the audit will be presented in a written report prepared by the auditor to the EPA-ORD Quality Assurance Manager and Task Order Manager.

C1.1.2 Laboratory Audits

EPA-ORD (or its representative) will, at a minimum, conduct one independent laboratory quality assurance audit of Bureau Veritas. This audit will be conducted following sample receipt to verify that all procedures specified in the QAPP are being implemented. The auditor will summarize the results of the audit(s) in a written report to the EPA-ORD Task Order Manager within 2 weeks of the audit. If any serious problems are identified that require immediate action, the auditor will verbally convey these problems at the time of the audit to the EPA-ORD Task Order Manager.

C1.2 Corrective Action

Sampling and analytical problems may occur during sample collection, sample handling and documentation, sample preparation, laboratory analysis, and data entry and review.

Immediate on-the-spot corrective actions will be implemented whenever possible and will be documented in the project record. Implementation of the corrective action will be confirmed in writing through a memorandum to the EPA-ORD Task Order Manager.

C2 REPORTS TO MANAGEMENT

Effective communication is an integral part of a quality system. Planned reports provide a structure to inform management of the project schedule, deviations from the approved QAPP, impact of the deviations, and potential uncertainties in decisions based on the data.

The Cadmus/Berger Project Manager will provide verbal progress reports to the EPA Task Order Manager. These reports will include pertinent information from the data processing and report writing progress reports and corrective action reports, as well as the status of analytical data as determined from conversations with the laboratory. The Cadmus/Berger Project Manager will promptly advise the EPA-ORD Task Order Manager on any items that may need corrective action.

The final project report will be prepared in accordance with the guidelines specified in the EPA Handbook for Preparing ORD Reports, EPA/600K/95/002.

D DATA VALIDATION AND USABILITY

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

The analytical laboratory will perform in-house analytical data reduction and verification under the direction of the laboratory's Quality Assurance Manager. The laboratory's Quality Assurance Manager is responsible for assessing data quality and advising of any data rated as "unacceptable" or other notations that would caution the data user of possible unreliability. The analytical results will be compared to the stated data quality indicators for each data quality objective.

Data verification and data validation will be conducted in accordance with EPA "*Guidance on Environmental Data Verification and Data Validation*," EPA QA/G-8 (EPA/240/R-02/004, November 2002). This will be performed by Berger's QA Officer.

Data verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method or QAPP requirements. The goal of data verification is to ensure and document that the data are what they purport to be; i.e., that the reported results reflect what was actually done.

Data validation is the analyte- and sample-specific process that extends the evaluation of the data beyond data verification. Data validation continues with the review of the raw analytical data and analysis notes. The data review will identify any out-of-control data points and data omissions. Based on the extent of the deficiency and its importance in the overall data set, the laboratory may be required to re-analyze the sample. Included in the data validation of a sample set will be an assessment of chain-of-custody and analyses of field quality control samples. Analytical data not appearing to be valid or not meeting data quality indicators will be flagged and reported to the Cadmus/Berger Project Manager. The Cadmus/Berger Project Manager will then transfer this information to the EPA Task Order Manager.

D2 DATA AND SAMPLE ARCHIVE

Data and sample storage encompasses an archive of all collected samples, generated electronic files, and any laboratory notes collected during collection or analysis of samples. Upon completion of the analysis, the respective laboratory will store the remaining portions of the samples or sample preparations (e.g., TEM grids) until such materials are requested to be shipped to EPA. *Note: No samples or sample preparations will be discarded.* Following submission of the final project report, all laboratory and field records/files (paper and electronic) will be transferred to the Cadmus/Berger Project Manager. The Cadmus/Berger Project Manager will then transfer the complete project file to the EPA-ORD Task Order Manager for permanent retention.

E PROJECT CLOSEOUT

At the conclusion of the testing for the burner studies, the Paris Road Landfill sight must be return to its original condition. The staging area and the burn site will be cleaned up at the end of the testing. This would include the removal of all debris and all unused portions of the structures that were stored on site. This debris will be taken to a landfill that the Parish normally uses.

In addition to the structure debris, the ash from the burner will be tested by Region 6 to determine if the ash is required to go to a hazardous waste landfill. If testing is positive, it will be handled as a hazardous waste and properly disposed of. If the testing is negative, the ash will be disposed of along with the other debris.

F1 REFERENCES

Air Burners, LLC. 2005. http://www.airburners.com/DATA-FILES_Print/ab27_Specs_PRNT.pdf.

Miller, C. A., Lemieux, P. M., 2005. Preliminary Report, Observation of Air Burner Technology Operation, AMID Landfill, New Orleans, LA, Phase 1 Test, October 25, 2005, Draft – November 1, 2005, Dallas, TX.

USEPA, 1992. Mixing Height Meteorological Data, http://www.epa.gov/scram001/tt24.htm#mixing.

USEPA, 1992. Surface Meteorological Data, http://www.epa.gov/scram001/tt24.htm#surface.

USEPA, 1995. User's Guide for Industrial Source Complex (ISC3) Dispersion Models. Volume II - Description of Model Algorithms, EPA-454/B-95-003b.

APPENDIX A

SAMPLING AND ANALYSIS

PROTOCOL FOR ASBESTOS AND LEAD INSPECTIONS OF BUILDINGS TO BE USED IN THE ABT AND GRINDER EVALUATIONS

Draft 01.30.08

SAMPLING AND ANALYSIS PLAN:

PRE-DEMOLITION ASBESTOS and LEAD INSPECTION OF BUILDINGS to be DEMOLISHED and USED for GRINDER and ABT OPERATION PILOT TEST as a RESULT of HURRICANE KATRINA

Prepared by:

U.S. EPA, Office of Research & Development
National Risk Management Research Laboratory
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Cincinnati, OH 45268

SAMPLING AND ANALYSIS PLAN

APPROVAL SHEET

Holly Wooten Date
Project Manager
Cadmus, Inc.
Cincinnati, OH 45240

David Ferguson Date
Task Order Manager
ORD, NRMRL, U.S. EPA
Cincinnati, OH 45268

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1.0 PROJECT DESCRIPTION AND ORGANIZATION

1.1 Project Description

The U.S. EPA's Office of Research and Development (ORD) and the Toxics Enforcement Section (Region VI) is conducting a pilot evaluation of the effectiveness of the use of a grinder and of an Air Curtain Destructor to reduce the building debris volume required for disposal in landfills.

The candidate buildings selected for demolition will be identified by the St Bernard Parish contractors. Only buildings safe for limited entry will be comprehensively sampled in accordance with NESHAP (40 CFR 61, Subpart M). In other cases, samples of the building and/or building debris will be collected to the extent that a safe condition permits. Every reasonable effort will be made to obtain the samples required to characterize the structure.

In accordance with the asbestos NESHAP, a comprehensive pre-demolition inspection will be conducted to identify the type, quantity, and location of regulated asbestos-containing material (RACM) in the buildings. In accordance with OSHA Standard 29 CFR 1926 §62 the buildings are being surveyed for inorganic lead.

1.2 Organization

Holly Wooten, Cadmus, Inc. (EQ) will serve as the Project Manager. She will be responsible for overall project management and coordination of the inspection.

The building inspections will be conducted by a Louisiana Department of Environmental Quality (ADEQ) licensed Asbestos Consultant.

Bureau Veritas North America, Inc., 3380 Chastain Meadows Parkway, Suite 300, Kennesaw, GA 30144 will analyze the bulk samples of building materials for asbestos and paint chip samples for inorganic lead. This laboratory is currently accredited by the National Institute of Standards and Technology (NIST) under its National Voluntary Laboratory Accreditation Program (NVLAP). It is also accredited by the American Industrial Hygiene Association (AIHA) and successfully participate in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program.

2.0 ASBESTOS SAMPLING

A comprehensive inspection will be conducted of the interior and exterior of the buildings in accordance with EPA's Asbestos Hazard Emergency Response Act (AHERA, 40 CFR §763) to determine the presence of RACM. The interior inspection will include but not necessarily limited to, resilient flooring and wall systems (including applicable interstitial spaces), mechanical systems (including plumbing and heating), as well as the attic space. The exterior inspection will include but not necessarily limited to, roofing systems, cladding, caulking, and glazing compounds.

Collection of samples will be conducted in accordance with AHERA. Samples will be collected using wet methods in order to minimize the potential for asbestos fiber release. All sampling tools will be decontaminated between uses in order to prevent cross-contamination of samples. The following procedures will be used in conducting the inspections of the buildings.

2.1 Identification of Homogeneous Materials

Prior to sampling, each homogeneous material will be categorized as surfacing material, thermal system insulation, or a miscellaneous material. The specific material in each category will be identified; e.g., roofing shingles. A homogeneous material will be determined by the same color, texture, size, and boundary of the building. At a minimum, three samples will be collected and analyzed per homogeneous area.

2.2 Sampling of Roofing Systems

The roofing system may contain multiple layers of homogeneous materials such as shingles and roofing felt. Each layer will be sampled and analyzed as a discrete[6] sample. This means that multiple layers of one sample *will not be composited for analysis*. Each bulk[7] sample will be approximately 4 square inches in size; 2-inches by 2-inches. The samples will be collected using a clean roofing knife. The knife will be cleaned with a disposable wipe after each sample is collected. Each bulk sample will be placed in a labeled plastic bag ($\geq$4-mil

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[6] A discrete sample is individually distinct and visually recognizable.

[7] A bulk sample is a representative portion of a building material taken at one distinct location for qualitative and quantitative identification of asbestos. In a multilayered system, a discrete sample representative of each portion of each layer will be obtained.

industrial weight); each sample will be double-bagged.

2.3 Sampling of Resilient Flooring Systems

The resilient flooring systems may contain multiple layers of homogeneous materials such resilient flooring, paper underlayment, and mastic. Each layer will be sampled and analyzed as a discrete sample; multiple layers of one sample *will not be composited for analysis*. The samples will be collected using a clean roofing knife or similar tool. Each bulk sample will be approximately 4 square inches in size; 2-inches by 2-inches. The tool will be cleaned with a disposable wipe after each sample is collected. Each bulk sample will be placed in a labeled plastic bag (≥4-mil industrial weight); each sample will be double-bagged.

2.4 Sampling of Glazing Compound

Each bulk sample will be approximately 2 square inches in size; e.g., approximately 0.5 inch by 4 inches. The samples will be collected using a clean roofing knife or similar tool. The tool will be cleaned with a disposable wipe after each sample is collected. Each bulk sample will be placed in a labeled plastic bag (≥4-mil industrial weight); each sample will be double-bagged.

2.5 Sampling of Wallboard Systems

The gypsum wallboard system will be sampled in accordance with the supplementary guidance on bulk sample collection and analysis offered by EPA on September 30, 1994 entitled *"Asbestos Sampling Bulletin*." This guidance bulletin offers a suggested strategy for distinguishing between joint compound found at joints in wallboard systems or when the material was applied as a skim coat over the wall surface.

2.5.1 Sampling of Joint Compound

Bulk samples will be collected at wallboard joint intervals (Figure 2). Depending on the placement of the wallboard and stud spacing, the joint intervals may be located approximately 4-feet from corners on wall stud or approximately 4-feet above the floor line. *Note:* Sampling will not be performed at the inside or outside of wall corners due the presence of metal lathe.

At each location a 2-inch diameter full-depth bulk sample will be collected of the wallboard using a hole-saw (*crown saw*[8]) attached to an electric powered variable speed drill. *Note:* If the 2-inch diameter bulk sample crumbles or breaks down at the time of sample collection, a 3-inch diameter sample will be collected. Sufficient care will be exercised by the building inspector to remove the bulk sample intact from the hole-saw. Prior to sampling the interior surface of the hole-saw will be sprayed with a silicone lubricant to increase the releasability of the intact bulk sample. The tool will be cleaned with a disposable wipe after each sample is collected. Each bulk sample will be placed in a labeled plastic bag (≥4-mil industrial weight); each sample will be double-bagged.

Each sample will be packaged to ensure that it remains intact until it reaches the analytical laboratory. In the laboratory the full-depth core sample will be separated into its discrete layers (Figure 2) for analysis (see Section 3.0 "Analytical).

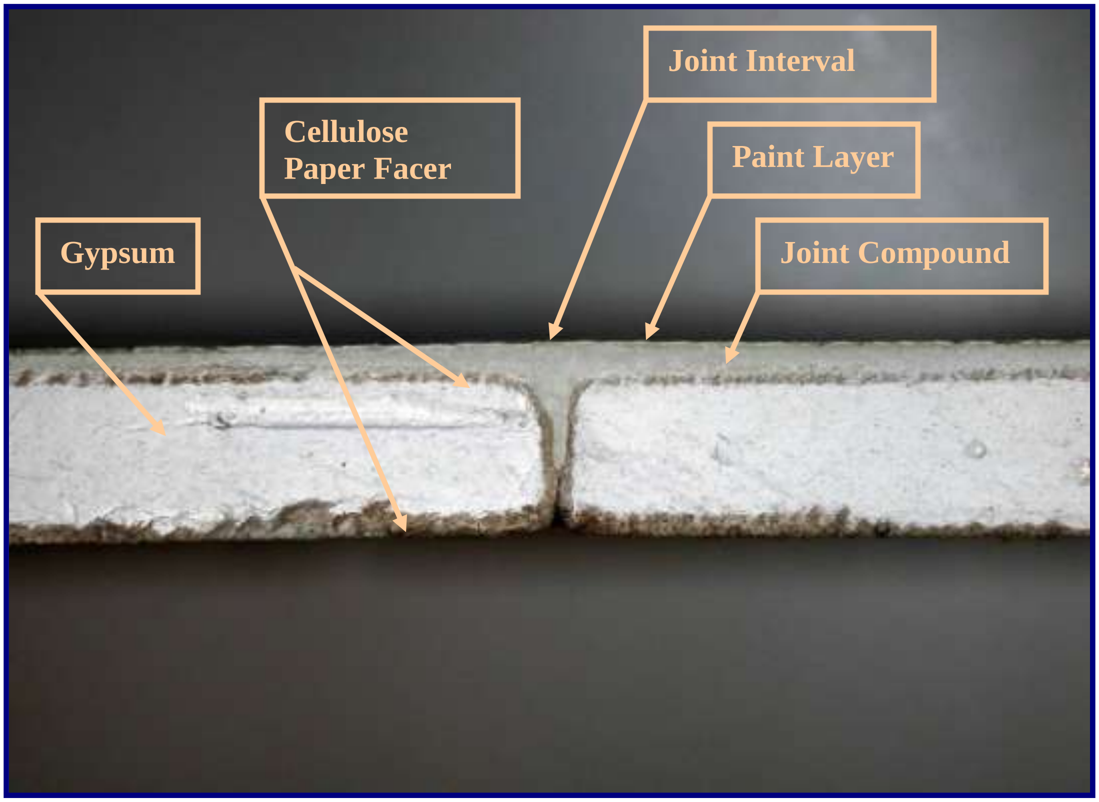

Figure 2. Section of ½-inch gypsum wallboard showing a multi-layered joint interval.

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[8] A saw with a hollow rotating cylinder that has teeth around the edge for drilling round holes in building materials.

2.5.2 Sampling of Add-On Application (Skim Coat)

At each location a 3-inch diameter full-depth bulk sample will be collected of the wallboard using a hole-saw (*crown saw*) as described above. The bulk samples will be collected where wallboard joint interval's and framing studs are not present. The samples will be collected as described for the joint compound at wallboard intervals. In the laboratory the full-depth core sample will be separated into its discrete layers (Figure 2) for analysis (see Section 3.0 "Analytical).

2.6 Other Suspect Asbestos-Containing Building Materials

Other suspect asbestos-containing building materials (e.g., thermal system insulation) will sampled in accordance with the sampling protocol outlined in AHERA.

2.7 Sample Identification

Each sample will have a unique sample number identification to ensure that the sample is clearly identified. The number identification will include a three part system. The 1st part will represent the homogeneous material sequence; the 2nd part the homogeneous material; and the 3rd part the numerical sample sequence. The sample identification will also include the street address for the structure sampled.

2.8 Sample Location Documentation

A digitized image will be taken of each sample location. An appropriate label identifying the sample number will be photographed to identify the sample location; i.e., street address. A description of each sampling location will be recorded in the field notes and on a drawing.

2.9 Shipment of Samples to the Laboratory for Analysis

The sample chain-of-custody will be initiated and the samples will be shipped directly from the field to the laboratory for analysis using a one-day (overnight) courier service. The samples will be shipped to Bureau Veritas North America, Inc., 3380 Chastain Meadows Parkway, Suite 300, Kennesaw, GA 30144.

2.10 Quantification and Assessment of Condition RACM

Quantification of the RACM is very important. In general, all miscellaneous materials (excluding caulking and glazing compound) and surfacing material will be quantified in square footage. Thermal system insulation, caulking, and glazing compound will be quantified in linear footage.

3.0 LEAD SAMPLING

3.1 Paint Film

Lead in paint film (paint chip) samples will be collected from the interior finishes (e.g., painted gypsum wallboard and millwork) and from the exterior surfaces (e.g., clapboard siding and window sash/frame). The samples will be collected in accordance with Appendix 13.2 '*Paint Chip Sampling*" of the HUD Guidelines (1997 Revision). At a minimum, one sample will be collected per material. The paint chip sample will be obtained from approximately a 2-square inch area (1-inch by 2-inch). The paint will be scraped directly off the substrate using a clean 1-inch wide wood chisel or similar tool. The paint film will be removed to bare substrate. The paint sample will be placed into a labeled centrifuge tube with screw cap for shipment to the laboratory.

3.2 Sample Location Documentation

A digitized image will be taken of each sample location. An appropriate label identifying the sample number will be photographed to identify the sample location; i.e., street address of the structure sampled. A description of each sampling location will be recorded in the field notes and on a drawing.

3.3 Shipment of Samples to the Laboratory for Analysis

The sample chain-of-custody will be initiated and the samples will be shipped directly from the field to the laboratory for analysis using a one-day (overnight) courier service. The samples will be shipped to Bureau Veritas North America, Inc., 3380 Chastain Meadows Parkway, Suite 300, Kennesaw, GA 30144

4.0 ANALYTICAL

4.1 Asbestos

4.1.1 Building Materials

The samples will be analyzed for asbestos content using polarized light microscopy (PLM) and dispersion staining in accordance with EPA method entitled “*Method for the Determination of Asbestos in Bulk Building Materials*” (EPA/600/R-93/116, July 1993). Point counting will completed on all samples showing >1≤10% asbestos in accordance the “*Method for the Determination of Asbestos in Bulk Building Materials”* (EPA/600/R-93/116, July 1993).

For materials composed of distinct layers (Figure 2) or two or more distinct building materials, each layer or distinct building material will be treated as a discrete sample. The relative proportion of each in the sample will be recorded. The layers or materials will be separated and analyzed individually. *Note:* Each layer or material will be checked for homogeneity during the stereomicroscopic analysis to determine the extent of sample preparation and homogenization necessary for successful PLM analysis. If there is any uncertainty regarding the homogeneity of the layer or material the entire sample or sub-sample will be homogenized for analysis.

The laboratory will report a *single value for each material or discrete layer*. In addition, the laboratory will report a combined (weighted) value for multi-layered materials such as joint compound of a wallboard system. *Note:* All samples for each homogeneous material will be analyzed regardless of whether the 1st sample is positive.

Joint Compound in Wallboard Systems— The 2-inch (or 3-inch) diameter full-depth core sample will be sub-sampled at the centerline of the joint to include ¼-inch (but not more than ⅜-inch) of the wallboard system on either side of joint. This will yield a sample with approximate dimensions 2-inches (L) by ½-inch (W). The sub-sample will then be separated into its discrete layers for analysis, as feasible. For example, it *may not be feasible* to separate the paint from the joint compound.

Add-On Application (Skim Coat)— The 2-inch (or 3-inch) diameter full-depth core sample will be sub-sampled at the centerline of the sample include ¼-inch (but not more than ⅜-inch) of the wallboard system on either side of centerline of the sample. This will yield a sample with approximate dimensions 2-inches (L) by ½-inch (W). The sub-sample will then be separated into its discrete layers for analysis, as feasible.

4.2 Inorganic Lead

4.2.1 Paint Chips

The paint chip samples will be prepared for analysis in accordance with EPA SW-846 Method 3050 and analyzed by ICP-AES in accordance with EPA SW-846 Method 6010.

5.0 QUALITY ASSURANCE (QA)/QUALITY CONTROL (QC)

5.1 Chain-of-Custody Procedures

Strict chain-of-custody procedures will be followed. Sample chain-of-custody procedures will be in accordance with ASTM Standard D 4840-99 “Standard Guide for Sample Chain-of-Custody Procedures.”

5.2 Selection of Laboratory

Bureau Veritas North America, Inc., 3380 Chastain Meadows Parkway, Suite 300, Kennesaw, GA 30144 will analyze the bulk samples of building materials for asbestos and the paint chip samples for inorganic lead. This laboratory is currently accredited by the National Institute of Standards and Technology (NIST) under its National Voluntary Laboratory Accreditation Program (NVLAP). It is also accredited by the American Industrial Hygiene Association (AIHA) and successfully participate in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program.

5.3 Duplicate Field Samples

The performance of the laboratory will be evaluated using duplicate samples; i.e., the samples will be collected side-by-side. The samples will be sent to the same laboratory for analysis. This will serve as a check on the analytical variability within the same laboratory, as well as the measured variability associated with the sampling process and the material homogeneity. Each of the quality control samples will be labeled independently so that the identity of the QC samples cannot be determined except by reference to the field sampling records maintained by the building inspector.

5.3.1 Asbestos

For every homogeneous material, a duplicate sample will be collected and analyzed of every 10 samples unless the total sample size is less than 10. If the latter is the case, one duplicate sample will be collected and analyzed. Laboratory results on these QC samples should not disagree on the presence or absence of asbestos; i.e., <1% vs. >1% asbestos. Any disagreement about the presence/absence of asbestos will be resolved by additional analysis.

5.3.2 Lead

A duplicate sample will be collected and analyzed of every 10 samples unless the total sample size is less than 10. If the latter is the case, one duplicate sample will be collected and analyzed.

5.4 Method Specified QA/QC Samples

5.4.1 Asbestos

QA/QC samples will be analyzed as specified in the test method "*Method for the Determination of Asbestos in Bulk Building Materials"* (EPA/600/R-93/116, July 1993). These analyses will be included in the laboratory report.

5.4.2 Lead

QA/QC samples will be analyzed as specified in EPA SW-846 Method 6010. These analyses will be included in the laboratory report.

6.0 REPORTING

The inspection report will be prepared that includes the following information for each of the four buildings:

- Description of the building survey and methodology.
- Description of the samples taken. The description will include the field sample number, laboratory number, location of where the sample was collected, and description of the homogeneous area sampled.
- The laboratory results for asbestos and lead analysis will be reported as described in the respective methods. The fully-executed chain-of-custody records will be included as an appendix to the report.
- An inventory of all RACM including the location of RACM, approximate quantities of RACM, NESHAP category (friable, non-friable Category I or non-friable Category II), and category of RACM (surfacing, TSI, or miscellaneous material), and the specific material in each category (e.g., resilient flooring mastic).
- The names and proof of AHERA Asbestos Building Inspector training and applicable LDEQ license for the individual(s) who performed the inspection.