

## Quality Assurance Project Plan

### Southwest Indianapolis Neighborhood Air Toxics Study



**Office:** Air Quality

**Branch:** Air Programs Branch

**Section:** Program Planning and Policy

**Creation date:** October 2, 2006

**Revision #:** 0

**Revised:**

**Review/ Revision cycle:** Two years

**Effective date:** October 2, 2006

**Project summary:** This is a two-year study of air toxics in southwestern Indianapolis. Working with the City of Indianapolis, community groups, local businesses, environmental organizations, other public institutions, and the U.S. Environmental Protection Agency, IDEM will study 80 pollutants to determine whether any of them may be present in the air in concentrations that would warrant further attention to reduce potential health risks.

## 1.0 QA Project Plan Identification and Approval

**Title:** Southwest Indianapolis Neighborhood Air Toxics Study

The attached QAPP for the Air Toxics Monitoring Program is hereby recommended for approval and commits the Department to the following elements described within.

### Indiana Department of Environmental Management

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### EPA Region 5

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Gordon Jones - QA Coordinator

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### 3.0 Distribution

A hardcopy of this QAPP has been distributed to the individuals in Table 3-1. The document is also available upon request.

Table 3.1 Distribution List

Name	Position	Affiliation
<b>Indiana Department of Environmental Management</b>		
Balvant Patel	Monitoring Section Chief	Monitoring
Jeffery Stoaks	Environmental Scientist	Modeling
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Scott Deloney	Planning and policy Section Chief	Management
Brian Wolff	Environmental Scientist	Project Manager
Richard Zeiler	Monitoring Branch Chief	Management
Bowden Quinn	Environmental Liaison	Environmental Liaison
Rob Elstro	Media Liaison	Media Liaison
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<b>City of Indianapolis OES</b>		
Aaron Childs		Monitoring
Felicia Robinson	Director of Operations	Management
Matt Mosier		Technical Support

## **4.0 Project**

### **4.1 Roles and Responsibilities**

The Southwest Indianapolis Monitoring Project will involve the Indiana Department of Environmental Management (IDEM), City of Indianapolis Office of Environmental Services (OES), Environmental Protection Agency (EPA) Region V, and the Eastern Research Group (ERG). The breakdown of the roles and responsibilities of each group are listed below.

#### **4.1.1 Indiana Department of Environmental Management (IDEM)**

The Indiana Department of Environmental Management is responsible for the overall management of the project. IDEM will coordinate all the sampling and analysis activities with OES and ERG. IDEM will also be responsible for the data management, modeling, and risk assessment. Along with those responsibilities, the IDEM laboratory will analyze the 6-L stainless steel canisters for VOC analysis using U.S. EPA method TO-15.

IDEM will be working with the Technical Advisory Group (TAG) to guide the project and to advise on any technical issues that may arise.

#### **4.1.2 City of Indianapolis Office of Environmental Services (OES)**

OES will coordinate monitoring activities with IDEM and ERG at both project locations, including sample set-up, shipment to the appropriate analysis laboratory, and maintenance and certification of the equipment. They will also be responsible for conducting emission inventories for the surrounding area sources.

OES shall conduct these activities such that data collected and instrument operation meets Valid Data Return requirements as described in Chapter 11 of the IDEM/OAQ “Quality Assurance Manual” (1/1/06 revision). This manual is available to the public on IDEM’s web site at <http://www.state.in.us/idem/>.

#### **4.1.3 U.S. Environmental Protection Agency Region 5 (U.S. EPA)**

U.S.EPA will provide oversight of the project to ensure that all aspects are performed up to standard and of good quality. EPA will also provide members to be a part of the Technical Advisory Group (TAG) which will aid IDEM in answering technical questions that arise during the course of the project.



#### **4.1.4 Eastern Research Group (ERG)**

Part of the Southwest Indianapolis Monitoring project grant money is allocated to ERG, EPA's main contract laboratory, to provide analytical support for this project. ERG will be installing the Chromium (VI) sampler and train OES staff on its operation. ERG will also provide the monitoring supplies and analysis for Cr(VI) and carbonyl monitoring. ERG will also be analyzing the PM-10 hi-volume filters for the seven metals listed in this project. ERG will submit all the analytical results from the Cr(VI), carbonyl and PM-10 metals to the IDEM data manager.

## **5.0 Problem Definition/Background**

### **5.1 Problem Statement and Background**

#### **5.1.1 Background**

On December 31, 2002, the Indiana Department of Environmental Management published a report summarizing key hazardous air pollutant (HAP) risk issues in Indiana, based on a comprehensive review of existing emissions, monitoring and modeling data. This report addressed the requirements of Senate Enrolled Act (SEA) 259, which was passed by the Indiana General Assembly in 2002. In addition to summarizing HAP risk issues, the report also contained a five-year strategy, with priorities, for further assessing and addressing these issues.

One finding of the assessment was that, based on US EPA's 1996 National Air Toxics Assessment (NATA), some areas of the state (e.g., Marion, Allen and Lake Counties) have significantly higher estimated risk from HAPs. These three counties, which account for 27% of the state population, have a population-adjusted estimated cancer risk of 94 in a million – almost 60% greater than the statewide average. The risk in these counties is driven primarily by point source emissions.

Further, certain census tracts may be subject to even greater risk associated with exposure to air toxics. Two census tracts located in southwest Marion County (#342600 and #358100) are of particular concern. Based on the 1996 NATA, these two census tracts, which are adjacent, rank #17 and #21 nationally (out of over 60,000 census tracts assessed). The risk in these census tracts appears to be driven by point source emissions, primarily Chromium. Furthermore, preliminary information associated with the 1999 NATA indicates that cancer risk within certain portions of the proposed study area may even be greater and driven by arsenic (primarily from a single industrial source).

#### **5.1.2 Role of Ambient Monitoring**

IDEM will conduct HAP monitoring in two residential neighborhoods in the primary study area. The monitored concentrations of HAPs will be evaluated and compared to a U.S. EPA based pre-determined threshold (see Table 4) for each pollutant, other Indiana ToxWatch sites, and the National Air Toxics Assessment. In addition, IDEM will collect speciated Chromium data and a ratio of Chromium VI to total Chromium will be established.

##### **Uses of monitoring data:**

- Evaluate ambient levels of air toxics for use in exposure assessment.

- Aid in the development of a refined emissions inventory of sources and categories of sources likely to be contributing to HAP concentrations in the study area.
- A tool to compare results of the 1999 and future National Air Toxics Assessment (NATA) modeling projects.
- Compare HAP concentrations to those measured in other parts of Indiana.

## 5.2 List of Pollutants

There were a number of pollutants identified by the 1996 and 1999 National Air Toxics Assessment (NATA) as being pollutants that could be of concern. These pollutants were also highlighted in a number of newspaper articles as being of concern to the residents in the community. Three analytical methods were chosen for sampling in order to ensure that the pollutants identified as posing the highest potential risk in the 1996 and 1999 NATA were monitored.

<b>Table 5.1</b>
<b>Method IO-3.2 Compounds</b>
Antimony Compounds
Arsenic Compounds
Beryllium Compounds
Cadmium Compounds
Cobalt Compounds
Chromium Compounds
Lead Compounds
Manganese Compounds
Mercury Compounds
Nickel Compounds
Selenium Compounds

<b>Table 5.2</b>
<b>Method TO-11A Compounds</b>
2,5-dimethylbenzaldehyde
Acetaldehyde
Acetone
Benzaldehyde
Butyr/Isobutyraldehyde
Crotonaldehyde
Formaldehyde
Hexaldehyde
Isovaleraldehyde
Propionaldehyde

Tolualdehydes
Valeraldehyde

<b>Compounds monitored using method TO-15</b>		
1,1,1-Trichloroethane	Carbon Disulfide	MBK
1,1,2,2-Tetrachloroethane	Carbon Tetrachloride	m-Dichlorobenzene
1,1,2-Trichloroethane	Chlorobenzene	MEK
1,1-Dichloroethane	Chloroethane	MIBK
1,2,4-Trichlorobenzene	Chloroform	MTBE
1,2,4-Trimethylbenzene	Chloromethane	o-Dichlorobenzene
1,2-Dibromoethane	Cyclohexane	o-Xylene
1,2-Dichloroethane	Dibromochloromethane	p-Dichlorobenzene
1,2-Dichloropropane	Dichloromethane	p-Ethyltoluene
1,3,5-Trimethylbenzene	Ethanol	Propylene
1,3-Butadiene	Ethyl Acetate	Styrene
1,4-dioxane	Ethylbenzene	t-1,2-Dichloroethene
Acetone	Freon-11	t-1,3-Dichloropropene
Acrolein	Freon-113	Tetrachloroethene
Benzene	Freon-114	THF
Benzyl Chloride	Freon-12	Toluene
bromodichloromethane	Heptane	Trichloroethene
Bromoform	Hexachloro-1,3-butadiene	Vinyl Acetate
Bromomethane	Hexane	Vinyl Chloride
c-1,2-Dichloroethene	Isopropanol	Vinylidene Chloride
c-1,3-Dichloropropene	m+p-Xylenes	

In addition, IDEM will also analyze in order to speciate the different valence levels of Chromium in the ambient air. Monitoring will use a RMESI Model 924-Cr+6 Sampler or equivalent to obtain the total amount of Chromium VI. Results will then be compared to the total volume of Chromium collected using the PM-10 samplers to obtain a Chromium ratio for the monitoring location.

### 5.3 Locations of Interest for Air Toxics

Information on air toxics is needed for this area of the State. There is very little ambient air data available for this area. Southwest Marion County (Indianapolis) is heavily industrialized with a number of large stationary sources. Sources in this area emit over 1000 Tons annually. The Indianapolis International Airport is located within a few miles of the assessment area, and two urban interstates (I-70 and I-465) interconnect near the

assessment area. Both of these urban interstates are among the most heavily traveled transportation arteries in Indiana. There are also a number of communities located between and around the industrial sources in the area. The area has a dense population and a number of schools. All of these elements add up to an assessment area with significantly impacted air quality.

### **5.3.1 Spatial and Temporal Consideration**

The monitoring will primarily emphasize long-term measurements of air quality. The major part of the effort to develop air quality and emissions data will focus on year round information. To provide maximum flexibility in data use, the data collected will be based on intermittent (every six days) collection of 24-hr samples for two years. Chromium VI sampling differs in that sampling will take place every six days and will only take place over one year.

## 6.0 Project Description

### 6.1 Description of work to be performed

The goal of the monitoring is to identify if a number of air toxics are present in the area and to estimate ambient concentrations for those air toxic compounds. This will be accomplished by four separate collection media.

EPA approved PM-10 samplers will be used to collect samples that will be analyzed for trace metals. The seven metals will be analyzed using ICP-MS analysis. The method code for analysis is EPA compendium method IO-3.2.

Carbonyl samples will be collected using Atec 2-channel DNPH tube samplers, which allow for duplicate sample runs for quality assurance/quality control purposes. Carbonyl compounds are analyzed using EPA method TO-11A using DNPH (2,4-dinitrophenylhydrazine) cartridges. The cartridges are extracted and analyzed using HPLC (high performance liquid chromatography) equipment.

Volatile Organic Compounds (VOC) will be collected in 6-liter stainless steel Summa-polished canisters using Meriter air toxic samplers, also capable of duplicate runs for QA/QC. All canister VOC samples will be analyzed by IDEM using EPA method TO-15

Chromium speciation monitoring will take place using a specialized monitor (RMESI Model 924-Cr+6 Sampler or equivalent) to collect hexavalent Chromium data. Data will be collected at the site for one year. This activity will include sixty samples (1 every 6 days), ten-percent duplicates (additional 6), and twelve field blanks, for a total of seventy-eight samples. Data collected will enable IDEM and the U.S. EPA to determine what portion (fraction) of the total measured Chromium is hexavalent (Cr+6).

### 6.2 Field Activities

Table 6.1, 6.2, 6.3 and 6.4 summarizes some of the more critical performance requirements.

**Table 6.1 Particulate Matter 10 micron or less – Toxics Metals**

Equipment	Frequency	Acceptance Criteria	Reference
<b>Filter Design Specs.</b>			
Size	1 in 6 days	See Reference 1 203 x 254 mm.	See Reference 1 “ IO1 Sec 2.1.1
Medium		Quartz Glass Fiber Filter	“ Sec 1.1
Pore size		0.3µm	“ Sec 5.6
Filter thickness		0.50 mm	“ Sec 6.1.3.2
Max. pressure drop		600 mm Hg @ 1.13 m <sup>3</sup> /min	“ Sec 7.3.1
Collection efficiency		99.95%	“ Sec 5.6

Alkalinity		6.5<pH<7.5	“ Sec 6.1.3
<b>Sampler performance Specs.</b>	1 in 6 days		
Sample flow rate		1.13 m <sup>3</sup> /min	“ Sec 2.1
Flow regulation		0.1 m <sup>3</sup> /min	“
Flow rate precision		± 10%	“
Flow rate accuracy		± 10%	“
External Leakage		Vendor Specs	NA
Internal Leakage		Vendor Specs	NA
Clock/Timer		24 hour ± 2 minute accuracy	“ Sec2.1.8

**Table 6.2 Design/Performance Specifications – Air Canister Sampler – Volatile Organic Compounds**

Equipment	Frequency	Acceptance Criteria	Reference
<b>Canister Design Specs.</b>			
Size	1 in 6 days	See Reference 2	See Reference 2
Medium		6 liter spherical	“Vendor Spec.
Max Pressure		Passivated SUMMA electro-polished Stainless Steel Canister	“Vendor Spec.
Max pressure drop		30 psig	“Vendor Spec.
Collection efficiency		14 psig	“Vendor Spec.
Lower Detection limit		99%	“Vendor Spec.
		Compound specific, usually >0.1 ppbv	See TO-15
<b>Sampler Performance Specs.</b>	1 in 6 days		
Sample flow rate		6.5 cc/min	“Vendor Spec.
Flow regulation		1.0 cc/min	See Reference 2
Flow Rate precision		± 10%	TO-15
Flow rate accuracy		± 10%	TO-15
External Leakage		Vendor specs	NA
Internal Leakage		Vendor specs	NA
Clock/Timer		24 hour ± 2 min accuracy	“Sec 6.1.8

**Table 6.3 Design/Performance Specifications – Carbonyl Sampler – Aldehyde and Ketone Compounds**

Equipment	Frequency	Acceptance Criteria	Reference
<b>Filter Design Specs.</b>			
Size	1 in 6 days	See Reference 4	See Reference 3
		100 mm Cylindrical Silica Gel cartridge coated with	“TO-11A Sec 7.1
Medium		2,4-Dinitro-phenyl hydrazine	“TO-11A Sec 7.1
<b>Sampler Performance Specs.</b>	1 in 6 days		
Sample flow rate		250 cc/min	“Vendor specs
Flow regulation		1.0 cc/min	“Vendor specs
Flow rate precision		± 10%	“Vendor specs
Flow rate accuracy		± 10%	“Vendor specs
External leakage		Vendor specs	NA
Internal leakage		Vendor specs	NA
Clock/Timer		24 hour ± 2 min accuracy	“Vendor specs

### **6.3 Laboratory Activities**

Laboratory activities for the air toxics program include preparing the filters, canisters and cartridges for the routine field operator, which includes three general phases:

#### **Pre-Sampling**

- Receiving filters, canisters or cartridges from the vendors;
- Checking sample integrity;
- Conditioning filters, storing canisters and cartridges;
- Weighing filters;
- Storing prior to field use;
- Packaging filters, canisters and cartridges for field use;
- Associated QA/QC activities;
- Maintaining microbalance and analytical equipment at specified environmental conditions
- Equipment maintenance and calibrations.

#### **Shipping/Receiving**

- Receiving filters, canisters and cartridges from the field and logging into database;
- Storing filters, canisters and cartridges;
- Associated QA/QC activities.

#### **Post-Sampling**

- Checking filter, cartridge and canister integrity;
- Stabilizing/weighing filters;
- Extraction of metals from quartz filter using hot acid/microwave extraction;
- Extraction of DNPH compounds;
- Analysis of samples extracted;
- Analysis of VOCs in canisters;
- Data downloads from field samplers;
- Data entry/upload to AQS and the public website
- Data archiving;
- Storing filters/archiving;
- Cleaning/certifying canisters;
- Associated QA/QC activities.



## 6.4 Project Assessment Techniques

**Table 6.4 Project Assessment Techniques**

Assessment Type	Assessment Agency	Frequency
Performance Evaluation	State's QA Office	Submit "blind" samples to laboratory annually
Data Quality Assessment	State's QA Office	1 every 3 years
	District's QA Office	Annually
Performance Audits (field)	District's QA Office	Annually

Parameter	Performance Assessment	Frequency
<b>Volatile Organic Compounds (VOC)</b>	Mass flow stability verification	Initial – 1 year
	ET Meter	Every 6 months
	QC Precision – Duplicate Analysis	10% - Every 2 months
	Inter-comparison (States)	Every six months
	Blanks	Blank is run with each batch of canister analysis
<b>Metals</b>	Mass Flow audits	Monthly
<b>Hexavalent Chromium</b>	QC Precision – Duplicate Analysis	10% - Every 2 months
	Blanks	Monthly
<b>Carbonyl</b>	Sampler Flow Audits	Initial - 6 months
	Duplicates	10% - Every 2 months
	Blanks	1 per month

## 6.5 Schedule of Activities

**Table 6.5 Schedule of Activities**

Activity	Due Date	Comments
Order Monitoring Equipment	February 2006	Requisition submitted for equipment purchase.
Set-up Field Sites	September 2006	Use field site footprints already in use.
Move Harding Street Trailer	September 2006	Due to construction near the original site, the Harding Street trailer will move approximately 300 yards away.

Begin Sampling	October 2006	All 1-in-6 day sampling will begin.
Return Harding Street Trailer	November 2006	Return trailer to original location after construction is completed.
End Sampling	September 2008	End sampling at conclusion of two-year study.

## 6.6 Project Records

IDEM will maintain procedures for the timely preparation, review, approval, issuance, control, revision, and maintenance of documents which are applicable to document control for air toxics information. IDEM will adhere to the Records Retention and Disposition Schedule as found on the Public Records website [http://www.in.gov/apps/icpr/retention/icpr\\_retention](http://www.in.gov/apps/icpr/retention/icpr_retention) .

### Reference:

1. Compendium Method for the Determination of Inorganic Compounds in Air, U.S. EPA, June 1999, Section IO-2.1 and 3.5
2. Compendium Method for the Determination of Toxics Organic Compounds in Air, U.S. EPA, January 1999, Section TO-15
3. Compendium Method for the Determination of Toxics Organic Compounds in Air, U.S. EPA, January 1999, Section TO-11A

## **7.0 Quality Objectives and Criteria for Measurement Data**

### **7.1 Data Quality Objectives (DQOs)**

#### **7.1.1 DQO Process**

The DQO Process consists of seven steps. The output from each step influences the choices that will be made later in the Process. During the first six steps of the DQO Process, the planning team developed the decision performance criteria that were used to develop the data collection design. The final step of the process involves developing the data collection design based on the DQOs. Every step should be completed before data collection begins.

The seven steps of the DQO process are:

1. State the Problem
2. Identify the Decision
3. Identify the Inputs to the Decision
4. Define the Study Boundaries
5. Develop a Decision Rule
6. Specify Tolerable Limits on Decision Errors
7. Optimize the design

Each of these steps will be examined in the following section. Each of these steps has been performed to ensure a maximized project.

#### **1. State the Problem**

Currently IDEM does not have a sufficient amount of monitoring data of known quality or quantity to understand the hazards residents in the area of Southwestern Indianapolis face due to air toxics. There is evidence through national modeling exercises that a number of air toxics are emitted in the area and may be at concentrations in the ambient air that could be detrimental to the health of the citizens living in that area of Indianapolis. Funding provided by U.S. EPA will help IDEM by allowing the set up of two monitoring locations in that area of the city.

The goals of the monitoring data are to:

- Determined measured concentrations of air toxics in the ambient air
- Use monitoring results to identify “gaps” in the emissions inventory for the area
- Establish a Chromium VI to total Chromium ratio for air quality in the area
- Calculate inhalation risk for air toxics in the neighborhood

The current problem is:

*IDEM will characterize air toxics concentrations in the southwest area of Indianapolis Indiana. How much monitoring is needed and where should monitors be placed for the study to characterize risk to citizens of this area. Is the emissions inventory for this area complete enough to model ambient concentrations of air toxic? Are detection limits for monitoring low enough for the intended uses of the data?*

To address this problem IDEM will use monitoring and modeling data. IDEM was awarded a grant from U.S. EPA for \$244,262 for the project for 2 years worth of modeling and monitoring work.

## **2. Identify the Decision:**

The decision that must be made once the data is evaluated is whether or not IDEM feels it can provide a meaningful annual air toxics concentration estimates for the monitoring area at an every 6-day sampling frequency. The decision also must be made as to if the monitoring data is sensitive enough to allow for an accurate determination of an exposure concentration for all pollutants. Possible actions could be that the data from the study appears to adequately represent the study area and that we continue our plans to implement an ambient air monitoring program; or our results indicate that the estimate are not sufficient which could be corrected by implementing one or a number of the following options: increasing the number on monitors, increasing the sampling frequency, stratifying the monitoring boundaries, changing monitoring methods, or correcting sampling or analytical errors.

## **3. Identify the Input to the Decision:**

For this study the important inputs are:

- The 24-hour concentration estimates of air toxics
- The measured average concentration of air toxics
- The Minimum Detection Limits (MDL) for methods used to monitor the pollutants
- Screening values for the pollutants

## **4. Define Study Boundaries**

The boundary for this study is described in section 10. The boundary represents the area in which modeling results will derive exposure concentrations. Temporal conditions for this study are 2 years.

## **5. Develop a Decision Rule**

Given that there are screening levels developed for the compounds, a comparison of the MDLs to the screening levels will work as a comparison to determine if detection limits are low enough for all pollutants (see table 7.1).

Monitoring data should have below a 10% coefficient of variation in order for the data to be considered precise when estimating exposure concentrations in the area

## 6. Specific Tolerable Limits on Decision Errors

It is important that each sampling site provides a true estimate of pollutant concentrations at that location. IDEM must feel comfortable that the results will provide reasonable estimates of air toxics. Since screening levels have been established for air toxics in this project, it is important to have an established and adequate level of confidence in the concentrations that are reported. Since there are many pollutants being examined in this study, benzene will be used as an example.

The baseline condition is:

***The average concentration for benzene is greater than the screening level value of 0.13  $\mu\text{g}/\text{m}^3$ .***

From this statement, two types of potential decision error could be established.

1. Falsely accepting the baseline condition that the average concentration for benzene is greater than the screening value thus this pollutant fails screening and warrants further evaluation.
2. Falsely rejecting the baseline condition by stating that the annual average concentration for benzene is less than the screening level when in truth it is greater than the screening level. Thus the pollutant could be potentially dropped from future consideration for inventory and risk evaluations.

Since the baseline condition will be used for screening purposes, it is important that IDEM error on the side of being health protective. As such, decision error number one would simply result in the pollutant being evaluated further by IDEM. While this is an added burden to the State's resources, an error of this nature does not potentially threaten human health and the environment. Error in decision number two could represent that IDEM has overlooked a potential threat to human health and the environment. Because of this, health protective assumptions were used in the derivation of the screening values. This helps limit the possibility that an error of this nature will result in a threat to human health and the environment. Generally, a 10% Coefficient of Variability (CV) calculated for the monitoring data will result in the acceptance of the data.

Since one of the primary purposes of the monitoring data is to use in the derivation of an exposure concentration, it is necessary that the Minimal Detection Limits (MDL) for the

various monitoring methods are lower than the screening values. If an MDL is higher than the screening value that pollutant will fail screening and be subject to further evaluation.

**Table 7.1 Monitored pollutant screening levels and MDLs**

Compound	CAS #	MDL (ug/m3)	Screening value	Sufficient/ Not Sufficient
Antimony		0.0000293	*	
Arsenic		0.0000221	0.00023	Sufficient
Beryllium		0.000248	0.00042	Sufficient
Cadmium		0.000019	0.00056	Sufficient
Chromium		0.0005093	8.30E-05	Not Sufficient
Cobalt		0.0000221	0.1	Sufficient
Lead		0.0000683	1.5	Sufficient
Manganese		0.0001253	0.05	Sufficient
Mercury		0.0002123	0.3	Sufficient
Nickel		0.0001835	0.0042	Sufficient
Selenium		0.0000273	20	Sufficient
<b>Carbonyls</b>				
2,5-dimethylbenzaldehyde	97-51-8	0.005	*	
Acetaldehyde	75-07-0	0.009	0.45	Sufficient
Acetone	67-64-1	0.019	31000	Sufficient
Benzaldehyde	100-52-7	0.01	35	Sufficient
Butyr/Isobutyraldehyde	78-84-2	0.005	35	Sufficient
Crotonaldehyde	4170-30-3	0.004	0.0018	Not Sufficient
Formaldehyde	50-00-0	0.007	0.077	Sufficient
Hexaldehyde	123-05-7	0.007	*	
Isovaleraldehyde	590-86-3	0.005	*	
Propionaldehyde	123-38-6	0.004	*	
Tolualdehydes		0.014	*	
Valeraldehyde	110-62-3	0.005	*	
<b>VOC</b>				
1,1,1-Trichloroethane	71-55-6	0.218	1000	Sufficient
1,1,2,2-Tetrachloroethane	79-34-5	0.367	0.017	Not Sufficient
1,1,2-Trichloroethane	79-00-5	0.135	0.063	Not Sufficient
1,1-Dichloroethane	75-34-3	0.178	0.63	Sufficient
1,2,4-Trichlorobenzene	120-82-1	0.259	1	Sufficient
1,2,4-Trimethylbenzene	95-63-6	0.188	6	Sufficient
1,2-Dibromoethane	106-93-4	0.258	0.0045	Not Sufficient
1,2-Dichloroethane	107-06-2	0.114	0.038	Not Sufficient
1,2-Dichloropropane	78-87-5	0.138	0.052	Not Sufficient
1,3,5-Trimethylbenzene	108-67-8	0.307	6	Sufficient
1,3-Butadiene	106-99-0	0.175	0.033	Not Sufficient
1,4-dioxane	123-91-1	0.194	0.32	Sufficient
Acetone	67-64-1	0.125	31000	Sufficient

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Acrolein	107-02-8	0.355	0.02	Not Sufficient
Benzene	71-43-2	0.135	0.13	Not Sufficient
Benzyl Chloride	100-44-7	0.321	0.02	Not Sufficient
Bromodichloromethane	75-27-4	0.159	0.056	Not Sufficient
Bromoform	75-25-2	0.361	0.91	Sufficient
Bromomethane	74-83-9	0.065	5	Sufficient
c-1,2-Dichloroethene	156-59-2	0.182	0.357	Sufficient
c-1,3-Dichloropropene	10061-01-5	0.159	0.02	Not Sufficient
Carbon Disulfide	75-15-0	0.095	700	Sufficient
Carbon Tetrachloride	56-23-5	0.251	0.067	Not Sufficient
Chlorobenzene	108-90-7	0.109	1000	Sufficient
Chloroethane	75-00-3	0.104	7.52	Sufficient
Chloroform	67-66-3	0.150	0.043	Not Sufficient
Chloromethane	74-87-3	0.062	0.56	Sufficient
Cyclohexane	110-82-7	0.123	6000	Sufficient
Dibromochloromethane	124-48-1	0.286	0.042	Not Sufficient
Dichloromethane	75-09-2	0.106	2.13	Sufficient
Ethanol	64-17-5	0.441	2200	Sufficient
Ethyl Acetate	141-78-6	0.214	315	Sufficient
Ethylbenzene	100-41-4	0.103	1000	Sufficient
Freon-11	75-69-4	0.159	700	Sufficient
Freon-113	76-13-1	0.306	30000	Sufficient
Freon-114	76-14-2	2.127	*	
Freon-12	75-71-8	0.606	200	Sufficient
Heptane	142-82-5	0.208	1900	Sufficient
Hexachloro-1,3-butadiene	87-68-3	0.380	0.045	Not Sufficient
Hexane	110-54-3	0.157	200	Sufficient
Isopropanol	67-63-0	0.189	7000	Sufficient
m+p-Xylenes	1330-20-7	0.219	200	Sufficient
MBK	591-78-6	0.354	*	
m-Dichlorobenzene	541-73-1	0.229	200	Sufficient
MEK	78-93-3	0.125	5000	Sufficient
MIBK	108-10-1	0.122	3000	Sufficient
MTBE	1634-04-4	0.126	3000	Sufficient
o-Dichlorobenzene	95-50-1	0.143	200	Sufficient
o-Xylene	95-47-6	0.094	200	Sufficient
p-Dichlorobenzene	106-46-7	0.229	0.15	Not Sufficient
p-Ethyltoluene	622-96-8	0.175	*	
Propylene	115-07-1	2.239	3000	Sufficient
Styrene	100-42-5	0.254	1000	Sufficient
t-1,2-Dichloroethene	156-60-5	0.268	0.7	Sufficient
t-1,3-Dichloropropene	10061-02-6	0.231	0.027	Not Sufficient
Tetrachloroethene	127-18-4	0.168	0.067	Not Sufficient
Tetrahydrofuran	109-99-9	0.118	0.238	Sufficient
Toluene	108-88-3	0.126	400	Sufficient

Trichloroethene	79-01-6	0.133	0.32	Sufficient
Vinyl Acetate	108-05-4	0.354	200	Sufficient
Vinyl Chloride	75-01-4	0.153	0.11	Not Sufficient
Vinylidene Chloride	75-35-4	0.196	0.0029	Not Sufficient

## 7. Optimize the Design

Ideally, the IDEM would be able to use monitoring methods that detect pollutants at levels low enough to be below all screening values. Since this is not feasible for this study, those pollutants that do not have MDLs below the screening values will be evaluated further through modeling and emission inventory methods to ensure that they do not pose a threat to human health and the environment.

Based upon U.S. EPA documents (reference 1,2,3) on the statistical analyses of ambient monitoring data, generally a 1 in 6 day sampling frequency will produce data that meets the 10% Coefficient of Variation requirements as detailed in this QAPP. However, since this is dependent on the actual variability of the data collected, this cannot be determined until all the data has been collected. If the data for a particular pollutant does not meet these criteria, appropriate assumptions and statistical evaluations will be used for that pollutant.

### 7.2 Measurement Quality Objectives

Once a DQO is established, the quality of the data must be evaluated and controlled to ensure that it is maintained within the established acceptance criteria. Measurement Quality Objectives (MQOs) are designed to evaluate and control various phases (samplings, preparation, analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the DQOs. This is covered in more detail in section 14 of this QAPP.

### References

1. [www.ladco.org/toxics/reports/Battelle/Phase2%20final%20report/Final%20Technical%20Report/sections%2013-18.pdf](http://www.ladco.org/toxics/reports/Battelle/Phase2%20final%20report/Final%20Technical%20Report/sections%2013-18.pdf)
2. Model QAPP for local scale monitoring projects – [www.epa.gov/ttn/amtic/files/ambient/airtox/pilotqapp.pdf](http://www.epa.gov/ttn/amtic/files/ambient/airtox/pilotqapp.pdf)
3. NATTS Quality Management plan – [www.epa.gov/ttn/amtic/files/ambient/airtox/nattsqmp.pdf](http://www.epa.gov/ttn/amtic/files/ambient/airtox/nattsqmp.pdf)





## **8.0 Special Training Requirements/Certification**

### **8.1 Training**

IDEM will follow the training and certifications procedures as covered in Section 3 in the Office of Air Quality Air Monitoring Quality Management Plan version 3. OAQ AMB uses Senior personal to train employees in addition to using vendor provided training for equipment used.

Training needs OAQ AMB personnel are determined by supervisors based on the skills and abilities of the staff and identified during annual performance appraisals. OAQ AMB does not employ staff members that require formal training and licensing. OAQ AMB supervisors determine when staff should be retrained or be provided with training updates based on employee performance and when significant technical changes have occurred.

### **8.2 Certification**

IDEM office of air quality does not require or issue official certification for the collection of monitoring employees.

## 9.0 Documentation and Records

### 9.1 Identification of Q/A-related Records

OAQ Ambient Monitoring Branch identifies various documents and records that require chain-of-custody and secure filing in the OAQ Quality Assurance Manual and AMB SOPs. AMB retains all records concerning data validity, including calibration records, data audits, and sighting process records. AMB also retains records of contractual arrangements with landowners and external monitoring entities. In addition, the Air Compliance Branch retains any document and all records bearing an original signature used as the basis for decision-making. Staff work with the file room to adhere to the Records Retention and Disposition Schedule as found on the Public Records website [http://www.in.gov/apps/icpr/retention/icpr\\_retention](http://www.in.gov/apps/icpr/retention/icpr_retention).

IDEM has a structured records management system that allows for the efficient archive and retrieval of records. The air toxics information will be included in this system. Table 9.1 includes the documents and records that will be filed according to the statute of limitations discussed in Section 19.

IDEM will have responsibility to maintain and update the QAPP throughout the project. Steve Blaser of IDEM's Office of Air Quality Air Monitoring Branch will maintain the most up to date copy of the QAPP and will ensure that updated copies are distributed to the appropriate people as changes are made.



**Table 9.1 Record Handling Processes**

<b>Series #</b>	<b>Document Name</b>	<b>Preparation</b>	<b>Review</b>	<b>Approval</b>
Series # from file-room listing (if applicable)	Name of document type.	Information related to file preparation, including the following: <ul style="list-style-type: none"> <li>The policy on what goes to the file room. Do you have written policy? If yes, please summarize and reference. If not, please provide a summary of your oral policy in your response.</li> <li>Documents are coded by the programs before they are sent to the file room. Reference any guidance containing the coding system currently used by your program.</li> <li>What staff position does the file coding and preparation?</li> <li>Do you have confidential records, and/or exceptions to confidentiality associated with this record series? If yes, please explain.</li> </ul>	Describe processes associated with Q/A document review. <ul style="list-style-type: none"> <li>Who (by name and position) reviews materials to be sent to the file room?</li> <li>What do they look for, and how do they determine if the records are complete?</li> <li>Are there written processes (SOPs), or checklists?</li> </ul>	Describe processes associated with Q/A document approval. <ul style="list-style-type: none"> <li>Are there particular levels of approval for a document before it is sent to the file room?</li> <li>What positions participate in the approval?</li> <li>If, in your area, the level of approval needed depends upon document type, please provide the alternate review scenarios in your response.</li> </ul>
	All documents below except as noted.	<ul style="list-style-type: none"> <li>AMB has no written policy regarding filing. The item drives the file location through job responsibilities.</li> <li>Files are sent to secretary for filing in central files or filed by the staff member in an appropriate area.</li> <li>Files are not coded. They are filed by subject or by county-facility-date.</li> <li>There are no confidential files other than personnel files.</li> </ul>	<ul style="list-style-type: none"> <li>Group Leaders (Environmental Manage 2Ws) or Senior Environmental Manager 1s review documents initially and Section Chiefs or Branch Chief provide final review if necessary.</li> <li>Documents are reviewed for completeness and correctness. Completeness is has no missing information in areas that require response. If a response is missing it must be documented in comments. Correctness is evaluated by checking to make sure the entries are in the correct range and that calculations produce correct values.</li> <li>There are no written SOPs for the review although there is guidance for acceptable completion of the documents.</li> </ul>	<ul style="list-style-type: none"> <li>Very few QA documents require sign-off approval other than the originator and for communications the Section Chief or Branch Chief.</li> <li>Documents that do require approval generally follow the review path described to the left whit sign-off.</li> <li>When signature approval is needed it will be noted below.</li> </ul>
79-2748	Correspondence - Industry/ External Customers	As indicated above	Section Chiefs or Branch Chief provide final review for correspondence	Section Chiefs and Branch Chief approve/sign correspondence
80-479	Annual Reports - AT Data Summaries	As indicated above	As indicated above	As indicated above
80-1234	Documentation - Motor Pool	As indicated above	As indicated above	As indicated above
80-1255	Reference documents- Quarterly Reports - Reports to Section Chief - Requisition Justifications - Justifications for Equipment, Site Files	As indicated above	As indicated above	As indicated above
80-1284	Excel files - purchase requisitions, siting images	As indicated above	As indicated above	As indicated above

80-1285	QA Reference Files - Certification Stickers, QAPPs, Methods, General Information	As indicated above	Section Chiefs and Branch Chief provide final review for QAPPs	Section Chiefs and Branch Chief approve
80-1286	Chap 17 Manual - Monitoring Analysis QA	As indicated above	As indicated above	As indicated above
80-1287	Miscellaneous Files - Areas of Responsibility, Site inspections, procedure references, forms	As indicated above	As indicated above	As indicated above
80-1300	Requisitions - Siting Information, Local Agency reference files	As indicated above	Section Chiefs and Branch Chief provide final review for Requisitions	Section Chiefs and Branch Chief approve Requisitions
80-1304	Particulate Sampler - Performance Records	As indicated above	As indicated above	As indicated above
80-1327	Reference documentation - site monitoring lists	As indicated above	As indicated above	As indicated above
80-1345	Industry Monitoring Plans - Discontinued Monitoring Plans, NADP Reports	As indicated above	As indicated above	As indicated above
80-1368	Background Information - Subject Reference Files, Site Safety Evaluations	As indicated above	As indicated above	As indicated above
80-1370	Audits/Cals/Invalidations, Branch Activities, certifications	As indicated above	As indicated above	As indicated above
80-1389	Instrument Manuals	As indicated above	As indicated above	As indicated above
80-1390	Quality Assurance Manual - All Chapters, AMB SOPs	As indicated above	Section Chiefs and Branch Chief provide final review	Section Chiefs and Branch Chief approve
80-1411	Reference documents - speciation procedures	As indicated above	As indicated above	As indicated above
80-1412	Forms - Filter Weight Check, Equipment Photos, reference files	As indicated above	As indicated above	As indicated above
80-1414	OAMD Manual - OAMD Reference Guide	As indicated above	As indicated above	As indicated above
80-1430	Speciation Audits - Procedures-Forms-	As indicated above	As indicated above	As indicated above
80-1435	EPA Reference Procedures - Quality Assurance Methods	As indicated above	As indicated above	As indicated above
80-1440	Invalid Memos - Office Memos	As indicated above	As indicated above	As indicated above
80-1446	QA Laboratory - Certification Reports	As indicated above	As indicated above	As indicated above
80-1455	Summary documents - Network Review site summary docs, PARS Program Files	As indicated above	As indicated above	As indicated above
80-1462	Monitoring Site Maps - Site Addresses, Site Summaries, Data Checks, Data Summaries	As indicated above	As indicated above	As indicated above
80-6813	Equipment Maintenance - General Program	As indicated above	As indicated above	As indicated above
83-483	Lab SOPs - QA Cert Facility-Lab SOPs, field operational	As indicated above	As indicated above	As indicated above
83-485	Local Agency Evaluations - Performance Records	As indicated above	As indicated above	As indicated above
83-540	Inter-QA Lab Audits - Local and Industrial	As indicated above	As indicated above	As indicated above

Series #	Document Name	Issuance	Use	Authentication	Revisions
Series # from file-room listing (if applicable)	Name of document type.	Describe processes associated with Q/A document issuance. With respect to permits and other decisions, what are the processes for the following: <ul style="list-style-type: none"> <li>Who is notified of the issuances?</li> <li>Where to store the documents bearing the decision filed?</li> <li>Where the underlying, or working, documents associated with the issuance are filed or stored?</li> </ul>	Describe processes associated with Q/A document use (i.e. when to use, who uses). <ul style="list-style-type: none"> <li>Are there protocols (SOPs) for using existing records (current permits, DMRs, inspection reports) in decision-making and/or the development of new documents (renewed permits, future inspection lists, etc)?</li> </ul>	Describe processes associated with Q/A document authentication (for documents that need to be managed in print form). Please provide: <ul style="list-style-type: none"> <li>Process to ensure that the current versions of Q/A documents are signed and dated.</li> <li>Reference any associated routing sheets.</li> </ul>	Describe processes associated with Q/A document revisions, including revision timelines and roles). <ul style="list-style-type: none"> <li>Describe triggers (regulatory changes, judicial decisions, EPA policy changes, changes to SIPs, etc) that initiate revisions to this document type, and associated work tools and daily forms?</li> <li>SOPs are discussed separately under QMP Element #8</li> </ul>
		<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	<ul style="list-style-type: none"> <li>Document use is described in the OAQ QA Manual and in some SOPs.</li> </ul>	<ul style="list-style-type: none"> <li>There is a tracking spreadsheet for tracking SOPs and QAPPs that have routing through signature and a distribution database. Other QA documents are not tracked or routed, but updated as needed. Distribution to applicable parties upon update.</li> </ul>	<ul style="list-style-type: none"> <li>Revisions are made to documents based changes in Federal or State law, technical guidance, new methods, Agency policy, QA policy changes, physical site, and for convenience of use.</li> </ul>
79-2748	Correspondence - Industry/ External Customers	Not applicable	As indicated above	As indicated above	No Revisions
80-479	Annual Reports - AT Data Summaries	Not applicable	As indicated above	As indicated above	No Revisions
80-1234	Documentation - Motor Pool	Not applicable	As indicated above	As indicated above	No Revisions
80-1255	Reference documents- Quarterly Reports - Reports to Section Chief - Requisition Justifications - Justifications for Equipment, Site Files	Not applicable	As indicated above	As indicated above	No Revisions except site files are updated as physical changes occur or about annually.
80-1284	Excel files - purchase requisitions, siting images	Not applicable	As indicated above	As indicated above	No Revisions
80-1285	QA Reference Files - Certification Stickers, QAPPs, Methods, General Information	Not applicable	As indicated above	As indicated above	As indicated above
80-1286	Chap 17 Manual - Monitoring Analysis QA	Not applicable	As indicated above	As indicated above	As indicated above, but on 2 year revision schedule
80-1287	Miscellaneous Files - Areas of Responsibility, Site inspections, procedure references, forms	Not applicable	As indicated above	As indicated above	As indicated above
80-1300	Requisitions - Siting Information, Local Agency reference files	Not applicable	As indicated above	As indicated above	No Revisions except site files are updated as physical changes occur or about annually.
80-1304	Particulate Sampler - Performance Records	Not applicable	As indicated above	As indicated above	As indicated above
80-1327	Reference documentation - site monitoring lists	Not applicable	As indicated above	As indicated above	As indicated above
80-1345	Industry Monitoring Plans - Discontinued Monitoring Plans, NADP Reports	Not applicable	As indicated above	As indicated above	As indicated above
80-1368	Background Information - Subject Reference Files, Site Safety Evaluations	Not applicable	As indicated above	As indicated above	No Revisions

80-1370	Audits/Cals/Invalidations, Branch Activities, certifications	Not applicable	As indicated above	As indicated above	No Revisions
80-1389	Instrument Manuals	Not applicable	As indicated above	As indicated above	No Revisions
80-1390	Quality Assurance Manual - All Chapters, AMB SOPs	Not applicable	As indicated above	As indicated above	As indicated above, but on 2 year revision schedule
80-1411	Reference documents - speciation procedures	Not applicable	As indicated above	As indicated above	As indicated above
80-1412	Forms - Filter Weight Check, Equipment Photos, reference files	Not applicable	As indicated above	As indicated above	No Revisions – photos updated when change occurs.
80-1414	OAMD Manual - OAMD Reference Guide	Not applicable	As indicated above	As indicated above	No Revisions
80-1430	Speciation Audits - Procedures-Forms-	Not applicable	As indicated above	As indicated above	No Revisions
80-1435	EPA Reference Procedures - Quality Assurance Methods	Not applicable	As indicated above	As indicated above	As indicated above
80-1440	Invalid Memos - Office Memos	Not applicable	As indicated above	As indicated above	No Revisions
80-1446	QA Laboratory - Certification Reports	Not applicable	As indicated above	As indicated above	No Revisions
80-1455	Summary documents - Network Review site summary docs, PARS Program Files	Not applicable	As indicated above	As indicated above	No Revisions
80-1462	Monitoring Site Maps - Site Addresses, Site Summaries, Data Checks, Data Summaries	Not applicable	As indicated above	As indicated above	No Revisions
80-6813	Equipment Maintenance - General Program	Not applicable	As indicated above	As indicated above	No Revisions
83-483	Lab SOPs - QA Cert Facility-Lab SOPs, field operational	Not applicable	As indicated above	As indicated above	As indicated above
83-485	Local Agency Evaluations - Performance Records	Not applicable	As indicated above	As indicated above	No Revisions
83-540	Inter-QA Lab Audits - Local and Industrial	Not applicable	As indicated above	As indicated above	No Revisions



**Table 9.2 Document Maintenance**

Series #	Document Name	Transmittal	Distribution	Retention	Access
		Processes associated with transmittal of Q/A related documents. <ul style="list-style-type: none"> <li>When, how, and to where are completed work documents transmitted?</li> </ul>	Processes associated with distribution of Q/A related documents. <ul style="list-style-type: none"> <li>Who gets what?</li> <li>What is the protocol for what work product goes to the public (including via the Internet), to the file room, or to non-file room, but internal program files?</li> </ul>	Processes associated with retention of Q/A related documents. <ul style="list-style-type: none"> <li>What are your record retention policies?</li> </ul>	Processes / network locations associated with access of Q/A related documents. <ul style="list-style-type: none"> <li>What are the access points (both internal and external) for this document type?</li> </ul>
		A comprehensive document management system is under development.	A comprehensive document management system is under development.	Agency Document Retention Schedule – A comprehensive document management system is under development.	A comprehensive document management system is under development.
79-2748	Correspondence - Industry/ External Customers	As indicated above	As indicated above	As indicated above	As indicated above
80-479	Annual Reports - AT Data Summaries	As indicated above	As indicated above	As indicated above	As indicated above
80-1234	Documentation - Motor Pool	As indicated above	As indicated above	As indicated above	As indicated above
80-1255	Reference documents- Quarterly Reports - Reports to Section Chief - Requisition Justifications - Justifications for Equipment, Site Files	As indicated above	As indicated above	As indicated above	As indicated above
80-1284	Excel files - purchase requisitions, siting images	As indicated above	As indicated above	As indicated above	As indicated above
80-1285	QA Reference Files - Certification Stickers, QAPPs, Methods, General Information	As indicated above	As indicated above	As indicated above	As indicated above
80-1286	Chap 17 Manual - Monitoring Analysis QA	As indicated above	As indicated above	As indicated above	As indicated above
80-1287	Miscellaneous Files - Areas of Responsibility, Site inspections, procedure references, forms	As indicated above	As indicated above	As indicated above	As indicated above
80-1300	Requisitions - Siting Information, Local Agency reference files	As indicated above	As indicated above	As indicated above	As indicated above
80-1304	Particulate Sampler - Performance Records	As indicated above	As indicated above	As indicated above	As indicated above
80-1327	Reference documentation - site monitoring lists	As indicated above	As indicated above	As indicated above	As indicated above
80-1345	Industry Monitoring Plans - Discontinued Monitoring Plans, NADP Reports	As indicated above	As indicated above	As indicated above	As indicated above
80-1368	Background Information - Subject Reference Files, Site Safety Evaluations	As indicated above	As indicated above	As indicated above	As indicated above
80-1370	Audits/Cals/Invalidations, Branch Activities, certifications	As indicated above	As indicated above	As indicated above	As indicated above
80-1389	Instrument Manuals	As indicated above	As indicated above	As indicated above	As indicated above
80-1390	Quality Assurance Manual - All Chapters, AMB SOPs	As indicated above	As indicated above	As indicated above	As indicated above
80-1411	Reference documents - speciation procedures	As indicated above	As indicated above	As indicated above	As indicated above
80-1412	Forms - Filter Weight Check, Equipment Photos, reference files	As indicated above	As indicated above	As indicated above	As indicated above

80-1414	OAMD Manual - OAMD Reference Guide	As indicated above	As indicated above	As indicated above	As indicated above
80-1430	Speciation Audits - Procedures-Forms-	As indicated above	As indicated above	As indicated above	As indicated above
80-1435	EPA Reference Procedures - Quality Assurance Methods	As indicated above	As indicated above	As indicated above	As indicated above
80-1440	Invalid Memos - Office Memos	As indicated above	As indicated above	As indicated above	As indicated above
80-1446	QA Laboratory - Certification Reports	As indicated above	As indicated above	As indicated above	As indicated above
80-1455	Summary documents - Network Review site summary docs, PARS Program Files	As indicated above	As indicated above	As indicated above	As indicated above
80-1462	Monitoring Site Maps - Site Addresses, Site Summaries, Data Checks, Data Summaries	As indicated above	As indicated above	As indicated above	As indicated above
80-6813	Equipment Maintenance - General Program	As indicated above	As indicated above	As indicated above	As indicated above
83-483	Lab SOPs - QA Cert Facility-Lab SOPs, field operational	As indicated above	As indicated above	As indicated above	As indicated above
83-485	Local Agency Evaluations - Performance Records	As indicated above	As indicated above	As indicated above	As indicated above
83-540	Inter-QA Lab Audits - Local and Industrial	As indicated above	As indicated above	As indicated above	As indicated above

Series #	Document Name	Traceability	Retrieval	Removal of Obsolete Documentation	Archiving and/or Disposal
		Processes associated with tracking of Q/A related documents. <ul style="list-style-type: none"> <li>List tracking tools (forms, routing sheets, software, etc)</li> <li>List any written SOPs or policies that address the use or maintenance and/or use of these tracking tools.</li> </ul>	Processes associated with retrieval of Q/A related documents. <ul style="list-style-type: none"> <li>What are the protocol/SOPs for retrieving non-file room documents? (That is, documents that must be maintained, but are not sent to the file room and which may be public or confidential?)</li> </ul>	Processes associated with removing obsolete Q/A related documents. <ul style="list-style-type: none"> <li>Describe process for purging records that have exceeded scheduled retention timetables?</li> </ul>	Processes associated with archiving and/or disposing of Q/A related documents. [What we want is: what is your process for addressing disposal of documents that may have special disposal requirements due to confidentiality? Regarding archiving, that might overlap somewhat with 5.4.5. above, on document preservation?]
		Agency Document Retention Schedule – A comprehensive document management system is under development.	Agency Document Retention Schedule – A comprehensive document management system is under development.	Agency Document Retention Schedule – A comprehensive document management system is under development.	Agency Document Retention Schedule – A comprehensive document management system is under development.
79-2748	Correspondence - Industry/ External Customers	As indicated above	As indicated above	As indicated above	As indicated above
80-479	Annual Reports - AT Data Summaries	As indicated above	As indicated above	As indicated above	As indicated above
80-1234	Documentation - Motor Pool	As indicated above	As indicated above	As indicated above	As indicated above
80-1255	Reference documents- Quarterly Reports - Reports to Section Chief - Requisition Justifications - Justifications for Equipment, Site Files	As indicated above	As indicated above	As indicated above	As indicated above
80-1284	Excel files - purchase requisitions, siting images	As indicated above	As indicated above	As indicated above	As indicated above
80-1285	QA Reference Files - Certification Stickers, QAPPs, Methods, General Information	As indicated above	As indicated above	As indicated above	As indicated above
80-1286	Chap 17 Manual - Monitoring Analysis QA	As indicated above	As indicated above	As indicated above	As indicated above
80-1287	Miscellaneous Files - Areas of Responsibility, Site inspections, procedure references, forms	As indicated above	As indicated above	As indicated above	As indicated above
80-1300	Requisitions - Siting Information, Local Agency reference files	As indicated above	As indicated above	As indicated above	As indicated above
80-1304	Particulate Sampler - Performance Records	As indicated above	As indicated above	As indicated above	As indicated above
80-1327	Reference documentation - site monitoring lists	As indicated above	As indicated above	As indicated above	As indicated above
80-1345	Industry Monitoring Plans - Discontinued Monitoring Plans, NADP Reports	As indicated above	As indicated above	As indicated above	As indicated above
80-1368	Background Information - Subject Reference Files, Site Safety Evaluations	As indicated above	As indicated above	As indicated above	As indicated above
80-1370	Audits/Cals/Invalidations, Branch Activities, certifications	As indicated above	As indicated above	As indicated above	As indicated above
80-1389	Instrument Manuals	As indicated above	As indicated above	As indicated above	As indicated above
80-1390	Quality Assurance Manual - All Chapters, AMB SOPs	As indicated above	As indicated above	As indicated above	As indicated above
80-1411	Reference documents - speciation procedures	As indicated above	As indicated above	As indicated above	As indicated above
80-1412	Forms - Filter Weight Check, Equipment Photos, reference files	As indicated above	As indicated above	As indicated above	As indicated above
80-1414	OAMD Manual - OAMD Reference Guide	As indicated above	As indicated above	As indicated above	As indicated above

80-1430	Speciation Audits - Procedures-Forms-	As indicated above	As indicated above	As indicated above	As indicated above
80-1435	EPA Reference Procedures - Quality Assurance Methods	As indicated above	As indicated above	As indicated above	As indicated above
80-1440	Invalid Memos - Office Memos	As indicated above	As indicated above	As indicated above	As indicated above
80-1446	QA Laboratory - Certification Reports	As indicated above	As indicated above	As indicated above	As indicated above
80-1455	Summary documents - Network Review site summary docs, PARS Program Files	As indicated above	As indicated above	As indicated above	As indicated above
80-1462	Monitoring Site Maps - Site Addresses, Site Summaries, Data Checks, Data Summaries	As indicated above	As indicated above	As indicated above	As indicated above
80-6813	Equipment Maintenance - General Program	As indicated above	As indicated above	As indicated above	As indicated above
83-483	Lab SOPs - QA Cert Facility-Lab SOPs, field operational	As indicated above	As indicated above	As indicated above	As indicated above
83-485	Local Agency Evaluations - Performance Records	As indicated above	As indicated above	As indicated above	As indicated above
83-540	Inter-QA Lab Audits - Local and Industrial	As indicated above	As indicated above	As indicated above	As indicated above

## **9.2 Ensuring that Documents Accurately Reflect Completed Work**

The primary role of AMB is to perform monitoring. Documents created are reviewed by senior AMB personnel, as well as supervisors. In addition, the OAQ Ambient Monitoring Branch employs a wide range of QC/QA reviews to ensure documents produced and monitoring work performed is complete and accurate. Documentation produced as a result of monitoring includes field reports and data – these documents are not reflective of a completed work product but integrate with various work activities that are documented. Monitoring data is subject to rigorous QA/QC as described in element 6.4.

## **9.3 Compliance with Statutory/EPA Recordkeeping Requirements**

Upon promulgation of new legislation that has potential to alter or present new monitoring and recordkeeping requirements, Air Monitoring Branch forms a workgroup of program staff to analyze regulatory requirements. Monitoring Branch then identifies documents used to establish data validity and as the basis for decision-making under such legislation and works with OLC to develop or use an existing retention schedule for such documents.

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## 10.0 Sampling Design

The purpose of this section is to describe the relevant components of the monitors to be operated during the course of the study. This includes describing the key parameters to be estimated, the rationale for the location of the monitors, the frequency of sampling, and the type of samplers used.

### 10.1 Schedule of monitoring activities

**Table 10.1 Schedule of activities**

Activity	Due Date	Comments
Order Monitoring Equipment	February 2006	Requisition submitted for equipment purchase.
Set-up Field Sites	September 2006	Use field site footprints already in use.
Move Harding Street Trailer	September 2006	Due to construction near the original site, the Harding Street trailer will move approximately 300 yards away.
Begin Sampling	October 2006	All 1-in-6 day sampling will begin.
Return Harding Street Trailer	November 2006	Return trailer to original location after construction is completed.
End Sampling	September 2008	End sampling at conclusion of two-year study.

### 10.2 Design Assumptions

#### 10.2.1 Primary Samplers

The purpose of the samplers in this study is to ascertain the spatial/temporal variability of the urban area. To determine whether these characteristics are quantified with sufficient confidence, IDEM must address sampler type, sampling frequency, and sampler siting. By employing samplers that are described in the appropriate compendia, the data collected will be comparable to standard EPA methods. By complying with the sampling frequency requirements of *Network Design and Site Exposure Criteria for Selected Noncriteria Air Pollutants*, IDEM assumes that the sampling frequency is sufficient to attain the desired confidence in the annual 95th percentile and annual mean of concentrations in the vicinity of each monitor. By selecting sampler locations using the rules in *Network Design and Site Exposure Criteria for Selected Noncriteria Air Pollutants*, IDEM can be confident that the concentrations within its jurisdiction are adequately characterized. Sampler type, frequency, and siting are further described in section 10.3.

### **10.2.2 QA Samplers**

Field accuracy will be estimated using flow, temperature sensor and barometric checks. Laboratory accuracy will be determined by the analysis of known reference analytes prepared by independent laboratories submitted to IDEM's laboratory. If samplers and laboratory equipment are operating within the required bias, precision and accuracy levels, then the decision maker can proceed knowing that the decisions will be supported by unambiguous data. Thus the key characteristics being measured with the QA samplers are bias and precision.

### **10.3 Procedure for Locating and Selecting Monitor Locations and Rationale for Design**

Monitoring location selection conforms to EPA standards for ambient air monitoring locations as detailed in the Quality Assurance Handbook for Air Pollution Measurement Systems - Ambient Air Quality Monitoring Program Quality System Development EPA-454/R-98-004. Each will be strategically located based on an evaluation of the EPA's 1996 and 1999 NATA, proximity to major sources for HAP emissions, and in locations where the general public lives and congregates.

Monitors will be located at 1321 South Harding Street and at Stout Field National Guard Armory at 1802 South Holt Road in Indianapolis Indiana.

Two monitoring locations were selected for this project. A number of criteria were used in the selection of monitoring locations. As stated above, the monitoring will have three primary uses; evaluated exposure concentrations to air toxics at a location, evaluated modeling needs, and rough comparison to the 1999 NATA results.

From a risk perspective it is important that the monitor be placed in an area that is representative of where the public would be exposed. That is, the monitor should be located in an area where people live or congregate. It would be appropriate to attempt to locate the monitor in a location where it is expected that the public would be exposed to the greatest levels of pollutants and/or in an area where the risk is predicted to be the greatest. This would add an extra measure of health protective assumptions when formulating the risk characterization. However, since the risk characterization will take into account the placement of the monitors when risk is characterized this is not necessary, but having monitoring data from locations predicted to pose the greatest risk has benefits. It gives confidence to the risk managers when making decisions that they are considering the upper end of exposure.

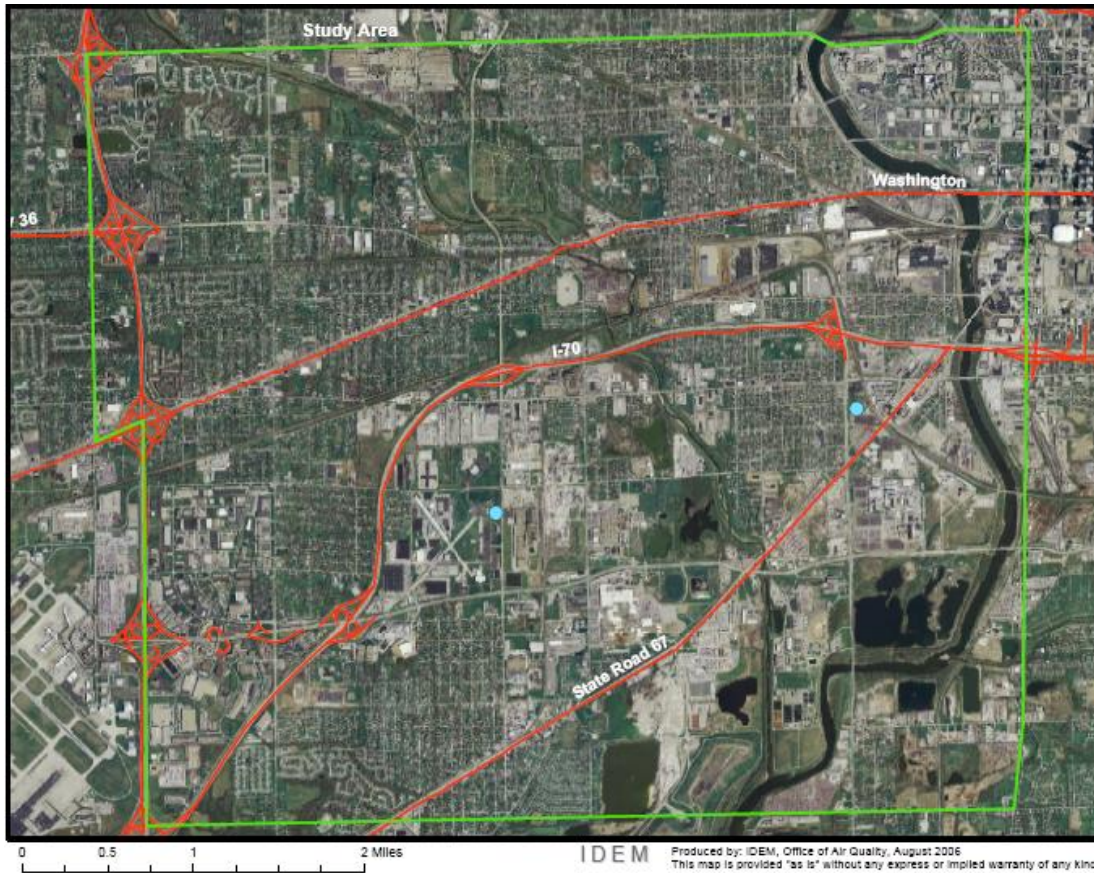
In general, placement of the monitors from a risk prospective should be in locations where it is reasonable for the public to be exposed. Consideration should be made using other tools available to attempt to locate the monitors in an area where the risk is

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perceived to be the greatest. In this study area there are a number of locations that meet these criteria.

1999 NATA results were considered when selecting where to place the monitors but NATA was not the only tool used when selecting sites. In this study area arsenic is predicted to be the risk driver in a number of census tracts in the northeast sections of the study area. It is also believed that the 1999 NATA underestimates the levels of metals that the public is exposed to. As such, it may be beneficial to place a monitor in a location where the 1999 NATA predicted arsenic risk to be relatively high to evaluate the levels of metals. The monitors were placed in areas that were predicted to have high risk values for the census tracts in and around the study area.

General siting requirements were used when considering the location of the monitors. Those requirements are detailed in Appendix A of the IDEM's Quality Assurance of Ambient Air Toxics Compounds Monitoring Manual.



● Monitoring Locations



### **Sampling Frequency**

IDEM has set the frequency for samples to once every six days for VOC, Carbonyl, and PM-10 and Chromium speciation monitoring.

### **Collocated Sampling**

IDEM OAQ will not have collocated samples during this project.

### **Classification of Measurements as Critical/Noncritical**

All of the measurements are considered critical because they form the basis for estimating bias and precision.

### **Validation of Any Non-Standard Measurements**

IDEM is deploying and operating instruments according to descriptions in the applicable EPA guidance documents.

## 11.0 Sampling Methods Requirements

### 11.1 Purpose/Background

The methods described herein provide for measurement of the relative concentration of a number of hazardous air pollutants in ambient air for a 24-hour sampling period. Since there are 4 separate instruments and subsequently four separate analytical techniques, each of the sampling methods are different. General QA handling requirements are crucial for all sampling, so in that aspect, sample handling is similar. Below is a list of SOPs that will be used by IDEM during the course of the project. ERG's QAPP contains a list of SOPs that they will follow.

- Preparation of Aqua Regia Extracting Solution SOP
- GC/MS SOP
- PM10 sampling SOP
- Clean room SOP
- Canister Cleaning SOP
- Canister Handling SOP
- OAQ AMB Management Plan
- ERG QAPP

### 11.2 Sample Collection and Preparation

Sample preparation is an essential portion of the AMTP. The following functions are required for sample preparation:

- PM10 - filter receipt and inspection, filter numbering, conditioning and storage;
- VOC - cleaning, testing, verification and storage of canisters;
- Aldehydes - receipt and storage of DNPH cartridges in the laboratory refrigerator.
- Chromium VI

Sample set-up of the air toxics samplers in the IDEM network takes place any day after the previous sample has been recovered. For instance, on a Sunday - Thursday sample day set-up when 1 in 6 day sampling is required, the pickup occurs the day after the run. However, on Friday and Saturday run dates, the pickup is on the following Monday. It is important to recognize that the only holding time that affects sample set-up is the 30 day window from the time samples are pre-weighed/processed to the time they are installed in the monitor. Detailed sample set-up procedures are available from the IDEM OAQ AMB sample methods standard operating procedure.

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**Table 11.1 SW INDIANAPOLIS CR+6 Sampling Calendar for 2006**

January						
S	M	T	W	T	F	S
1	2	3	4	FB	6	7
8	9	10	FB	12	13	14
15	16	17	18	19	20	21
22	D	24	25	26	27	28
29	30	31				

February						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	FB	11
12	13	14	15	16	17	18
19	20	21	M	23	24	25
26	27	FB				

March						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
FB	13	14	15	16	17	D
19	20	21	22	23	24	25
26	27	28	29	FB	31	

April						
S	M	T	W	T	F	S
						1
2	3	4	FB	6	7	8
9	10	FB	12	13	14	15
16	17	18	19	20	21	22
M	24	25	26	27	28	29
30						

May						
S	M	T	W	T	F	S
	1	2	3	4	FB	6
7	8	9	10	D	12	13
14	15	16	17	18	19	20
21	22	FB	24	25	26	27
28	29	30	31			

June						
S	M	T	W	T	F	S
				1	2	3
FB	5	6	7	8	9	FB
11	12	13	14	15	M	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

July						
S	M	T	W	T	F	S
						1
2	3	FB	5	6	7	8
9	FB	11	12	13	14	15
D	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

August						
S	M	T	W	T	F	S
		1	2	FB	4	5
6	7	8	FB	10	11	12
13	14	15	16	17	18	19
20	M	22	23	24	25	26
27	28	29	30	31		

September						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	FB	9
10	11	12	13	FB	15	16
17	18	19	D	21	22	23
24	25	26	27	28	29	30

October						
S	M	T	W	T	F	S
1	FB	3	4	5	6	7
8	9	10	11	12	13	M
15	16	17	18	19	FB	21
22	23	24	25	26	27	28
29	30	31				

November						
S	M	T	W	T	F	S
			1	2	3	4
5	6	FB	8	9	10	11
12	D	14	15	16	17	18
19	20	21	22	23	24	FB
26	27	28	29	30		

December						
S	M	T	W	T	F	S
					1	2
3	4	5	6	FB	8	9
10	11	12	FB	14	15	16
17	18	M	20	21	22	23
24	25	26	27	28	29	30
31						

**M** ----- Make-up Duplicate day or normal sample

**FB** ----- Field Blank + Normal Sample

**D** ----- Duplicate sample

### 11.3 Support Facilities for Sampling Methods

The main support facility for sampling is the sample trailer or shelter. At each sample location there is a climate controlled sample trailer. The trailer has limited storage space for items used in support of air toxic sampling. Since there are other items that the field operator may need during a site visit that are not expected to be at each site, the operator is expected to bring these items with him/her.

### 11.4 Sampling/Measurement System Corrective Action

Corrective action measures in the ATMP will be taken to ensure the data quality objectives are attained. There is the potential for many types of sampling and measurement system corrective actions. Table 11.3 is an attempt to detail the expected problems and corrective actions needed for the project.

**Table 11.2 Corrective Action Table**

Field Corrective Action Item	Problem	Action	Notification
Filter Inspection (Pre-sample)	Pinhole(s) or torn	1.) If additional filters have been brought, use one of them. Void filter with pinhole or tear. 2.) Use new field blank filter as sample filter. 3.) Obtain a new filter from lab.	1.) Document on field data sheet. 2.) Document on field data sheet. 3.) Notify Field Manager
Filter Inspection (Post-sample)	Torn or otherwise suspect particulate bypassing 46.2 mm filter.	1.) Inspect area downstream of where filter rests in sampler and determine if particulate has been bypassing filter. 2.) Inspect in-line filter before sample pump and determine if excessive loading has occurred. Replace as necessary.	1.) Document on field data sheet. 2.) Document in logbook.
Flow rate erratic	Heavy loading or motor/motor brushes are worn.	Replace brushes or motor. Re-calibrate flow rate.	Document in log book
Sample Flow Rate Verification	Out of Specification (+ 10% of transfer standard)	1.) Completely remove mass flow controller and perform flow rate check. 2.) Perform leak test. 3.) Check flow rate at 3 points to determine if flow rate problem is with zero bias or slope. 4.) Re-calibrate flow rate	1.) Document on datasheet. 2.) Document on datasheet. 3.) Document on datasheet. Notify Field Manager 4.) Document on datasheet. Notify Field Manager.
Leak Test	VOC canisters will not hold pressure.	1.) Replace fitting on nut on sampler line. 2.) Inspect connections to the mass flow controller and re-perform leak test.	1.) Document in logbook. 2.) Document in logbook, notify Field Manager, and flag data since last successful leak test.
Sample Flow Rate	Consistently low flows documented during sample run	1.) Check programming of sampler flow rate of VOC/Carbonyl Sampler. 2.) Check flow with a flow rate verification filter and determine if actual flow is low. 3.) Inspect in-line filter and PUF	1.) Document in logbook. 2.) Document in logbook. 3.) Document in logbook.

Field Corrective Action Item	Problem	Action	Notification
		cartridge downstream of filter location, replace as necessary.	
Ambient Temperature Verification and Filter Temperature Verification.	Out of Specification (+ 1°C of standard)	1.) Make certain thermocouples are immersed in same liquid at same point without touching sides or bottom of container. 2.) Use ice bath or warm water bath to check a different temperature. If acceptable, re-perform ambient temperature verification. 3.) Connect new thermocouple. 4.) Check ambient temperature with another NIST traceable thermometer.	1.) Document on datasheet. 2.) Document on datasheet. 3.) Document on datasheet. Notify Field Manager. 4.) Document on datasheet. Notify Field Manager.
Ambient Pressure Verification	Out of Specification ( $\pm 10$ mm Hg)	1.) Make certain pressure sensors are each exposed to the ambient air and are not in direct sunlight. 2.) Compare certified pressure device measurement to pressure data from monitor's sensor. Pressure correction maybe required 3.) Connect new pressure sensor	1.) Document on datasheet. 2.) Document on datasheet. 3.) Document on datasheet. Notify Field Manager
Elapsed Sample Time	Out of Specification ( 10 min/day)	Check Programming, Verify Power Outages	Notify Field Manager
Elapsed Sample Time	Sample did not run	1.) Check Programming 2.) Try programming sample run to start while operator is at site. Use a flow verification filter.	1.) Document on datasheet. Notify Field Manager 2.) Document in logbook. Notify Field Manager.
Power	Power Interruptions	Check Line Voltage	Notify Field Manager
Power	LCD panel on, but sample not working.	Check circuit breaker, some VOC and Carbonyl samplers have battery back-up for data but will not work without AC power.	Document in log book
Data Downloading	Data will not transfer to laptop computer or there is no printout from the Carbonyl/VOC samplers	Document key information on sample data sheet. Make certain problem is resolved before data is written over in sampler microprocessor.	Notify Field Manager.

In addition to these corrective actions, the samplers will also be calibrated: when installed, after any major repairs, or when an audit flow rate shows that the sampler is outside of the +/- 10% (+/- 7% for PM10) relative to the audit flow value.

### 11.5 Sampling Equipment, Preservation, and Holding Time Requirements

This sections details the requirements needed to prevent sample contamination, the volume of air to be sampled, how to protect the sample from contamination, temperature preservation requirements, and the permissible holding times to ensure against degradation of sample integrity.

#### 11.5.1 Sample Contamination Prevention

The quality system has rigid requirements for preventing sample contamination. Powder free gloves are worn while handling filter cassettes, and DNPH cartridges. Filter and

cartridges are to be held in storage containers (static resistant zip lock bags) as provided by the sampler manufacturer during transport to and from the laboratory. Once samples have been analyzed they, are stored in static resistant zip lock bags.

### 11.5.2 Sample Volume

The volume of air to be sampled is specified in manufacturer's method specifications. The different methods specify that certain minimum volumes must be collected. Samples are expected to be collected for 24 hours, therefore the site operators must set the flow rates to collect sufficient sample to obtain the minimum sample volume. In some cases a shorter sample period may occur due to power outages. A valid sample run should not to be less than 23 hours. If the sample period is less than 23 hours or greater than 25 hours, the sample will be flagged and the Branch Manager notified.

### 11.5.3 Temperature Preservation Requirements

The temperature requirements of the samples vary between methods. During transport from the laboratory to the sample location there are no specific requirements for temperature control with the exception of DNPH cartridges. Filters will be located in their protective container and in the transport container. Excessive heat must be avoided (e.g., do not leave in direct sunlight or a closed-up car during summer). DNPH cartridges need to be stored at 4° C until they are loaded into the sampler. The filter temperature requirements are detailed in Table 11.4.

**Table 11.3 Temperature Requirements**

Item	Temperature Requirement	Reference
PM10 filter temperature control during sampling and until recovery.	No requirements	
DNPH Cartridge Filter temperature control pre- and post-sampling.	4° C or less	TO-11A Compendium Section 9.4.3
VOC canister Pre and post sampling	No Requirements	

### 11.4 Permissible Holding Times

Item	Holding Time	From:	To:	Reference
PM10 filter temperature	No limits			
VOC canister	<30 days	Completion of sample period	Time of analysis	TO-15 Compendium Section 9.4.2.1
DNPH Cartridge Filter	<30 days	Sample end date/time	Date of Post Weigh	TO-11A Compendium Section 11.1.1

## 12.0 Sampling Custody

An essential part of any sampling or analytical process is ensuring the integrity of the sample from collection through data reporting. A Chain-of-Custody is necessary if there is any possibility that litigants will use analytical data or conclusions based upon that data in litigation. "Chain-of-Custody" is defined as the documentation of the history of samples through all possession and handling from the time of collection through analysis and final disposition. For more information on Chain of Custody procedures used by IDEM please refer to Chapter 8 and 10 of the Office of Air Quality's Quality Assurance Manual and Chapter 5 of Office of Air Quality Air Monitoring Quality Management Plan.

Consider all ambient sampling data collected in the State of Indiana as having potential use in court; therefore, all sampling data must follow a Chain-of-Custody procedure. In cases involving no litigation, many Chain-of-Custody procedures are still useful for routine control of validity of sample data.

When samples collected at one location are mailed or hand carried to another agency (IDEM lab for example) for analysis, the Chain-of-Custody procedures must be followed. All samples or sample lots must be accompanied by a Chain-of-Custody form (see Forms 1, 2, 3, and 4 for examples of forms). These forms must include who relinquishes the sample and the signature of the person(s) who receives the sample(s). All samples must be hand carried or sent by a reputable courier service such as the U.S. mail. The shipping envelopes must be sealed.

Once the samples have been delivered to the laboratory, the addressee or a designated substitute should make sure the package has not been tampered with. The addressee should then open the package and verify the contents. He should sign on the accompanying form that the packages were or were not received in the original package and that all appropriate information has been addressed. The samples should be logged in at the laboratory facility and be placed in limited access area until and during analysis. When dealing with multiple parameters in the same package container, each technician or analyst handling the samples or portions of the sample indicates handling by signing the Chain-of-Custody form.

Procedure for Chain-of-Custody and Sample Logging (Canister System Only): The air samples brought into the laboratory for analysis generally originate from ambient air monitoring or individual complaint. The person bringing in the sample completes a request for analysis form to register the samples for analysis. The custody of the sample is relinquished, the form is signed, and the transfer of the sample chain of custody (chain of custody form is on the back of the request for analysis form) is acknowledged.

These are usually grab samples and are pressurized to one atmosphere. For analysis, the samples are diluted by pressurizing with zero air to 1.5 times the pressure of the sample when received.

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Procedure:

1. Sign the chain of custody form. Make and keep a copy of the form.
2. In the sample logbook, assign a sample number and record the source, date of sampling, canister number, and any other pertinent information about the sample.
3. Measure the canister pressure and record in the logbook along with other sample information. If the pressure is at or below 14.3 psi absolute, dilute the sample with zero air to 1.5 times the sample canister pressure. Record the dilution factor (x1.5), final dilution pressure and sample volume.
4. Record the pressures, before and after dilution, on the tag on the sample canister and initial the tag.
5. Repeat procedure 1 through 4 for the next sample.
6. When all samples have been logged in, place the canisters in their proper place.

**Form 1**  
**Continuous Monitoring Data Chain-of-Custody Record**

**Sample Site Identification:**

\_\_\_\_\_

**Parameter/Inclusive Dates:**

\_\_\_\_\_

**Parameter/Inclusive Dates:**

\_\_\_\_\_

**Parameter/Inclusive Dates:**

\_\_\_\_\_

**Collector's Name and Organization:**

\_\_\_\_\_

**Shipped Via:**

\_\_\_\_\_

**Sample/Data Receiver:**

\_\_\_\_\_

1. \_\_\_\_\_

(Organization/Section Receiving Data/Sample)

2. \_\_\_\_\_

(Organization/Section Receiving Data/Sample)

3. \_\_\_\_\_

(Organization/Section Receiving Data/Sample)

**Chain of Custody:**

1. \_\_\_\_\_

(Signature, Title, Date Deposition)

2. \_\_\_\_\_

(Signature, Title, Date Deposition)

3. \_\_\_\_\_

(Signature, Title, Date Deposition)

**Remarks:** \_\_\_\_\_

\_\_\_\_\_

**Form 2**

**Intermittent Sampling Chain-of-Custody Record**

**Reporting Organization:** \_\_\_\_\_ **Operator:** \_\_\_\_\_

**Sample Identification:**

Site	Filter #	Run Date	Site	Filter #	Run Date

**Sample Receiver:**

1. \_\_\_\_\_

(Organization/Section Receiving Data/Sample)

2. \_\_\_\_\_

(Organization/Section Receiving Data/Sample)

3. \_\_\_\_\_

(Organization/Section Receiving Data/Sample)

**Chain of Custody:**

1. \_\_\_\_\_

(Signature, Title, Date Deposition)

2. \_\_\_\_\_

(Signature, Title, Date Deposition)

3. \_\_\_\_\_

(Signature, Title, Date Deposition)

### Form 3

## Request for Laboratory Analysis

Collected By:

\_\_\_\_\_

Section, Branch, or Agency:

\_\_\_\_\_

Test Approved By:

\_\_\_\_\_

Date and Time Collected:

\_\_\_\_\_

Site:

\_\_\_\_\_

Address:

\_\_\_\_\_

Method of Collection:

\_\_\_\_\_

Purpose of Analysis:

\_\_\_\_\_

### Samples

<u>I.D. Number</u>	<u>Location</u>	<u>Lab I.D. Number</u>

Remarks/Comments

Chain-of-Custody

**Relinquished By:** \_\_\_\_\_ **Date/Time:** \_\_\_\_\_ **Was Seal Intact?**

**Yes / No**

**Received By:** \_\_\_\_\_ **Reason:** \_\_\_\_\_

**Relinquished By:** \_\_\_\_\_ **Date/Time:** \_\_\_\_\_ **Was Seal Intact?**

**Yes / No**

**Received By:** \_\_\_\_\_ **Reason:** \_\_\_\_\_

**Relinquished By:** \_\_\_\_\_ **Date/Time:** \_\_\_\_\_ **Was Seal Intact?**

**Yes / No**

**Received By:** \_\_\_\_\_ **Reason:** \_\_\_\_\_

**Form 4**

**Filter Holder & Data Card (actual size 9 1/2 x 11)**

Volumetric Flow Controlled PM <sub>10</sub> Information	PM <sub>10</sub> / HI-VOL DATA RECORD
Initial Stagnation Press.: _____	Site: _____
Initial Barometric Press.: _____	AIRS No.: _____
Initial Temperature: _____	Flow Controller Serial No.: _____
Initial Flow Rate: _____	Hi-Vol Serial No.: _____
Final Stagnation Press.: _____	Filter No.: _____
Final Barometric Press.: _____	Time Start: _____ 00:00
Final Temperature: _____	mo. day yr.
Final Flow Rate: _____	Flow Meter Reading: _____
Average Flow Rate: _____	Time Stop: _____ 24:00
	mo. day yr.
	Flow Meter Reading: _____
	Pickup Day: _____
	Sample Day: _____
	Final: _____
	Initial: _____
	Elapsed Time: _____
	Average VFC Flow Rate: _____
	<b>This filter was invalidated</b>
	by: _____ on: _____
	Remarks: _____
	<p><b>Sample was collected in accordance with the guidelines as set forth in the Indiana Department of Environmental Management, Office of Air Management, Quality Assurance Manual.</b></p>
	_____ Signature

## 13.0 Analytical Methods Requirements

### 13.1 Background

The methods used during this study are approved by U.S. EPA for the detection of the air toxics. Methodologies were selected to allow the agency to detect pollutants identified by the 1996 and 1999 National Air Toxics Assessment as being those that contribute the greatest amount of risk to the public in the ambient air in the area. All analytical methods used for this project are approved USEPA Compendium Methods.

### 13.2 Analysis Method

Instruments used in analysis are listed below.

**Table 13.1 Instrument List**

Instrument	Analysis	Reference
Hewlett Packard Gaschromatograph,(HPGC) Model 6890 with a 5973 Mass Selective Detector (GC/MS) interfaced to Tekmar Autocan preconcentrator	VOC for 63 HAP's collected in a SUMA canister	EPA Compendium method TO-15
HP GC Model 6890 interfaced with a six port valve and pressure differential system	Total Non Methane Organic Compounds (TNMOC) analysis of all VOC canister samples	EPA Compendium Method TO-12
Sartorius Balance, Model: AC211S	Gravimetric Analysis for PM-10 filters	40 CFR Part 50; Appendix-J
Inductively Coupled Plasma with Mass Spectrometer (ICP-MS)	Trace metals analysis by ERG	EPA Reference Method IO.3
High Pressure Liquid Chromatography (HPLC)	Carbonyl Analysis by ERG Laboratory	EPA Compendium Method TO-11A
Ion Chromatography (IC)	Hexavalent Chromium analysis by ERG	Modified CARB Method 039

## 14.0 QC Requirements

To assure the quality of data from air monitoring measurements, two distinct and important interrelated functions must be performed. One function is the control of the measurement process through broad quality assurance activities, such as establishing policies and procedures, developing data quality objectives, assigning roles and responsibilities, procedures, such as audits, calibrations, checks, replicates, routine self-assessments, etc. In general, the greater the control of a given monitoring system, the better will be the resulting quality of the monitoring data.

### 14.1 Sampling

Quality Control (QC) is the overall system of technical activities that measures the attributes and performance of a process. In the case of the ATMP, QC activities are used to ensure that measurement uncertainty, as discussed in Section 7, is maintained within acceptance criteria for the attainment of the DQO. Figure 14.1 represents a number of QC activities that help to evaluate and control data quality for the program. Many of the activities in this figure are implemented by the Air Division and are discussed in the appropriate sections of this QAPP.

#### 14.1.1 Air Canister Sampling Quality Control/Quality Assurance

**General Site Check:** This involves sampler and instrument checks at the site. On a monthly basis the site check will be performed by Air Toxics Monitoring Section's personnel. See Appendix G for details involving a site check.

1. **Sampler Assembly Cleanliness Check:** This is required every 6 months. The entire sampler assembly will be flushed with hot, hydrocarbon free zero-grade air for two hours at approximately 40-50 cc/min. A certified canister will then be attached and the sampler will be allowed to sample the zero grade air until the canister is pressurized to approximately 20 psia. The canister will then be analyzed by the Air Toxics Section according to the procedure found in Appendix F using a GC/FID system. Cleanliness is defined as <10 ppbv TNMOC.

If a sampler fails the certification then the cleaning process is continued until it passes the certification.

2. **Flow Controller Stability Verification:** Mass flow controllers for canister systems will be verified for stability every 6 months by the Quality Assurance Section. Flow rate can't fluctuate more than  $\pm 20\%$  in a 24 hour period. An approved NIST traceable bubble meter and stopwatch, or NIST traceable flow meter will be used as the primary standard. For *verification*, two flows are to be taken; one at the beginning of
-



the 24 hour period, and one at the end. The two flows must correlate to the above stated tolerance.

3. Sample Integrity Logbook Audit: All canisters must have a final pressure of 15 - 30 psia (21.0 psia is ideal) or the canister sample is invalid. An elapsed time meter reading of  $1440 \pm 60$  minutes is required or the canister sample data is flagged.
4. Canister Integrity: Before the sample is taken, the evacuated pressure of the canister will be verified by field personnel to determine canister integrity. After sampling, the sample canister pressure will be verified by laboratory personnel, and it must meet the specifications above to ensure sample integrity.
5. Elapsed Time Meter Certifications: These are required every 6 months. Some of these time meters are built-in to the samplers. Elapsed time meters (ETM's), or other built-in timing device will be certified every 6 months by the Quality Assurance Section at  $\pm 1.0$  minute tolerance per 24 hour certification test period.
6. Condensation Control: This is part of the monthly site check performed by the Ambient Monitoring and Toxics Sections. Water droplets in the manifold will indicate that condensation has occurred. If condensation has occurred, the canister data will be deemed invalid for the appropriate period.
7. Replacement of or physical trauma to components in any system warrants recertification.

#### **14.1.2 Analysis Quality Control/Quality Assurance**

**Precision:** Analysis precision audits will be performed by duplicate independent analysis of a single canister with each batch of canisters analyzed. Ten percent of all samples are projected to undergo duplicate analysis. The Air Toxic Section also participates in an EPA sponsored Performance Testing Audit program (PT Audit) which is available to all States participates in a National Air Toxic Trend Sites (NATTS) to track analysis precision. PT audits will be done twice a r year. Analytical results are expected to be within 30%. The Quality Assurance Section will review the audit results. If any discrepancies in data between the states are found, appropriate corrective action will be coordinated by both sections to remedy the situation.

**Accuracy:** Air Toxics personnel will perform analysis accuracy audits by direct analysis of humidified NIST gas standards. Accuracy standards will be analyzed every other analytical run.

**Quality Control Standards:** Three quality control standards have been provided by the EPA for the calibration of the VOC analysis equipment. After initial calibration, all systems are checked weekly with at least one of the quality control standards to ensure that the continuing calibration of each instrument meets the EPA QA/QC guidelines.

Blanks:

VOC blanks are run for each analytical run to determine system contamination. In this case, zero is defined as less than 0.2 ppbC per target compound. If it is not “zero”, final data can still be submitted to the AQS database, however, the Air Toxics Section will need to identify the source of contamination.

Table 14.1 Blanks Process

<b>Parameter</b>	<b>Blank Process</b>	<b>Baseline</b>	<b>Frequency</b>
PM10 Metals	Analyze a strip of a blank filter from the same lot with each batch of sample analysis	Blank concentration is reported to AQS	With each batch of filters analyzed
VOC	Humidified zero air blank is run with each batch of canisters analyzed	<0.2 ppbC per target compound	With each run
Aldehydes	Duplicate DNPH cartridges setup but not run	Blank concentration is reported to AQS	With each batch analysis
Chromium VI	Field blanks are run twice a month	Blanks results are submitted to AQS	2 /month

## 14.2 Data Precision and Accuracy

Procedures currently used to report precision and accuracy of criteria pollutants are also used to assess precision and accuracy of selected toxic air pollutant species (see Attachments 2 and 3). These procedures conform to 40 CFR Part 58, Appendix A, and “U.S. EPA Quality Assurance Handbook for Air Pollution Measurement Systems Volume 1, Principles” (see Reference 10). Detailed procedures are described in Chapter 13 of the IDEM/OAQ/QA Manual (see Reference 9).

Since no precision and accuracy limits are initially defined, outliers will not be included when audit data is assessed. Testing for outliers will be performed using procedures found in the U.S. EPA Quality Assurance Handbook for Air Pollution Measurement Systems Volume 1, Appendix F. A separate listing of outliers will be maintained and available on request. Outliers will be dealt with according to corrective action procedures (see Section 3.11).

#### **14.2.1 Entire System Precision**

The quantitative difference between data duplicate samples will determine the entire system's precision.

#### **14.2.2 Entire System Accuracy**

The entire VOC measurement system's accuracy will be determined by the quantitative difference between (1) data obtained by analysis of a canister filled with challenge compounds (NIST standards) drawn through the entire sampling apparatus, and (2) the known values of the NIST gas standards. The quantitative difference between two independent measurements of a single canister sample will determine analysis accuracy. Recoveries of each challenge compound should be 80-120%. Overall system specific recovery (the average of the individual compound recoveries) should be 85-115%. The challenge sample percent recoveries are used to gauge potential additive/subtractive bias characteristics for each specific sampling system.

#### **14.2.3 VOC Analysis Accuracy**

The quantitative difference between data obtained using direct analysis of humidified NIST standards and known values of the standards will determine analysis accuracy.

#### **14.2.4 VOC Canister Sampling Precision**

Sampling precision will be calculated from the difference in the overall system precision and the analysis precision.

#### **14.2.5 VOC Canister Sampling Accuracy**

Sampling accuracy will be calculated from the difference in the overall system accuracy and the analysis accuracy.

#### **14.2.6 Reporting Agency Accuracy and Precision**

The precision and accuracy of the reporting agency will be calculated using results from all reporting sites.

## **15.0 Testing and Maintenance**

IDEM OAQ Air Monitoring Lab will follow the procedures as detailed in the Standard Operating Procedures (SOP) for the Air monitoring Lab for testing of the equipment. SOPs for the lab are attached in appendix B through G.

IDEM will follow procedures as detailed in the instrumentation manuals as provided by the manufacturers of the machines for maintenance of equipment.

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## 16.0 Calibration

Because the requirements of the programs for analytical system calibrations differ, the programs are discussed separately in this section. Each calibration is stored, electronically and hardcopy, with the samples analyzed using that calibration. All programs store the calibration information separately with all pertinent information (raw data, control charts, and/or any summary statistics) together with the analyzed samples. Each of the analytical systems is calibrated for all of the reported target analytes. For more information on the calibration of equipment please see appendix H.

Analytical instruments and equipment are calibrated prior to each use or on a scheduled periodic basis. Analytical methods requiring calibration standards are governed by SOPs for laboratory standards. Appropriate standards are prepared by serial dilutions of pure substances or accurately prepared concentrated solutions. Many analytical instruments have high sensitivity, so calibration standards must be extremely dilute solutions. In preparing stock solutions of calibration standards, great care is exercised in measuring weights and volumes, since analyses following the calibration are based on the accuracy of the calibration. Calibration requirements for the HAPs analytical methods are shown in Table 16.1.

**Table 16.1 HAP Analytical Equipment Calibrations**

Analytical Parameter	Quality Parameter	Method of Determination	Frequency	Acceptance Criteria
GC/MS (8270C)	Calibration Quantitative	Initial analysis of standards at 5 levels bracketing sample concentrations	Prior to sample analysis	Variability of average Relative Response Factor < 30%
	Calibration Calibration Check Compounds	With calibration standards	Prior to sample analysis	Percent Difference with curve MUST be <30%
	Calibration System	With calibration standards	Prior to sample analysis	Minimum Relative Response Factor for
	Performance Check Compounds			Check Compounds <input type="checkbox"/> 0.050

	Calibration - Daily calibration check	Every 12 hours	Prior to sample analysis	Relative percent difference compared to mean of calibration curve <20%
	Calibration - Blanks	20% of samples	Concurrent with sample analysis	Analytes < Method Detection Limit
Hexavalent Chromium	Calibration Quantitative	Initial analysis of 4 levels of standards bracketing sample concentrations	Daily	Linear correlation coefficient > 0.995
	Filter Blanks	After calibration standards	Every batch	Less than method detection limit of 0.434 ng/filter
	Continuing Calibration Check	Analysis of mid-range calibration standard	Every 10 samples	90-110% of expected value

## **17.0 Inspection of Supplies**

### **17.1 Purpose**

The purpose of this element is to establish and document a system for inspecting and accepting all supplies and consumables that may directly or indirectly affect the quality of the Program. By having documented inspection and acceptance criteria, consistency of the supplies can be assured. This section details the supplies/consumables, their acceptance criteria, and the required documentation for tracing this process.

### **17.2 Acceptance Criteria**

Acceptance criteria must be consistent with overall project technical and quality criteria. It is the laboratory analyst's responsibility to update the criteria for acceptance of consumables. As requirements change, so do the acceptance criteria. Knowledge of laboratory equipment and experience are the best guides to acceptance criteria. Other acceptance criteria such as observation of damage due to shipping can only be performed once the equipment has arrived on site.

### **17.3 Tracking and Quality Verification of Supplies and Consumables**

Tracking and quality verification of supplies and consumables have two main components. The first is the need of the end user of the supply or consumable to have an item of the required quality. The second need is for the purchasing department to accurately track goods received so that payment or credit of invoices can be approved. In order to address these two issues, the following procedures outline the proper tracking and documentation procedures to follow:

Receiving personnel will perform an initial inspection of the packages as they are received from the courier or shipping company. Note any obvious problems with a receiving shipment such as crushed box or wet cardboard.

The package will be opened, inspected, and contents compared against the packing slip.

If there is a problem with the equipment/supply, note it on the packing list and notify the Purchasing Agent who will immediately call the vendor. If the equipment/supplies appear to be complete and in good condition, sign and date the packing list and sent to the Purchasing Agent so that payment can be made in a timely manner.

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Notify appropriate personnel that equipment/supplies are available. For items such as the filters, it is critical to notify the laboratory manager of the weigh room so sufficient time for processing of the filters can be allowed.

Equipment/supplies are stocked in an appropriate pre-determined area.



## 18.0 Data Acquisition Requirements

This section addresses data not obtained by direct measurement from air toxics monitoring during this project.

Air toxics monitoring relies on data that are generated through field and laboratory operations; however, other significant data are obtained from sources outside IDEM or from historical records. This section lists this data and addresses quality issues related to the monitoring.

### 18.1 Chemical and Physical Properties Data

Physical and chemical properties data and conversion constants are often required in the processing of raw data into reporting units. This type of information that has not already been specified in the monitoring regulations will be obtained from nationally and internationally recognized sources. Other data sources may be used with approval of the Air Division QA Officer.

- National Institute of Standards and Technology (NIST);
- ISO, IUPAC, ANSI, and other widely-recognized national and international standards organizations;
- U.S. EPA;
- The current edition of certain standard handbooks may be used without prior approval of the IDEM QA Officer.

### 18.2 Sampler Operation and Manufacturers' Literature

Another important source of information needed for sampler operation is manufacturers' literature. Operations manuals and users' manuals frequently provide numerical information and equations pertaining to specific equipment. IDEM personnel are cautioned that such information is sometimes in error, and appropriate cross-checks will be made to verify the reasonableness of information contained in manuals. Whenever possible, the field operators will compare physical and chemical constants in the operators manuals to those given in the sources listed above. If discrepancies are found, determine the correct value by contacting the manufacturer. The following types of errors are commonly found in such manuals:

- insufficient precision;
- outdated values for physical constants;
- typographical errors;
- incorrectly specified units;
- inconsistent values within a manual, and
- use of different reference conditions than those called for in EPA regulations.

### **18.3 Geographic Location**

Another type of data that will commonly be used in conjunction with the Monitoring Program is geographic information. The IDEM located sites using global positioning systems (GPS) that meet EPA Locational Data Policy of 25 meters accuracy. USGS maps were used for locating and siting stations for the project.

### **18.4 External Monitoring Data Bases**

Data from the EPA -AQS database may be used in published reports with appropriate caution. Care must be taken in reviewing/using any data that contain flags or data qualifiers. If data is flagged, such data shall not be utilized unless it is clear that the data still meets critical QA/QC requirements. It is impossible to assure that a data base such as AQS is completely free from errors including outliers and biases, so caution and skepticism is called for in comparing Southwest Indianapolis data from other reporting agencies as reported in AQS. Users should review available QA/QC information to assure that the external data are comparable with IDEM measurements and that the original data generator had an acceptable QA program in place.

### **18.5 Lead and Speciated Particulate Data**

IDEM has been routinely monitoring airborne lead since the 1981. Early data is likely to be problematic because of significantly higher detection limits. Caution is needed in directly comparing this data because of the difference in size fractions.

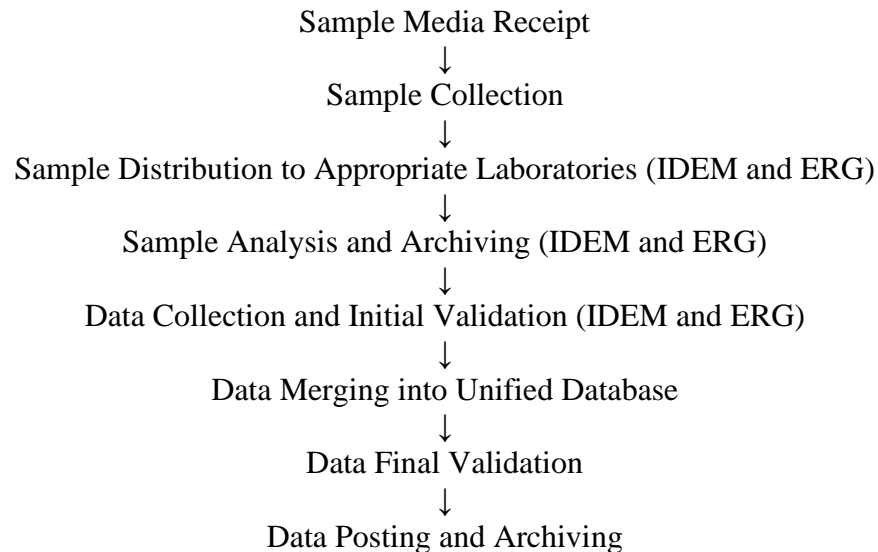
### **18.6 U.S. Weather Service Data**

Meteorological information is gathered from the U.S. Weather Service station at the Indianapolis International Airport. Parameters include: temperature, relative humidity, barometric pressure, rainfall, wind speed, wind direction, cloud type/layers, percentage cloud cover and visibility range. No changes to the way in which these data are collected are anticipated due to the addition of the air toxics data.

## 19.0 Data Management

### 19.1 Background and Overview

This section describes the data management operations pertaining to this project. This includes an overview of the mathematical operations and analyses performed on raw (“as-collected”) data. These operations include data recording, validation, transformation, transmittal, reduction, analysis, management, storage, and retrieval. Data processing for air toxics data are summarized in Figure 19.1. Data processing steps are integrated, to the extent possible, into the existing data system used for the IDEM air toxics network.



**Figure 19.1: Data processing steps for the project**

### 19.2 Data Recording

Data entry, validation, and verification functions are all integrated in the database. Bench sheets shown in Figure 19.1 are entered by laboratory personnel. Procedures for filling out the laboratory sheets and subsequent data entry are provided in SOPs listed in Appendix B-G

### 19.3 Data Validation

Data validation is a combination of checking that data processing operations have been carried out correctly and of monitoring the quality of the field operations. Data validation can identify problems in either of these areas. Once problems are identified, the data can be corrected or invalidated, and corrective actions can be taken for field or

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laboratory operations. Numerical data stored in the database are never internally overwritten by condition flags. Flags denoting error conditions or QA status are saved as separate fields in the data base, so that it is possible to recover the original data.

The following validation functions are incorporated into the data processing procedure to ensure quality of data entry and data processing operations:

- **Range Checks** - almost all monitored parameters have simple range checks programmed in. For example, valid times must be between 00:00 and 23:59, summer temperatures must be between 10 and 50 degrees Celsius, etc. The data entry operator is notified when an entry is out of range. The operator has the option of correcting the entry or overriding the range limit. The specific values used for range checks may vary depending on season and other factors. Since these range limits for data input are not regulatory requirements, the Air Division QA Officer may adjust them from time to time to better meet quality goals.
- **Completeness Checks** - When the data are processed certain completeness criteria must be met. For example, each sample must have a start time, an end time, an average flow rate, dates weighed or analyzed and operator and technician names. The data entry operator will be notified if an incomplete record has been entered before the record can be closed.
- **Internal Consistency and Other Reasonableness Checks** -Several other internal consistency checks are built into the database. For example, the end time of a sample must be greater than the start time. Computed filter volume (integrated flow) must be approximately equal to the exposure time multiplied by the nominal flow. Additional consistency and other checks will be implemented as the result of problems encountered during data screening..
- **Data Retention** - Raw data sheets are retained on file for a minimum of two years, and are readily available for audits and data verification activities. After two years, hardcopy records and computer backup media are cataloged and boxed for storage at the warehouse. Physical samples such as filters shall be discarded with appropriate attention to proper disposal of potentially hazardous materials.
- **Statistical Data Checks** - Errors found during statistical screening will be traced back to original data entry files and to the raw data sheets, if necessary. These checks shall be run on a monthly schedule and prior to any data submission to AQS. Data validation is the process by which raw data are screened and assessed before it can be included in the main data base.

Table 19.1 summarizes the validation checks applicable to the data.

Table 19.1 Validation Check Summaries

	Electronic Transmission and Storage	Manual Checks	Automated Checks
Data Parity and Transmission Protocol Checks	X		
Date and Time Consistency		X	X
Completeness of Required Fields		X	X
Range Checking		X	X
Statistical Outlier Checking		X	X
Manual Inspection of Charts and Reports		X	
Field and Lab Blank Checks		X	

#### 19.4 Data Transformation

Calculations for transforming raw data from measured units to final concentrations are relatively straightforward.

#### 19.5 Data Transmittal

Data transmittal occurs when data are transferred from one person or location to another or when data are copied from one form to another. Some examples of data transmittal are copying raw data from a notebook onto a data entry form for keying into a computer file and electronic transfer of data over a telephone or computer network.

Table 19.2 summarizes the data transfer operations.

Table 19.2 Data Transfer Operations

Description of Data Transfer	Originator	Recipient	QA Measures Applied
Keying Data into The Database	Laboratory Technician (hand-written data form)	Data Processing Personnel	
Electronic data transfer	(between computers or over network)		Parity Checking; transmission protocols
Filter Receiving and Chain-of-Custody	Filter Technician	The database computer (technician enters data at a local terminal)	Sample numbers are verified automatically; reports indicate missing filters and/or incorrect data entries
Calibration and Audit Data	Auditor or field supervisor	Air Quality Field Supervisor	Entries are checked by Air Quality Supervisor and QA Officer
AQS data summaries	Air Quality Supervisor	AQS (U.S. EPA)	Entries are checked by Air Quality Supervisor and QA Officer

IDEM will report all ambient air quality data and information specified by the AQS Users Guide (Volume II, Air Quality Data Coding, and Volume III, Air Quality Data Storage), coded in the AIRS-AQS format. Such air quality data and information will be fully screened and validated and will be submitted directly to the AIRS-AQS via electronic transmission, in the format of the AIRS-AQS, and in accordance with the monthly schedule.

### 19.6 Data Reduction

Data reduction processes involve aggregating and summarizing results so that they can be understood and interpreted in different ways. Examples of data summaries include:

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

The Audit Trail is another important concept associated with data transformations and reductions. An audit trail is a data structure that provides documentation for changes

made to a data set during processing. Typical reasons for data changes that would be recorded include the following:

- corrections of data input due to human error;
- application of revised calibration factors;
- addition of new or supplementary data;
- flagging of data as invalid or suspect;

The audit trail is implemented as a separate worksheet in the database. Audit trail records will include the following fields:

- operator's identity;
- date and time of the change;
- location of the changed data item;
- reason for the change;
- information for the item changed (date, time, site location, parameter, etc.);
- value of the item before and after the change.

### **19.7 Data Summary**

IDEM is currently developing the data summary and analysis protocol. It is anticipated that as the project develops, the data analysis procedures will evolve.

### **19.8 Data Tracking**

The database contains the necessary input functions and reports necessary to track and account for the whereabouts of filters and the status of data processing operations for specific data. Information about filter location is updated at the data entry terminal at the points of significant operations. In most cases the tracking data base and the monitoring data base are updated simultaneously. For example, when the filter is pre-weighed, the weight is entered into the monitoring data base and the filter number and status are entered into the tracking data base. For the VOC system, the sample handling is different. The VOC canisters are reused many times before they are retired from field use. Each canister has its own unique code that designates the can number. When the canister is sent into the field, a canister number becomes a portion of the tracking code. This allows the sample that was in the canister to be tracked.

### **19.9 Data Storage and Retrieval**

IDEM data archival policies for the data are shown in Table 19.3.

Table 19.3 Data Archive Policies

Data Type	Medium	Location	Retention Time	Final Disposition
Weighing records; chain of custody forms	Hardcopy	Laboratory	10 years	Discarded
Laboratory Notebooks	Hardcopy	Laboratory	10 years	Discarded
Field Notebooks	Hardcopy	Air Monitoring Branch	10 years	Discarded
Data Base and Audit Trail records	Electronic (on-line)	Air Monitoring Branch	indefinite (may be moved to backup media after 2 years)	Backup media retained indefinitely
PM10 Quartz filters	Filters	Warehouse	10 years	Discarded
VOC canisters	metal can	Laboratory	reused after cleaning	Recycled

ERG data archival policies can be found in the referenced QAPP document for that laboratory.



## **20.0 Assessments and Response Actions**

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

The results of quality assurance assessments indicate whether the control efforts are adequate or need to be improved. Documentation of all quality assurance and quality control efforts implemented during the data collection, analysis, and reporting phases is important to data users, who can then consider the impact of these control efforts on the data quality (see Section 21). Both qualitative and quantitative assessments of the effectiveness of these control efforts will identify those areas most likely to impact the data quality and to what extent. In order to ensure the adequate performance of the quality system, IDEM will perform the following assessments:

### **20.1 Assessment Activities and Project Planning**

#### **20.1.1 Network Reviews**

Network reviews determine conformance with network requirements of the monitoring network through annual review. The network review is used to determine how well a particular air monitoring network is achieving its required air monitoring objective, and how it should be modified to continue to meet its objective. The Air Monitoring Branch will be responsible for conducting the network review.

Prior to the implementation of the network review, significant data and information pertaining to the review will be compiled and evaluated. Such information might include the following:

- network files (including updated site information and site photographs);
- AQS reports (AMP220, 225, 380, 390, 450);
- air quality summaries;
- air toxics emissions trends reports for major metropolitan area;
- emission information, such as emission density maps for the region in which the monitor is located and emission maps showing the major sources of emissions;
- National Weather Service summaries for monitoring area.

Upon receiving the information it will be checked to ensure it is the most current. Discrepancies will be noted on the checklist and resolved during the review. Files and/or

photographs that need to be updated will also be identified. The following categories will be emphasized during network reviews:

Adequacy of the network will be determined by using the following information:

- maps of historical monitoring data;
- maps of emission densities
- dispersion modeling
- special studies/saturation sampling;
- best professional judgment
- GIS updates.

### **Location of Monitors**

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

During the network review, the stated objective for each monitoring location or site (see section 10) will be “reconfirmed” and the spatial scale “reverified” and then compared to each location to determine whether these objectives can still be attained at the present location.

### **Other Discussion Topics**

In addition to the items included in the checklists, other subjects for discussion as part of the network review and overall adequacy of the monitoring program will include:

- relocation of existing monitors;
- siting criteria problems and suggested solutions;
- problems with data submittals and data completeness;
- maintenance and replacement of existing monitors and related equipment;
- quality assurance problems;
- air quality studies and special monitoring programs;
- other issues;
  - proposed regulations;
  - funding.

### **20.1.2 Technical Systems Audits**

A TSA is a thorough and systematic on-site qualitative audit, where facilities, equipment, personnel, training, procedures, and record keeping are examined for conformance to the QAPP. TSAs of the project will be conducted by IDEM every year. The QA Section will implement the TSA either as a team or as an individual auditor.

Key personnel to be interviewed during the audit are those individuals with responsibilities for: planning, field operations, laboratory operations, QA/QC, data management, and reporting.

The audit finding form has been designed such that one is filled out for each major deficiency that requires formal corrective action. The finding should include items like: systems impacted, estimated time period of deficiency, site(s) affected, and reason of action. The finding form will inform the AMB Chief about serious problems that may compromise the quality of the data and therefore require specific corrective actions. These are discussed and a course of resolution is determined.

Within thirty (30) calendar days of the completion of the audit, the audit report will be prepared and submitted. The systems audit report will be submitted to the applicable branch managers and appropriately filed. The report will include an agreed-upon schedule for corrective action implementation.

### **Follow-up and Corrective Action Requirements**

The QA Office and the audited Branch Sections will work together to implement required corrective actions. As part of corrective action and follow-up, an audit finding response memo will be generated by the AMB within 30 days of acceptance of the audit report.

### **20.1.3 Performance Audit**

A Performance Audit is a field operations audit that ascertains whether the samplers are operating within the specified limits as stated in the SOPs and QAPP. The Performance Audit is performed is normally done in conjunction with the field TSA. Independent Performance audits are not deemed necessary since challenging sampler operation using independent NIST-traceable orifices or other flow devices is ongoing throughout the project. If US EPA Region V conducts a performance audit during project operation the results will be included in the TSA report.

### **20.1.4 Data Quality Assessments**

A data quality assessment (DQA) is the statistical analysis of environmental data to determine whether the quality of data is adequate to support the decision which are

based on the DQOs. Data are appropriate if the level of uncertainty in a decision based on the data is acceptable. The DQA process is described in detail in *Guidance for the Data Quality Assessment Process*, EPA QA/G-9 and is summarized below.

1. Review the data quality objectives (DQOs) and sampling design of the program: review the DQO. Define statistical hypothesis, tolerance limits, and/or confidence intervals.
2. Conduct preliminary data review. Review Precision & Accuracy (P&A) and other available QA reports; calculate summary statistics, plots and graphs. Look for patterns, relationships, or anomalies.
3. Select the statistical test: select the best test for analysis based on the preliminary review, and identify underlying assumptions about the data for that test.
4. Verify test assumptions: decide whether the underlying assumptions made by the selected test hold true for the data and the consequences.
5. Perform the statistical test: perform test and document inferences. Evaluate the performance for future use.

Data quality assessment will be included in the Quality Assurance Assessment Reports. Details of these reports are discussed in Section 21.

Measurement uncertainty will be estimated for both automated and manual methods. Terminology associated with measurement uncertainty are found within 40 CFR Part 58 Appendix A and includes: (a) Precision - a measurement of mutual agreement among individual measurements of the same property usually under prescribed similar conditions, expressed generally in terms of the standard deviation; (b) Accuracy- the degree of agreement between an observed value and an accepted reference value, accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; (c) Bias-the systematic or persistent distortion of a measurement process which causes errors in one direction. The individual results of these tests for each method or analyzer shall be reported to EPA.

Estimates of the data quality will be calculated on the basis of single monitors and aggregated to all monitors.

### **20.1.5 Performance Evaluations**

The PE is an assessment tool for the laboratory operations. The State's Laboratory Division creates "blind" samples and sends them periodically to the District's laboratory. Upon receipt, the laboratory logs in the samples and performs the normal handling routines as any other sample. The PE is analyzed in accordance with the SOPs and QAPP. The results are then sent to the Laboratory Branch Manager for final review. Then the results are reported to the State's Laboratory Director. The State's

laboratory writes up a PE report and sends a copy of the results to the Laboratory Branch Manager and the EPA QA Office. Any results outside of the State's acceptance criteria are then noted in the PE report. IDEM has 120 days to address any deficiencies noted in the PE Report

Table 20.1 Interlaboratory/Independent Sample Assessment

<b>Parameter</b>	<b>Assessment</b>	<b>Frequency</b>
PM10	EPA Flow Transfer Standard	Annually
VOC	EPA's PT Audits	Every six months
Aldehydes - DNPH cartridges	EPA's Inter lab Audit	Every six months
Chromium VI	Duplicate sampling and analysis	10% of the samples

## 21.0 Reports to Managers

IDEM and City managers are involved in the day to day activities and are constantly being informed of any problems associated with the quality of the monitoring being performed. Staff provide periodic updates to managers through verbal report, e-mail, and notes alerting management of any quality concerns. In addition, management oversees the daily operations of the monitoring and is able to identify any quality issues that may be overlooked by staff.

IDEM will report monitoring results to the Technical Advisory Group (TAG) on a quarterly basis. These reports will also contain any quality problems encountered and the remedies applied to correct any problems.

Table 21.1 Reporting Schedule

<b>Report</b>	<b>Contents</b>	<b>Frequency</b>
Site Inspections	Details current site operations and safety issues	Quarterly Annually
PARS/AQS	Audit summary results and statistics	Quarterly Annually
VDR	Quantity of data collected	Quarterly Annually
Quality Assurance Assessment Report	Network Review TSA DQA	Annual Project Completion
Annual Report		Annual

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## 22.0 Data Review

### 22.1 Data Review Design

The primary purpose of this section is to describe the data validation procedures which may be used by IDEM to process ambient air toxics data. Data validation refers to those activities that may be performed after the fact, that is, after the data have been collected. The difference between data validation and quality control techniques is that the quality control techniques attempt to minimize the amount of bad data being collected, while data validation seeks to prevent any bad data from getting through the data collection and storage systems.

It is preferable that data review be performed as soon as possible after the data collection, so that the questionable data can be checked by recalling information on unusual events and on meteorological conditions which can aid in the validation. Also, timely corrective actions should be taken when indicated to minimize further generation of questionable data.

Personnel performing data review should:

- Be familiar with typical diurnal concentration variations (e.g., the time daily maximum concentrations occur and the interrelationship of pollutants.) For example, benzene, toluene and xylene concentrations usually increase and decrease together, due to these being attributed to mobile sources, whereas, metals are usually attributable to manufacturing process, and may have a longer temporal cycle.
- Be familiar with the type of instrument malfunctions which cause characteristic trace irregularities.
- Recognize that cyclical or repetitive variations (at the same time each day or at periodic intervals during the day) may be caused by excessive line voltage or temperature variations. Nearby source activity can also cause erroneous or non-representative measurements.
- Recognize that flow traces showing little or no activity often indicate flow problems, or sample line leaks.

There is a wide variety of information with which to validate air toxics data. Among them are the following, along with their uses:

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- Multi-point Calibration Forms - the multipoint forms should be used to establish proper
- initial calibration and can be used to show changes in the calibration;
- Span Control Charts - these charts will be the most valuable tool in spotting data that is out of control limits;
- Site and Instrument Logs - because all station activities are noted in one or both of these logs, one can obtain a good picture of station operations by reading these logs
- Data From Other Air Quality Stations - data from other air quality stations nearby can be compared between two stations to help the identification of invalid data.
- Blanks, Replicates and Spikes - these QC indicators can be used to ascertain whether sample handling or analysis is causing bias in the data set.
- Monthly Summary Reports - The Monthly Summary Reports are outputs from the
- Analytical Laboratory OAMTDC database. These reports are “canned” reports provided by the computer vendor who writes the interface software. These reports provide the following information:
  - Completeness report;
  - Initial Calibration Report from the Analytical Instruments;

### **22.1.1 Data Identification Checks**

Data with improper identification codes are useless. Three equally important identification fields which must be correct are time, location, parameter and sampler ID.

### **22.1.2 Unusual Event Review**

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

### **22.1.3 Relationship Checks**

Toxics data sets contain many physically or chemically related parameters. These relations can be routinely checked to ensure that the measured values on an individual



parameter do not exceed the corresponding measured values of an aggregate parameter which includes the individual parameter. For example, benzene, toluene and xylene are mobile source driven. The relative concentrations are within +/- 10 ppbv, if these values are recorded at the same time and location. Data sets in which individual parameter values exceed the corresponding aggregate values are flagged for further investigation. Minor exceptions to allow for measurement system noise may be permitted in cases where the individual value is a large percentage of the aggregate value.

#### **22.1.4 Review of Spikes, Blanks and Replicates**

An additional check of the data set is to verify that the spikes, blanks and replicate samples have been reviewed. Generally, recovery of spikes in samples should be greater than 80%. Blanks should not be more than 3 times the MDL for any compound. The difference in concentration of replicates should be within +/- 10%. If any of these are outside of this boundary, then the reviewer should notify the air monitoring branch supervisor for direction. The air branch supervisor will discuss these results with the lab branch supervisor and the QA officer. The three will decide whether any of these results can or will invalidate a single run or batch.

### **22.2 Procedures**

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

- Data Plots
- Ratio Test
- Students "t-test"

#### **22.2.1. Tests for Historical and Temporal Consistency**

These tests check the consistency of the data set with respect to similar data recorded in the past. In particular these procedures will detect changes where each item is increased by a constant or by a multiplicative factor. Gross limit checks are useful in detecting data values that are either highly unlikely or considered impossible. The use of upper and lower 95% confidence limits is very useful in identifying outliers.

#### **22.2.2 Pattern and Successive Difference Tests**

These tests check data for pollutant behavior which has never or very rarely occurred in the past. Values representing pollutant behavior outside of these predetermined limits are then flagged for further investigation. Pattern tests place upper limits on:

- The individual concentration value (maximum-hour test),
- The difference in adjacent concentration values (adjacent hour test),
- The difference or percentage difference between a value and both of its adjacent values (spike test), and
- The average of three or more consecutive values (consecutive value test)

### **22.2.3 Parameter Relationship Tests**

Parameter relationship tests can be divided into deterministic tests involving the theoretical relationships between parameters (e.g., ratios between benzene and toluene) or empirical tests which determine whether or not a parameter is behaving normally in relation to the observed behavior of one or more other parameters. Determining the “normal” behavior of related parameters requires the detailed review of historical data.

## **23.0 Data Validation**

Many of the processes for verifying and validating the measurement phases of the data collection operation have been discussed in Section 22. If these processes, as written in the QAPP, are followed, and the sites are representative of the boundary conditions for which they were selected, one would expect to achieve the DQOs. However, exceptional field events may occur, and field and laboratory activities may negatively affect the integrity of samples. In addition, it is expected that some of the QC checks will fail to meet the acceptance criteria. This section will outline how IDEM will take the data to a higher level of analysis. This will be accomplished by performing software tests, plotting and other methods of analysis.

### **23.1 Process for Validating and Verifying Data**

#### **23.1.1 Verification of Samples**

After a sample batch is completed, a thorough review of the data will be conducted for completeness and data entry accuracy. For the chromatographic data, the data will be reviewed by another staff member for routine data outliers and data outside of acceptance criteria. These data will be flagged appropriately. All flagged data will be “reverified” that the values are entered correctly. The entries are compared to reduce the possibility of entry and transcription errors. Once the data is entered into the Office of Air Management Air Toxic Database (OAMTDC) database the system will review the data for routine data outliers and data outside of acceptance criteria.. The data qualifiers or flags can be found in the SOPs.

#### **23.1.2 Validation**

Validation of measurement data will be archived for 10 years. Information will include a brief summary of why the sample was invalidated along with the associated flags. This record will be available on the OAMTDC since all samples that were analyzed will be recorded. At least one flag will be associated with an invalid sample, that being the “INV” flag signifying invalid, or the “NAR” flag when no analysis result is reported, or “BDL” which means below the detection limit..

#### **Validation of Measurement Values**

Certain criteria based upon field operator and laboratory technician judgment have been developed that will be used to invalidate a sample or measurement. The flags listed in

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table 23.1 will be used to determine if individual samples, or samples from a particular instrument will be invalidated. In all cases the sample will be returned to the laboratory for further examination. When the laboratory technician reviews the field sheet and chain-of-custody forms he/she will look for flag values.

Filters that have flags related to obvious contamination (CON), filter damage (DAM), field accidents (FAC) will be immediately examined. Upon concurrence of the laboratory technician and laboratory branch manager, these samples will be invalidated. The flag “NAR” for no analysis result will be placed in the flag area associated with this sample, along with the other associated flags. Other flags listed may be used alone or in combination to invalidate samples. Since the possible flag combinations are overwhelming and can not be anticipated, the air division will review these flags and determine if single values or values from a site for a particular time period will be invalidated. The division will keep a record of the combination of flags that resulted in invalidating a sample or set of samples. As mentioned above, all data invalidation will be documented. Table 23.1 contains criteria that can be used to invalidate single samples based on single flags.

**Table 23.1 Single Flag Invalidation Criteria for Single Samples**

<b>Requirement</b>	<b>Flag</b>	<b>Comment</b>
Contamination	CON	Concurrence with lab technician and branch manager
Filter Damage	DAM	Concurrence with lab technician and branch manager
Event	EVT	Exceptional, known field event expected to have affected sample. Concurrence with lab technician and branch manager
Laboratory Accident	LAC	Concurrence with lab technician and branch manager
Below Detection Limits	BDL	Value is below the Minimum Detection Limit of the analytical system
Field Accident	FAC	Concurrence with lab technician and branch manager

## 23.2 Data Analysis

Data analysis refers to the process of attempting to make sense of the data that are collected. By examining the list in Table 5-1, there are a large number of parameters to analyze. However, many of these have similar characteristics.

This section will state how IDEM will begin to analyze the data to ascertain what the data illustrates and how it should be applied.

### 23.2.1 Analytical tests

IDEM will employ several software programs towards analyzing the data. These are listed below with a short explanation of each.

**Spreadsheet** - IDEM will perform a rudimentary analysis on the data sets using EXCEL spreadsheets. Spreadsheets allow the user to input data and statistically analyze, plot and graph linear data. This type of analysis will allow the user to see if there are any variations in the data sets. In addition, various statistical tests such as tests for linearity, slope, intercept or correlation coefficient can be generated between two strings of data. Box and Whisker, Scatter and other plots can be employed. Time series plots can help identify the following trends:

- Large jumps or dips in concentrations
- periodicity of peaks within a month or quarter
- Expected or un-expected relationships among species

**VOCDat**- As stated in Section 22, the EPA has placed resources into creating software that can analyze data. One such program is VOCDat. This software program was originally written for input of PAMS data.. VOCDat is a Windows-based program that provides a graphical platform from which to display collected VOC data; to perform quality control tasks on the data; and for exploratory data analysis. This program will enable IDEM to rapidly validate and release their air toxics VOC data to AIRS. VOCDat displays the concentrations of the VOC data using scatter, fingerprint, and time series plots. Customizable screening criteria may be applied to the data and the quality control codes may be changed for individual data points as well as for the entire sample on all plots. VOCDat can allow a user to find out what percentage a particular compound is of the total. This test allows the user the ability to see if the data exceeds the 3 sigma rule for outliers. For more details, please see Section 22.2.

**Wind Rose and Pollution Rose Plots** - The wind direction, wind speed and pollutant data will be input into the program and wind and rose which show the relative direction and speed of pollutants (transport) will be graphically displayed.

**GIS** - GIS program that allows the user the ability to overlay concentration data on geographic data. By creating “views”, the user can overlay temporally changing data into a spatial analysis too. Plots of concentrations of data can be temporal/spatially displaced.

## 24.0 Reconciliation with DQOs

This section of the QAPP will outline the assessment procedures that IDEM will follow to determine whether the monitors and laboratory analyses are producing data that comply with the stated goals. This section will then state what action will be taken as a result of the assessment process. Such an assessment is termed a Data Quality Assessment (DQA) and is thoroughly described in *EPA QA/G-9: Guidance for Data Quality Assessment*. For the stated DQO, the assessment process must follow statistical routines. The following five steps will discuss how this will be achieved.

### 24.1 Review DQOs and Sampling Design.

Section 7 of this QAPP contains the details for the development of the DQOs, including defining the objectives of the air toxics monitoring network and developing limits on the decision errors. Section 10 of this QAPP contains the details for the sampling design, including the rationale for the design, the design assumptions, and the sampling locations and frequency. If any deviations from the sampling design have occurred, these will be indicated and their potential effect carefully considered throughout the entire DQA. Since this project is in the formative stages no assessments have been performed.

### 24.2 Conduct Preliminary Data Review

A preliminary data review will be performed to uncover potential limitations to using the data, to reveal outliers, and generally to explore the basic structure of the data. The first step is to review the quality assurance reports. The second step is to calculate basic summary statistics, generate graphical presentations of the data, and review these summary statistics and graphs.

**24.2.1 Review Quality Assurance Reports-** IDEM will review all relevant quality assurance reports, internal and external, that describe the data collection and reporting process. Particular attention will be directed to looking for anomalies in recorded data, missing values, and any deviations from standard operating procedures. This is a qualitative review. However, any concerns will be further investigated in the next two steps.

#### 24.2.2 Select the Statistical Test

IDEM will generate summary statistics for each of its samplers. The summary statistics will be calculated at the quarterly, annual, and 2 year mark and will include only valid samples. These following statistical tests will be performed as well as others that are deemed to be appropriate:

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- Test to examine distribution of the data
- Simple averages of all pollutants
- 95% Upper confidence limit of the mean
- Examination of bias and precision of the data
- Seasonal averages to determine any seasonal variability
- Standard deviation
- Applicable trend analysis
- More tests as deemed applicable

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

#### **24.2.3 Verify Assumptions of Statistical Test**

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

*Normal distribution for measurement error-* Assuming that measurement errors are normally distributed is common in environmental monitoring. IDEM has not investigated the sensitivity of the statistical test to violation of this assumption; although, small departures from normality generally do not create serious problems. IDEM will evaluate the reasonableness of the normality assumption by reviewing a normal probability plot and employing the Coefficient of Variance Test. If the plot or statistics indicate possible violations of normality, IDEM may need to determine the sensitivity of the DQOs to departures in normality.

*Trends Analysis-*The study will not generate data for a long enough period of time to statistically evaluate for trends in pollutant concentrations. However, a simple linear regression test may be performed to observe the temporal variations in the data sets.

#### **24.2.4 Draw Conclusions from the Data**

If the sampling design and the statistical test bear out, it can be assumed that the network design and the uncertainty of the data are acceptable. This conclusion can then be written in the Annual Report to management. Management may then decide whether to perform risk assessments, allow the State and EPA to analyze the data or work closely with the nearby university to determine whether this data can be used to assess conclusion from health effects studies.

#### **24.2.5 Exposure concentration derivation**

Sampling results will be used to derive an exposure concentration for the purposes of risk assessment analysis. Only data that has passed the DQO process will be used for the derivation of the exposure concentration. Concentration outliers may be used in the derivation depending on the analysis of the outliers.



## Appendix A

### Glossary

The following glossary is taken from the document EPA Guidance for Quality Assurance Project Plans EPA QA/G-5.

#### GLOSSARY OF QUALITY ASSURANCE AND RELATED TERMS

**Acceptance criteria** — Specified limits placed on characteristics of an item, process, or service defined in requirements documents. (ASQC Definitions)

**Accuracy** — A measure of the closeness of an individual measurement or the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; the EPA recommends using the terms “*precision*” and “*bias*”, rather than “accuracy,” to convey the information usually associated with accuracy. Refer to *Appendix D, Data Quality Indicators* for a more detailed definition.

**Activity** — An all-inclusive term describing a specific set of operations of related tasks to be performed, either serially or in parallel (e.g., research and development, field sampling, analytical operations, equipment fabrication), that, in total, result in a product or service.

**Assessment** — The evaluation process used to measure the performance or effectiveness of a system and its elements. As used here, assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation (PE), management systems review (MSR), peer review, inspection, or surveillance.

**Audit (quality)** — A systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.

**Audit of Data Quality (ADQ)** — A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality.

**Authenticate** — The act of establishing an item as genuine, valid, or authoritative.

**Bias** — The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample’s true value). Refer to *Appendix D, Data Quality Indicators*, for a more detailed definition.

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**Blank** — A sample subjected to the usual analytical or measurement process to establish a zero baseline or background value. Sometimes used to adjust or correct routine analytical results. A sample that is intended to contain none of the analytes of interest. A blank is used to detect contamination during sample handling preparation and/or analysis.

**Calibration** — A comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustments.

**Calibration drift** — The deviation in instrument response from a reference value over a period of time before recalibration.

**Certification** — The process of testing and evaluation against specifications designed to document, verify, and recognize the competence of a person, organization, or other entity to perform a function or service, usually for a specified time.

**Chain of custody** — An unbroken trail of accountability that ensures the physical security of samples, data, and records.

**Characteristic** — Any property or attribute of a datum, item, process, or service that is distinct, describable, and/or measurable.

**Check standard** — A standard prepared independently of the calibration standards and analyzed exactly like the samples. Check standard results are used to estimate analytical precision and to indicate the presence of bias due to the calibration of the analytical system.

**Collocated samples** — Two or more portions collected at the same point in time and space so as to be considered identical. These samples are also known as field replicates and should be identified as such.

**Comparability** — A measure of the confidence with which one data set or method can be compared to another.

**Completeness** — A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions. Refer to *Appendix D, Data Quality Indicators*, for a more detailed definition.

**Computer program** — A sequence of instructions suitable for processing by a computer. Processing may include the use of an assembler, a compiler, an interpreter, or a translator to prepare the program for execution. A computer program may be stored on magnetic media and referred to as “software,” or it may be stored permanently on computer chips, referred to as “firmware.” Computer programs covered in a QAPP are those used for design analysis, data

acquisition, data reduction, data storage (databases), operation or control, and database or document control registers when used as the controlled source of quality information.

**Confidence Interval** — The numerical interval constructed around a point estimate of a population parameter, combined with a probability statement (the confidence coefficient) linking it to the population's true parameter value. If the same confidence interval construction technique and assumptions are used to calculate future intervals, they will include the unknown population parameter with the same specified probability.

**Confidentiality procedure** — A procedure used to protect confidential business information (including proprietary data and personnel records) from unauthorized access.

**Configuration** — The functional, physical, and procedural characteristics of an item, experiment, or document.

**Conformance** — An affirmative indication or judgment that a product or service has met the requirements of the relevant specification, contract, or regulation; also, the state of meeting the requirements.

**Consensus standard** — A standard established by a group representing a cross section of a particular industry or trade, or a part thereof.

**Contractor** — Any organization or individual contracting to furnish services or items or to perform work.

**Corrective action** — Any measures taken to rectify conditions adverse to quality and, where possible, to preclude their recurrence.

**Correlation coefficient** — A number between -1 and 1 that indicates the degree of linearity between two variables or sets of numbers. The closer to -1 or +1, the stronger the linear relationship between the two (i.e., the better the correlation). Values close to zero suggest no correlation between the two variables. The most common correlation coefficient is the product-moment, a measure of the degree of linear relationship between two variables.

**Data of known quality** — Data that have the qualitative and quantitative components associated with their derivation documented appropriately for their intended use, and when such documentation is verifiable and defensible.

**Data Quality Assessment (DQA)** — The scientific and statistical evaluation of data to determine if data obtained from environmental operations are of the right type, quality, and quantity to support their intended use. The five steps of the DQA Process include: 1) reviewing the DQOs and sampling design, 2) conducting a preliminary data review, 3) selecting the statistical test, 4) verifying the assumptions of the statistical test, and 5) drawing conclusions from the data.

**Data Quality Indicators (DQIs)** — The quantitative statistics and qualitative descriptors that are used to interpret the degree of acceptability or utility of data to the user. The principal data quality indicators are bias, precision, accuracy (bias is preferred), comparability, completeness, representativeness.

**Data Quality Objectives (DQOs)** — The qualitative and quantitative statements derived from the DQO Process that clarify study's technical and quality objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.

**Data Quality Objectives (DQO) Process** — A systematic strategic planning tool based on the scientific method that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use. The key elements of the DQO process include:

- state the problem,
- identify the decision,
- identify the inputs to the decision,
- define the boundaries of the study,
- develop a decision rule,
- specify tolerable limits on decision errors, and
- optimize the design for obtaining data. DQOs are the qualitative and quantitative outputs from the DQO Process.

**Data reduction** — The process of transforming the number of data items by arithmetic or statistical calculations, standard curves, and concentration factors, and collating them into a more useful form. Data reduction is irreversible and generally results in a reduced data set and an associated loss of detail.

**Data usability** — The process of ensuring or determining whether the quality of the data produced meets the intended use of the data.

**Deficiency** — An unauthorized deviation from acceptable procedures or practices, or a defect in an item.

**Demonstrated capability** — The capability to meet a procurement's technical and quality specifications through evidence presented by the supplier to substantiate its claims and in a manner defined by the customer.

**Design** — The specifications, drawings, design criteria, and performance requirements. Also, the result of deliberate planning, analysis, mathematical manipulations, and design processes.

**Design change** — Any revision or alteration of the technical requirements defined by approved and issued design output documents and approved and issued changes thereto.

**Design review** — A documented evaluation by a team, including personnel such as the responsible designers, the client for whom the work or product is being designed, and a quality assurance (QA) representative but excluding the original designers, to determine if a proposed design will meet the established design criteria and perform as expected when implemented.

**Detection Limit (DL)** — A measure of the capability of an analytical method to distinguish samples that do not contain a specific analyte from samples that contain low concentrations of the analyte; the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability. DLs are analyte- and matrix-specific and may be laboratory-dependent.

**Distribution** — 1) The appointment of an environmental contaminant at a point over time, over an area, or within a volume; 2) a probability function (density function, mass function, or distribution function) used to describe a set of observations (statistical sample) or a population from which the observations are generated.

**Document** — Any written or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results.

**Document control** — The policies and procedures used by an organization to ensure that its documents and their revisions are proposed, reviewed, approved for release, inventoried, distributed, archived, stored, and retrieved in accordance with the organization's requirements.

**Duplicate samples** — Two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method, including sampling and analysis. See also *collocated sample*.

**Environmental conditions** — The description of a physical medium (e.g., air, water, soil, sediment) or a biological system expressed in terms of its physical, chemical, radiological, or biological characteristics.

**Environmental data** — Any parameters or pieces of information collected or produced from measurements, analyses, or models of environmental processes, conditions, and effects of pollutants on human health and the ecology, including results from laboratory analyses or from experimental systems representing such processes and conditions.

**Environmental data operations** — Any work performed to obtain, use, or report information pertaining to environmental processes and conditions.

**Environmental monitoring** — The process of measuring or collecting environmental data.

**Environmental processes** — Any manufactured or natural processes that produce discharges to, or that impact, the ambient environment.

**Environmental programs** — An all-inclusive term pertaining to any work or activities involving the environment, including but not limited to: characterization of environmental processes and conditions; environmental monitoring; environmental research and development; the design, construction, and operation of environmental technologies; and laboratory operations on environmental samples.

**Environmental technology** — An all-inclusive term used to describe pollution control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and their components that may be utilized to remove pollutants or contaminants from, or to prevent them from entering, the environment. Examples include wet scrubbers (air), soil washing (soil), granulated activated carbon unit (water), and filtration (air, water). Usually, this term applies to hardware-based systems; however, it can also apply to methods or techniques used for pollution prevention, pollutant reduction, or containment of contamination to prevent further movement of the contaminants, such as capping, solidification or vitrification, and biological treatment.

**Estimate** — A characteristic from the sample from which inferences on parameters can be made.

**Evidentiary records** — Any records identified as part of litigation and subject to restricted access, custody, use, and disposal.

**Expedited change** — An abbreviated method of revising a document at the work location where the document is used when the normal change process would cause unnecessary or intolerable delay in the work.

**Field blank** — A blank used to provide information about contaminants that may be introduced during sample collection, storage, and transport. A clean sample, carried to the sampling site, exposed to sampling conditions, returned to the laboratory, and treated as an environmental sample.

**Field (matrix) spike** — A sample prepared at the sampling point (i.e., in the field) by adding a known mass of the target analyte to a specified amount of the sample. Field matrix spikes are used, for example, to determine the effect of the sample preservation, shipment, storage, and preparation on analyte recovery efficiency (the analytical bias).

**Field split samples** — Two or more representative portions taken from the same sample and submitted for analysis to different laboratories to estimate interlaboratory precision.

**Financial assistance** — The process by which funds are provided by one organization (usually governmental) to another organization for the purpose of performing work or furnishing services or items. Financial assistance mechanisms include grants, cooperative agreements, and governmental interagency agreements.

**Finding** — An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive or negative, and is normally

accompanied by specific examples of the observed condition.

**Goodness-of-fit test** — The application of the chi square distribution in comparing the frequency distribution of a statistic observed in a sample with the expected frequency distribution based on some theoretical model.

**Grade** — The category or rank given to entities having the same functional use but different requirements for quality.

**Graded approach** — The process of basing the level of application of managerial controls applied to an item or work according to the intended use of the results and the degree of confidence needed in the quality of the results. (See also *Data Quality Objectives (DQO) Process*.)

**Guidance** — A suggested practice that is not mandatory, intended as an aid or example in complying with a standard or requirement.

**Guideline** — A suggested practice that is not mandatory in programs intended to comply with a standard.

**Hazardous waste** — Any waste material that satisfies the definition of hazardous waste given in 40 CFR261, “Identification and Listing of Hazardous Waste.”

**Holding time** — The period of time a sample may be stored prior to its required analysis. While exceeding the holding time does not necessarily negate the veracity of analytical results, it causes the qualifying or “flagging” of any data not meeting all of the specified acceptance criteria.

**Identification error** — The misidentification of an analyte. In this error type, the contaminant of concern is unidentified and the measured concentration is incorrectly assigned to another contaminant.

**Independent assessment** — An assessment performed by a qualified individual, group, or organization that is not a part of the organization directly performing and accountable for the work being assessed.

**Inspection** — The examination or measurement of an item or activity to verify conformance to specific requirements.

**Internal standard** — A standard added to a test portion of a sample in a known amount and carried through the entire determination procedure as a reference for calibrating and controlling the precision and bias of the applied analytical method.

**Item** — An all-inclusive term used in place of the following: appurtenance, facility, sample, assembly, component, equipment, material, module, part, product, structure, subassembly,

subsystem, system, unit, documented concepts, or data.

**Laboratory split samples** — Two or more representative portions taken from the same sample and analyzed by different laboratories to estimate the interlaboratory precision or variability and the data comparability.

**Limit of quantitation** — The minimum concentration of an analyte or category of analytes in a specific matrix that can be identified and quantified above the method detection limit and within specified limits of precision and bias during routine analytical operating conditions.

**Management** — Those individuals directly responsible and accountable for planning, implementing, and assessing work.

**Management system** — A structured, nontechnical system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for conducting work and producing items and services.

**Management Systems Review (MSR)** — The qualitative assessment of a data collection operation and/or organization(s) to establish whether the prevailing quality management structure, policies, practices, and procedures are adequate for ensuring that the type and quality of data needed are obtained.

**Matrix spike** — A sample prepared by adding a known mass of a target analyte to a specified amount of matrix sample for which an independent estimate of the target analyte concentration is available. Spiked samples are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

**May** — When used in a sentence, a term denoting permission but not a necessity.

**Mean (arithmetic)** — The sum of all the values of a set of measurements divided by the number of values in the set; a measure of central tendency.

**Mean squared error** — A statistical term for variance added to the square of the bias.

**Measurement and Testing Equipment (M&TE)** — Tools, gauges, instruments, sampling devices, or systems used to calibrate, measure, test, or inspect in order to control or acquire data to verify conformance to specified requirements.

**Memory effects error** — The effect that a relatively high concentration sample has on the measurement of a lower concentration sample of the same analyte when the higher concentration sample precedes the lower concentration sample in the same analytical instrument.

**Method** — A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.



**Method blank** — A blank prepared to represent the sample matrix as closely as possible and analyzed exactly like the calibration standards, samples, and quality control (QC) samples. Results of method blanks provide an estimate of the within-batch variability of the blank response and an indication of bias introduced by the analytical procedure.

**Mid-range check**- A standard used to establish whether the middle of a measurement method's calibrated range is still within specifications.

**Mixed waste** — A hazardous waste material as defined by 40 CFR 261 Resource Conservation and Recovery Act (RCRA) and mixed with radioactive waste subject to the requirements of the Atomic Energy Act.

**Must** — When used in a sentence, a term denoting a requirement that has to be met.

**Nonconformance** — A deficiency in a characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate; nonfulfillment of a specified requirement.

**Objective evidence** — Any documented statement of fact, other information, or record, either quantitative or qualitative, pertaining to the quality of an item or activity, based on observations, measurements, or tests that can be verified.

**Observation** — An assessment conclusion that identifies a condition (either positive or negative) that does not represent a significant impact on an item or activity. An observation may identify a condition that has not yet caused a degradation of quality.

**Organization** — A company, corporation, firm, enterprise, or institution, or part thereof, whether incorporated or not, public or private, that has its own functions and administration.

**Organization structure** — The responsibilities, authorities, and relationships, arranged in a pattern, through which an organization performs its functions.

**Outlier** — An extreme observation that is shown to have a low probability of belonging to a specified data population.

**Parameter** — A quantity, usually unknown, such as a mean or a standard deviation characterizing a population. Commonly misused for "variable," "characteristic," or "property."

**Peer review** — A documented critical review of work generally beyond the state of the art or characterized by the existence of potential uncertainty. Conducted by qualified individuals (or an organization) who are independent of those who performed the work but collectively equivalent in technical expertise (i.e., peers) to those who performed the original work. Peer reviews are

conducted to ensure that activities are technically adequate, competently performed, properly documented, and satisfy established technical and quality requirements. An in-depth assessment of the assumptions, calculations, extrapolations, alternate interpretations, methodology, acceptance criteria, and conclusions pertaining to specific work and of the documentation that supports them. Peer reviews provide an evaluation of a subject where quantitative methods of analysis or measures of success are unavailable or undefined, such as in research and development.

**Performance Evaluation (PE)** — A type of audit in which the quantitative data generated in a measurement system are obtained independently and compared with routinely obtained data to evaluate the proficiency of an analyst or laboratory.

**Pollution prevention** — An organized, comprehensive effort to systematically reduce or eliminate pollutants or contaminants prior to their generation or their release or discharge into the environment.

**Population** — The totality of items or units of material under consideration or study.

**Precision** — A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions expressed generally in terms of the standard deviation. Refer to *Appendix D, Data Quality Indicators*, for a more detailed definition.

**Procedure** — A specified way to perform an activity.

**Process** — A set of interrelated resources and activities that transforms inputs into outputs. Examples of processes include analysis, design, data collection, operation, fabrication, and calculation.

**Project** — An organized set of activities within a program.

**Qualified data** — Any data that have been modified or adjusted as part of statistical or mathematical evaluation, data validation, or data verification operations.

**Qualified services** — An indication that suppliers providing services have been evaluated and determined to meet the technical and quality requirements of the client as provided by approved procurement documents and demonstrated by the supplier to the client's satisfaction.

**Quality** — The totality of features and characteristics of a product or service that bears on its ability to meet the stated or implied needs and expectations of the user.

**Quality Assurance (QA)** — An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.

**Quality Assurance Program Description/Plan** — See *quality management plan*.

**Quality Assurance Project Plan (QAPP)** — A formal document describing in comprehensive detail the necessary quality assurance (QA), quality control (QC), and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. The QAPP components are divided into four classes: 1) Project Management, 2) Measurement/Data Acquisition, 3) Assessment/Oversight, and 4) Data Validation and Usability. Guidance and requirements on preparation of QAPPs can be found in EPA QA/R-5 and QA/G-5.

**Quality Control (QC)** — The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality. The system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against “out of control” conditions and ensuring the results are of acceptable quality.

**Quality control (QC) sample** — An uncontaminated sample matrix spiked with known amounts of analytes from a source independent of the calibration standards. Generally used to establish intra-laboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system.

**Quality improvement** - A management program for improving the quality of operations. Such management programs generally entail a formal mechanism for encouraging worker recommendations with timely management evaluation and feedback or implementation.

**Quality management** — That aspect of the overall management system of the organization that determines and implements the quality policy. Quality management includes strategic planning, allocation of resources, and other systematic activities (e.g., planning, implementation, and assessment) pertaining to the quality system.

**Quality Management Plan (QMP)** — A formal document that describes the quality system in terms of the organization’s structure, the functional responsibilities of management and staff, the lines of authority, and the required interfaces for those planning, implementing, and assessing all activities conducted.

**Quality system** — A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance (QA) and quality control (QC).

**Radioactive waste** — Waste material containing, or contaminated by, radio nuclides, subject to the requirements of the Atomic Energy Act.

**Readiness review** — A systematic, documented review of the readiness for the start-up or continued use of a facility, process, or activity. Readiness reviews are typically conducted before proceeding beyond project milestones and prior to initiation of a major phase of work.

**Record (quality)** — A document that furnishes objective evidence of the quality of items or activities and that has been verified and authenticated as technically complete and correct. Records may include photographs, drawings, magnetic tape, and other data recording media.

**Recovery** — The act of determining whether or not the methodology measures all of the analyte contained in a sample. Refer to *Appendix D, Data Quality Indicators*, for a more detailed definition.

**Remediation** — The process of reducing the concentration of a contaminant (or contaminants) in air, water, or soil media to a level that poses an acceptable risk to human health.

**Repeatability** — The degree of agreement between independent test results produced by the same analyst, using the same test method and equipment on random aliquots of the same sample within a short time period.

**Reporting limit** — The lowest concentration or amount of the target analyte required to be reported from a data collection project. Reporting limits are generally greater than detection limits and are usually not associated with a probability level.

**Representativeness** — A measure of the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition. See also *Appendix D, Data Quality Indicators*.

**Reproducibility** -The precision, usually expressed as variance, that measures the variability among the results of measurements of the same sample at different laboratories.

**Requirement** — A formal statement of a need and the expected manner in which it is to be met.

**Research (applied)** — A process, the objective of which is to gain the knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.

**Research (basic)** — A process, the objective of which is to gain fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind.

**Research development/demonstration** — The systematic use of the knowledge and understanding gained from research and directed toward the production of useful materials, devices, systems, or methods, including prototypes and processes.

**Round-robin study** — A method validation study involving a predetermined number of laboratories or analysts, all analyzing the same sample(s) by the same method. In a round-robin study, all results are compared and used to develop summary statistics such as interlaboratory precision and method bias or recovery efficiency.

**Ruggedness study** — The carefully ordered testing of an analytical method while making slight variations in test conditions (as might be expected in routine use) to determine how such variations affect test results. If a variation affects the results significantly, the method restrictions are tightened to minimize this variability.

**Scientific method** — The principles and processes regarded as necessary for scientific investigation, including rules for concept or hypothesis formulation, conduct of experiments, and validation of hypotheses by analysis of observations.

**Self-assessment** — The assessments of work conducted by individuals, groups, or organizations directly responsible for overseeing and/or performing the work.

**Sensitivity** — the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. Refer to *Appendix D, Data Quality Indicators*, for a more detailed definition.

**Service** — The result generated by activities at the interface between the supplier and the customer, and the supplier internal activities to meet customer needs. Such activities in environmental programs include design, inspection, laboratory and/or field analysis, repair, and installation.

**Shall** — A term denoting a requirement that is mandatory whenever the criterion for conformance with the specification permits no deviation. This term does not prohibit the use of alternative approaches or methods for implementing the specification so long as the requirement is fulfilled.

**Should** — A term denoting a guideline or recommendation whenever noncompliance with the specification is permissible.

**Significant Condition** - Any state, status, incident, or situation of an environmental process or condition, or environmental technology in which the work being performed will be adversely affected sufficiently to require corrective action to satisfy quality objectives or specifications and safety requirements.

**Software life cycle** — The period of time that starts when a software product is conceived and ends when the software product is no longer available for routine use. The software life cycle typically includes a requirement phase, a design phase, an implementation phase, a test phase, an installation and check-out phase, an operation and maintenance phase, and sometimes a retirement phase.

**Source reduction** — Any practice that reduces the quantity of hazardous substances,

contaminants, or pollutants.

**Span check** — A standard used to establish that a measurement method is not deviating from its calibrated range.

**Specification** — A document stating requirements and referring to or including drawings or other relevant documents. Specifications should indicate the means and criteria for determining conformance.

**Spike** — A substance that is added to an environmental sample to increase the concentration of target analytes by known amounts; used to assess measurement accuracy (spike recovery). Spike duplicates are used to assess measurement precision.

**Split samples** — Two or more representative portions taken from one sample in the field or in the laboratory and analyzed by different analysts or laboratories. Split samples are quality control (QC) samples that are used to assess analytical variability and comparability.

**Standard deviation** — A measure of the dispersion or imprecision of a sample or population distribution expressed as the positive square root of the variance and has the same unit of measurement as the mean.

**Standard Operating Procedure (SOP)** — A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps and that is officially approved as the method for performing certain routine or repetitive tasks.

**Supplier** — Any individual or organization furnishing items or services or performing work according to a procurement document or a financial assistance agreement. An all-inclusive term used in place of any of the following: vendor, seller, contractor, subcontractor, fabricator, or consultant.

**Surrogate spike or analyte** — A pure substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples and is added to them to establish that the analytical method has been performed properly.

**Surveillance (quality)** — Continual or frequent monitoring and verification of the status of an entity and the analysis of records to ensure that specified requirements are being fulfilled.

**Technical review** — A documented critical review of work that has been performed within the state of the art. The review is accomplished by one or more qualified reviewers who are independent of those who performed the work but are collectively equivalent in technical expertise to those who performed the original work. The review is an in-depth analysis and evaluation of documents, activities, material, data, or items that require technical verification or validation for applicability, correctness, adequacy, completeness, and assurance that established requirements have been satisfied.

**Technical Systems Audit (TSA)** — A thorough, systematic, on-site qualitative audit of facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a system.

**Traceability** — The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.

**Trip blank** — A clean sample of a matrix that is taken to the sampling site and transported to the laboratory for analysis without having been exposed to sampling procedures.

**Validation** — Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use have been fulfilled. In design and development, validation concerns the process of examining a product or result to determine conformance to user needs. See also *Appendix G, Data Management*.

**Variance (statistical)** — A measure or dispersion of a sample or population distribution. Population variance is the sum of squares of deviation from the mean divided by the population size (number of elements). Sample variance is the sum of squares of deviations from the mean divided by the degrees of freedom (number of observations minus one).

**Verification** — Confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. In design and development, verification concerns the process of examining a result of a given activity to determine conformance to the stated requirements for that activity.

## **Appendix B**

### **PREPARATION OF AQUA REGIA EXTRACTING SOLUTION SOP**

1. Place approximately 300 ml. D. I. water into a 1 lit. volumetric flask.
2. Add 77 ml. Of concentrated HCL and 167 ml. of concentrated HNO<sub>3</sub>.
3. Allow the mixture to cool.
4. Add D. I. water to the flask.
5. Place a stirring rod in the flask.
6. Stir for 4 to 6 hours.
7. Add D. I. water to the flask in order to bring the flask to volume, i. e. 1 liter.
8. This solution is 2.6 M HNO<sub>3</sub> and 0.9 M HCL.

### **SAMPLE PREPARATION ULTRA SONIC EXTRACTION PROCEDURE**

1. Cut a 1" x 8" strip from the exposed filter.
2. Fold the strip in half twice and place in a 30 ml beaker. Add 15 ml of the Aqua Regia solution. The parafilm should be placed over the beaker such that none of the parafilm is in contact with water in the ultrasonic bath.
3. Place the beaker in the ultrasonic bath and operate for 30 minutes and quantitatively transfer the sample by rinsing parafilm and sides of beaker with D. I. water.
4. Decant extract and rinsing into a 100 ml volumetric flask and add 20 ml of D. I. water to cover the filter strip, cover with parafilm and set aside for a minimum of 30 minutes. This is a critical step can not be omitted.



5. Decant the water from the filter into the volumetric flask. Rinse filter and beaker twice with D. I. water and add rinsing to volumetric flask until total volume is 80 to 85 ml.
6. Put the Stopper on flask and shake vigorously. Set aside for approximately 5 minutes and bring solution to volume with D. I. water. Allow solution to settle for one hour before proceeding with analysis.

**CLEANING SOLUTION FOR GLASSWARE**  
**USED WITH METALS**

The metals analysis program requires all glassware to be cleaned very thoroughly with nitric acid solution according to EPA reference method 40 CFR CH.1 (7-1-86 Edition). A 20% (w/w) nitric acid cleaning solution is prepared as follows:

Check bottle of nitric acid (HNO<sub>3</sub>) for actual HNO<sub>3</sub> percentage contained in the bottle.  
e.g. 70.4%

Therefore, 100ml of 70.4% HNO<sub>3</sub> would contain 70.4 ml HNO<sub>3</sub>

70.4 ml \* Density of HNO<sub>3</sub> (check specific gravity on bottle)  
70.4 \* 1.41g/ml = 99.264 g HNO<sub>3</sub>

Thus, 100 ml of 70.4% HNO<sub>3</sub> contains 99.264 g HNO<sub>3</sub>

$99.264 \text{ g} = 0.2 * X$  ( X = total weight, i. e. HNO<sub>3</sub> + HCL)

$99.264/0.2 = X$

X = 496.32

For every 99.264 g HNO<sub>3</sub>, there are

$496.32 - 99.264 = 397.056 \text{ g H}_2\text{O}$

Every 100 ml of 70.4% HNO<sub>3</sub> solution contains approximately 29.6 ml H<sub>2</sub>O (1 g H<sub>2</sub>O = 1 ml H<sub>2</sub>O), so

$397.056 \text{ g H}_2\text{O} - 29.6 \text{ g H}_2\text{O} = 367.456 \text{ g H}_2\text{O}$

\*\*\*\* For every 100 ml of 70.4% HNO<sub>3</sub> solution, add 367.456 ml H<sub>2</sub>O \*\*\*\*

**GENERAL NOTES**

For H<sub>2</sub>O --- 1 ml = 1 g

I. Density = g/ml

J. ppm = ug/ml or ppm = ug/g of sample (for a solid sample)

K. 1 g = 1000 mg      1 mg/L = 1 ppm  
1 mg = 1000 ug      1 ug/L = 1 ppb

A. Examples of how to prepare standards manually  
\*\* ppm=ug/ml \*\*

1ml of 1000ppm = 1000ug Add the 1ml to 100ml D.I. water.  
1000ug/100ml = 10ug/ml or 10ppm

2ml of 10ppm = 20ug Add the 2ml to 100ml D.I. water.  
20ug/100ml = 0.2ug/ml or 0.2ppm

0.3ml of 1000ppm = 300ug Add the 0.3ml to 100ml D.I. water.  
300ug/100ml = 3ug/ml or 3ppm

Preparation of standards can be done with autosampler.

F. Dilutions:  
e.g. Dilution = 10 if take 1ml of the original sample volume and add it to 9ml D.I. water.

H. Calculation of Results (for a filter):  
Mean of Sample X 9 X ?ml  
Mean of Sample = Result obtained from AA

9 = Each filter strip is 1" x 8" which is 1/9th of the total filter, so to include the entire filter - take (x9)  
?ml = Total amount of extraction volume prepared.

I. In general, Air Volume =  $1.3\text{m}^3/\text{min}$  x minutes  
However, the  $\text{m}^3/\text{min}$  value can be different.

K. All values should be carried out to 3 significant figures.

### **TURNING ON THE AA**

1. Turn on the instrument (Spectrometer, the computer and printer).
2. Select **spectra AA** icon on the windows 95 desktop.

### **TURNING OFF AA**

1. Turn off the instrument (Spectrometer, the computer and printer).air and fuel off on the AA.
2. Turn fuel tank off.

### **DISPOSAL OF CLEANING SOLUTION**

1. Fill the basin of the sink with water.
2. Pour cleaning solution into the water. Do this in intervals so that not all cleaning solution is going into the drain pipes at once, therefore the pipes will not be destroyed.

### **EXTRACTION PROCEDURE FOR SOLID MATERIALS: (After 30 Minutes in Ultrasonication Bath)**

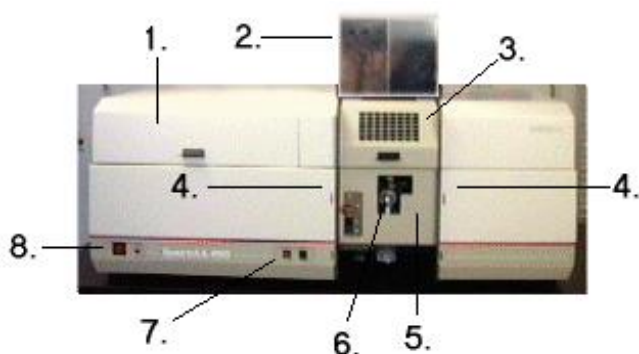
1. Put dry filter into funnel (placed in volumetric flask).
2. Rinse dry filter with:
  - A. D.I. water
  - B. Matrix (1/2 of a 15ml volume)
  - C. D.I. water
  - D. Matrix (1/2 of a 15ml volume)
  - E. D.I. water
3. Discard in sink the liquid which has flowed into volumetric flask.
4. **\*\*Do not have to wait an extra 30 minutes.\*\***
5. Rinse material in beaker several times with D.I. water. Put rinsings into flask.
6. Fill to volume with D.I. water.

#### **CLEANING PIPETTES**

- A. Clean the pipettes with a detergent solution.
  1. Put container with pipettes into the outer tub marked Nalgene.
  2. Fill with a detergent solution.
  3. Raise and slowly lower the pipettes.
  4. Allow the pipettes to sit in the detergent for 2 to 3 hours.
- B. Remove the basket containing the pipettes and place it in the larger tub marked Nalgene which has a hose attachment for water.
  1. Connect the hose from the Nalgene tub to the distilled water.
  2. Turn on the distilled water.
  3. The tub will automatically fill with water, rinse the pipettes, and drain.
  4. Allow the pipettes to be rinsed 4 to 5 times.
- C. Clean the pipettes in a dilute HNO<sub>3</sub> solution. Fill a large graduated cylinder with the cleaning solution used for glassware (this cylinder will probably be prepared and located under the hood), and dip the pipettes in this solution.
- D. Rinse the pipettes with distilled water as in B.

**Standard operating procedure for metals analysis using Varian Spectra 880 Atomic Absorption Spectrometer.**

**Front view - Flame (880)**



The diagram shows the front of a SpectrAA-880 Flame instrument.

The numbered items are:

1. Lamp compartment
2. Chimney
3. Flame shield
4. Slots for accessories and tray
5. Sample compartment front panel
6. Atomizer adjuster position controls
7. Flame off and ignition buttons
8. Power (off/on) switch and power indicator

Spectra 880 also comes with the Sample Introduction Pump System (SIPS 20) is an integrated, efficient sampling system and Auto sampler SPS 5 or PSD (for Graphite Furnace)

## **Burners**

Your Spectra AA Flame instrument is designed to use either a **nitrous oxide-acetylene burner** or an **air-acetylene burner**. Both burners include an interlock spigot designed to inhibit ignition if either a burner is not fitted to the spray chamber, or a burner is fitted which is not suitable for the flame gas mixture selected. A lever allows you to rotate the burner over a 90° range.

## Nitrous oxide-acetylene burner

This flame allows the determination of many refractory elements which cannot be determined in the cooler air-acetylene flame. It also provides better sensitivity and greater freedom from interference than air-acetylene for a number of elements, notably barium, calcium, chromium, molybdenum, and strontium. However, a nitrous oxide-acetylene flame is not as simple to use as an air-acetylene flame. Flame stoichiometry and burner position are more critical, and small departures from optimum may cause a severe loss in sensitivity.

Generally, a slightly fuel-rich flame is required with a red zone approximately 2 cm high. A number of metals are appreciably ionized in the nitrous oxide-acetylene flame but this interference can be countered by adding excess of potassium or cesium to the analytical solution (1000–2000 mg/L K or Cs).

## Air acetylene burner

For most elements the flame should be oxidizing (non-luminous with a hazy blue inner cone). For some metals, particularly chromium, and molybdenum, a reducing flame (white, luminous) is required.

## Installing a burner

1. Check the O-ring on the burner. It must be supple, free from nicks or cracks and make a gas-tight seal. If you are using the Universal spray chamber, make sure the O-ring on the base of the burner is the white fluoro-elastomer O-ring.
2. Align the hole in the rotation handle with the burner hole in the spray chamber.
3. Position the burner in the sample compartment, with the slot along the optical path and the plate with the warning toward the front of the instrument.

4. Hold the lower ratchet handle lever closed. Lower the burner so that the interlock key enters the interlock socket on the atomizer adjuster and the burner neck enters the hole for the burner in the handle and spray chamber.
5. Push the burner down as far as it will go. Release the lower ratchet handle and move the upper handle slightly to the left and right. The ratchet will engage and you should be able to rotate the burner using the rotation lever.

## SETTING UP AN INSTRUMENT

The general preparation procedure is as follows:

1. Check that all required hardware (including sampler and printer if necessary) is correctly installed.
2. Turn on any required accessories or peripheral equipment.
3. Turn on your instrument.
4. If you have not already done so, turn on the computer, start the SpectrAA system, go to the Instrument window, and select the sequence or method you require.
5. Check the lamps. Align them if necessary (refer to Aligning lamps for more detail). Make sure the exhaust system is working. You can do this by using the **smoke from an extinguished match, or holding a thin single-ply tissue up to the mouth of the extraction hood. The smoke or tissue should be drawn toward the hood.**

If you are using a sampler, make sure all solutions are in their correct positions. You can select Loading guide on the SPS Racks or PSD Carousels dialog to help you do this

### Aligning lamps

You should align a lamp if:

- You need the best possible signal to noise ratio
- You are using a non-Varian lamp
- You are using a position previously used for a non-Varian lamp
- You only need to align each lamp position once.

You should need only align the D2 lamp after it has been installed (Flame and Furnace only).

Use the following procedure for hollow cathode lamps and the D2 lamp.

1. On the Instrument page press Optimize, select an appropriate method, press OK then give the lamp time to warm up.
2. Make sure nothing is in the optical path, and while watching the lamp signal bar, slowly turn one of the adjustment knobs. If the signal decreases, turn the knob in the other direction, until you find the maximum signal. If the HC lamp signal is too small, first check that you have the correct lamp for the current method, and that it is glowing, then select Rescale. If the signal becomes too large, select Rescale.
3. Repeat the previous step with the other adjustment knob.

### **Lighting the flame**

1. Ensure that the working area is completely clear of all hazardous materials including corrosive liquids and flammable solvents.
2. Check that the liquid trap is filled with the same solvent as will be used in the matrix.
3. Make sure the waste container is empty.
4. Check that the drain tube is positioned correctly in the waste vessel, with the end of the tube as high as possible in the vessel above the expected liquid level.
5. Ensure that the correct burner is in place.
6. Make sure the flame shield and front panel are in position. When operating your SpectrAA in Flame mode, ensure that the flame shield is closed and the front panel is in place.
7. Make sure the chimney is correctly in place.
8. Press the 'Ignite' button, and keep it pressed until the flame ignites. If the ignition sequence times out before the flame ignites, release the button, wait about five seconds, and restart the sequence.
9. Check the gas regulator settings and readjust if necessary.
10. When the flame has stabilized, adjust the flame conditions.
11. Aspirate 50 mL of the appropriate solvent. When you are not aspirating a solution, you should be aspirating the appropriate solvent.



## Nebulizer setup

For correct operation of SIPS it is essential that the nebulizer uptake rate is correctly adjusted. The following procedure must be performed each time new tubing is installed on the SIPS and checked on a regular basis (e.g. daily).

Note: This procedure assumes the spectrometer is fully operational (lamp optimized, flame on etc.).

1. On the Instrument page press the “Optimize” button and select the required method.
2. Press the “OK” button to display the Flame Optimization dialog.
3. Press the “Optimize Signal” button to display the Optimize Signal dialog then press the “Start Pumps” button to optimize with the SIPS pump running.
4. Set the nebulizer to the high solids position (wound all the way in).
5. Using your finger, block the air vent (the small hole in the lid) on the diluent Mariott vessel. Very quickly disconnect and then reconnect the diluent tubing from the Mariott vessel. This will create a small air bubble in the diluent tubing.
6. Observe the movement of the bubble in the diluent line. If it is not travelling towards the nebulizer, then slowly wind out the nebulizer thimble until the bubble travels towards the nebulizer. It should take approximately 25-30 seconds for the bubble to travel 100 mm in the diluent tubing with the pump running at 100%.

Note: Make sure that you do not let too much air into the diluent tubing when you remove it from the Mariott vessel. If this is the case, when you reconnect the tubing, ensure that you run the SIPS until the tubing is air-free. Repeat step 5 again to create a small air bubble.

Note: Should a blockage occur in the nebulizer, the diluent in the Mariott vessel will need to be replaced since this causes the flow of diluent to be reversed, towards the Mariott vessel, leading to contamination of the diluent and hence erroneous results.

### Optimizing the flame signal (880)

\* Steps 1, 2, 3, and 4 are done with the **Flame Off** on the Optimization Page under the Optimize Lamps Heading... (Green Peaking Bar)

1. **Lamp** turn the two knobs at the base of the HCL while watching the green peaking bar, if the bar peaks out, hit the rescale button. When the lamp is optimized fully, record the % **Gain** number.

2. **Burner Vertical** using the burner alignment card in the center of the burner placing the line on the slot of the burner, align the burner using the inner knob on the front of the instrument to move vertically until the light is in the center of the circle of the card.
3. **Burner Horizontal** using the burner alignment card in the center of the burner placing the line on the slot of the burner, align the burner using the outer knob on the front of the instrument to move horizontally until the light is in the center of the circle of the card.
4. **Burner Rotational**... using the burner alignment card on both ends of the burner, squeeze the burner handle and slightly rotate the burner until the light is in the center of the circle of the card at both ends.

\*\* Steps 5, 6, and 7 are done with the **Flame On** the Optimization Page under the Optimize Signal Heading... (Blue Peaking Bar)

**Nebulizer Uptake Rate**... using a graduated cylinder with water, measure the uptake rate for 1 minute. The value should be 6 ml/min (+/- 0.5 ml/min). if not, adjust the barrel of the nebulizer counterclockwise to speed up and clockwise to slow down the rate.

5. **Glass Bead Adjustment**... on the optimize signal page, instrument zero on water, then aspirate a mid to high level std of the element observing the blue signal bar rising. Begin by turning the glass bead knob (the one under the nebulizer barrel) completely clockwise. Watch for the signal to decrease then turn the knob counterclockwise finding the peak in signal. The glass bead is now fully optimized.
6. **Fuel Adjustment**... on the optimize signal page, instrument zero on water, then aspirate a mid to high level std of the element observing the blue signal bar rising as in step 6. Begin by adjusting the red arrow up or down on right side of the page or turning the acetylene knob on the front of the instrument. Maximize the blue bar signal by adjusting this fuel flow to the best setting.
7. **Fuel Adjustment**... on the optimize signal page, instrument zero on water, then aspirate a mid to high level std of the element observing the blue signal bar rising as in step 6. Begin by adjusting the red arrow up or down on right side of the page or turning the acetylene knob on the front of the instrument. Maximize the blue bar signal by adjusting this fuel flow to the best setting.

Optimization is now complete, if using the sips, start the pump tube conditioning program and complete the bubble test to confirm an air bubble moving towards the instrument. This verifies no clogs and that the nebulizer uptake is 6 ml/min

## *Analysis*

### ***How to create a Worksheet***

To create a new worksheet:

1. Go to the Main Index window (first close the current worksheet if one is loaded).
2. Press the "Worksheet" buttons (the Load Worksheet dialog box will appear).
3. Press "New".
4. Enter the required name for this worksheet (this can be changed later).
5. Enter your name as the analyst (optional).
6. Enter any appropriate comments (optional).
7. Enter the required number of samples (this can be changed later).
8. Press "OK".

### ***How to create Flame method***

Click on worksheet icon and follow the steps "To create a new work sheet".

- A. Click on the ADD METHODS icon.
  1. Highlight the LOAD From Cookbook radio button
  2. Select FLAME as the method type
  3. Enter the symbol Pb (for Lead) in the search Element field.
  4. Click on the matrix field then enter 1% HNO<sub>3</sub>
  5. Highlight Pb in the Select an Element Window, then click on OK.
- B. Click on the EDIT METHOD icon.
  - 1 On the METHOD TYPE and MODE screen click on the empty Matrix box.
  - 2 At the flashing cursor type in 1% HNO<sub>3</sub>
  - 3 Select the options:

SAMPLING MODE:	Auto Normal
INSTUMENT MODE:	Absorbance

FLAME TYPE	Air/acetylene
USE SIPS	select or click

- C. Access the measurement parameters page by clicking on NEXT (or by clicking on MEASUREMENT in the PAGE INDEX tabs)  
On the MEASUREMENT PARAMETERS page select the following.

MEASUREMENT MODE:	Integration
CALIBRATION	Concentration
SMOOTHING:	5 point
MEASUREMENT TIME:	5 s
READ DELAY:	10 s
REPLICATES:	3 (standard and sample)

- D. Access the OPTICAL PARAMETERS page and check the default values:

ULTRA AA LAMP	Select (if you are using Ultra AA Lamp)
LAMP POSITION:	1 or 2(if you are using Ultra AA Lamp)
LAMP CURRENT:	10mA
WAVELENGTH:	217 nm
SLIT WIDTH	1.0 nm
BACKGROUND CORR.	BC On

- E. Access the SIPS PARAMETER page and check the following

NEBULIZER UPTAKE RATE:	5 ml/min
RIGHT PUMP	none

- F. Access the STANDARDS page and check the following.

Inst. Zero Rate	0
Recalibration Rate	100
Reslope rate	10
Reslope Std. No.	2
Expansion Factor	1.0
Conc. Decimal Places	3
Calib. Algorithm	New Rational

SLOPE TESTS

	Lower	Upper
Calibration	20 %	150 %



Optical  
SIPS  
QC Tests  
PSD Sampler (Furnace/Zeeman)  
SPS Sampler (Flame/Vapor)  
Notes  
Cookbook  
QCP

### ***How to modify existing methods***

To modify existing methods:

1. Select the Develop page.
2. Press "Edit Method" (the Methods window will appear).
3. Select the Method page tab corresponding to the Worksheet method you wish to edit (bottom page tabs).
4. Modify the required parameters on this page.
5. Press Ctrl+Tab to go to the next page in this method (top page tabs).
6. Repeat steps 4-5 for all the pages in this method.
7. Press "OK"

### ***How to enter sample labels***

Sample labels may be entered into the Worksheet in a number of ways

To enter sample labels:

1. Double click on the sample label cell where you wish to enter a label (or press F2).
2. Type in the name of the sample.
3. Press Enter to accept the entry or Esc to discard it.
4. Repeat steps 1-3 until all sample labels have been entered.

## **ANALYSIS**

There are two types of flame operation, (1) Air/Acetylene flame operation, (2) Nitrous Oxide/Acetylene flame operation. Following are the list of various metals to be analysis by either one of the above flame operation.

As-	Arsenic	Fe-	Iron
Ba-	Barium	Mn-	Manganese
Be-	Beryllium*	Mo-	Molybdenum*
Cd-	Cadmium	Ni-	Nickel
Co-	Cobalt	Pb-	Lead
Cu-	Copper	V -	Vanadium*
Cr-	Chromium*	Z -	Zinc

(\* - Nitrous Oxide/ Acetylene flame operation)

**Air/Acetylene flame operation:**

1. Insert the long path air/acetylene burner head
2. At the air cylinder, set pressure to 50 psig.
3. At the acetylene Cylinder, set pressure to 15 psig.
4. Turn the gas control to the AIR position.
5. Place the aspirator tube in a graduated cylinder containing deionized water.
6. Set the aspiration rate 4 to 6 ml/min. ( Clockwise rotation increases aspiration rate; counter-clockwise rotation decreases it.)
7. Place the gas flow selector switch to the AIR/FUEL position, and set upto 3 to 5 SCFH with the fuel flow control.

**DISPOSAL OF EXTRACTS**

The method used for this analysis (40 CFR, Part 50, App. G, 7-1-95 edition) does not address the disposal of the extracts generated.

After filling the sink with water, we take the extracts and dump them into the sink while more water is running into the sink. We continue to run water for approximately twenty minutes. The concentrations of acids before they are disposed of are approximately 1N. After these procedures, we estimate that only a very low concentration of acid actually makes it to the pipes.

Acid strength is not the only factor in the safety of the disposal of these solutions into the sink. These extracts also contain various hazardous metals. We generally find metals concentrations

in the range of a few micrograms per cubic meter (ug/m<sup>3</sup>). However, the permissible exposure limits for these metals (see PEL table) are well above the levels which we find in our samples. The only exception to this is for beryllium. This metal has a PEL of 2 ug/m<sup>3</sup>, but we rarely find any of this metal.

**OFFICE OF AIR MANAGEMENT  
METALS ANALYSIS OF HI-VOLUME FILTERS BY ATOMIC ABSORPTION**

This program, in existence since the 1970's, analyzes metals from hi-volume filters. Small strips of the filters are immersed in 15 ml of aqua regia reagent to extract their metals content. Then, these extracts are placed in 100 ml flasks and water is added to them. Finally, they are analyzed using atomic absorption spectrophotometry. This program began with lead as the metal of interest but has now expanded. The metals currently analyzed are:

As-	Arsenic	Fe-	Iron
Ba-	Barium	Mn-	Manganese
Be-	Beryllium*	Mo-	Molybdenum*
Cd-	Cadmium	Ni-	Nickel
Co-	Cobalt	Pb-	Lead
Cu-	Copper	V -	Vanadium*
Cr-	Chromium*	Z -	Zinc

**DISPOSAL OF EXTRACTS**

The method used for this analysis (40 CFR, Part 50, App. G, 7-1-95 edition) does not address the disposal of the extracts generated.

After filling the sink with water, we take the flasks two at a time and dump them into the sink while more water is running into the sink. We continue until all the flasks are dumped and then run water for an additional twenty minutes. The concentrations of acids before they are disposed of are approximately 1N. After these procedures, we estimate that only a very low concentration of acid actually makes it to the pipes.

Acid strength is not the only factor in the safety of the disposal of these solutions into the sink. These extracts also contain various hazardous metals. We generally find metals concentrations in the range of a few micrograms per cubic meter (ug/m<sup>3</sup>). However, the permissible exposure limits for these metals (see attached PEL table) are well above the levels which we find in our samples. The only exception to this is for beryllium. This metal has a PEL of 2 ug/m<sup>3</sup>, but we rarely find any of it.



## Graphite furnace operation of Varian GTA 100

### Furnace setup and Alignment:

1. **Lamp...** Goto optimization page and turn the two knobs at the base of the HCL while watching the green peaking bar, if the bar peaks out, hit the rescale button. When the lamp is optimized fully, record the lowest % **Gain** number
2. **Furnace Workhead...** Place furnace in sample compartment, locating pins in holes in adjustment assembly and locking down thumbscrew on side. Adjust height to set position for best light through put. Use handle to open door and place a new graphite tube into workhead with hole of tube centered in hole of workhead shroud. (Clean all graphite components with 10% methanol in water using Q-tips)
  - a. Turn on Water and Argon.
3. **Autosampler...** Hang PSD (Programmable Sample Dispenser / Autosampler) on front of AA on the two hooks in sample compartment. Alignment block on right of psd should have sample wall in slot. From the Instrument Page go to menu bar under **Instrument to Furnace Facilities**.
  - a. Capillary (white tubing) should go through black sleeve and length should be one inch from bottom tip to bottom of black sleeve.
  - b. Black sleeve should be parallel to depth adjustment screw on probe arm and bottom of sleeve should be approximately 2-5 mm above rinse station.
  - c. Click on Align in Furnace Facilities, Probe goes to cup one. Check alignment and repeat a & b if necessary.
  - d. Click OK and Probe goes to Graphite Tube. UNLOCK Adjustment screw on bottom of PSD. Use the 2 knobs of front and side of PSD to move Probe and capillary for alignment of capillary into Tube. Once aligned, LOCK screw.
  - e. With Capillary in Tube, Set depth using screw on probe so the capillary is about  $\frac{3}{4}$  ths down in tube using dental mirror to view this alignment. Click on OK and return probe to Rinse Station... Capillary is SET...
  - f. Remove Syringe from front of PSD, Take Plunger out of end and Click on Rinse. Air Bubbles should be forced out of end of Syringe. If not replace Plunger and slowly work bubbles to end and then try Rinsing again.
  - g. Fill Autosampler with solutions... Standard, Blank, Modifier, & Samples.

**4. Graphite Tubes...** Tubes should last for at least 300 firings... (Reset Firing Counter in Instrument on Menu Bar for new Tubes) New Tube Should receive at least 5 Tube Cleans on Furnace Facilities page. Old but good Tube should receive at least 2 Tube Cleans. (Tube Conditioning is even a better way to prepare a new Graphite Tube)

**5. Analysis...** Select the samples to run and Click on Start. View injection of Cal Zero to verify alignment. Cal Zero Abs should be less than 0.01 Abs. If not, do more Tube Cleans. Calibrate Standards and run samples.

**Note:** Cal Zero Abs. < 0.02 is good  
< 0.01 is Great  
< 0.005 excellent

% of RSD OF at least .05 abs .	< 10 is good		
	< 5 is Great		
	<	1	excellent

## Appendix C

### GC/MS SOP 2/16/03

The GC/MS instrument (Agilent Model 6890 GC/5971N MS) is used for the analysis of 62 toxic organic compounds as specified in EPA Method TO-15. The instrument is equipped with a Tekmar Autocan canister autosampler which allows for the analysis of up to 16 samples per batch in addition to up to 3 standards, spikes, blanks, or tuning checks. The instrument uses liquid nitrogen as a coolant for the trap, the cryofocusing unit, and the GC oven to ensure the best possible separation and resolution of all 62 organic compounds using a 60m 0.32mm i.d. 1 micron film thickness BP-1 capillary column. A detailed flow chart of all necessary steps in data acquisition and analysis is provided in the document "GCMS Flow Chart 2001".

#### ***Tuning the Mass Spectrometer***

The MS must be tuned prior to running any samples. Tuning sets the voltages on the various lenses in the ion source, as well as setting the electron multiplier voltage needed to generate adequate signal from the tuning compound. The MS uses PFTBA (perfluorotributylamine) as the tuning compound. PFTBA contains no hydrogen atoms, so it does not have the hydrogen "mass defect" (atomic mass of hydrogen is 1.008 amu). Tuning also verifies that the system is reasonably clean, free of leaks, and behaving normally. The tune which is used daily to ensure proper system performance is the Autotune. The steps used to perform the Autotune are found in the flow chart.

After the Autotune report has been generated, the following parameters should be verified in order to ensure proper system performance:

1. EMVoltage < 2500
2. Number of Peaks <250
3. Isotope Ratio approximately 1:4:9
4. Mass 28 (nitrogen peak) < 10% of mass 69 peak
5. Mass 18 (water peak) <5% of mass 69 peak

If any or all of parameters 1-3 fail, the ion source should be cleaned. There is a CDROM, which came with the instrument, which details this procedure and includes video, which can be paused when necessary. If parameter 4 and/or 5 fail, there is a leak somewhere in the system which must be fixed. The best method of troubleshooting the leak is to isolate the parts of the system (autosampler, GC, and MS) and check each one for leaks individually. Once the leak has been

found and repaired, allow the system to pump down for at least 4 hours (preferably overnight), and perform the Autotune again. The instrument is NOT performing properly unless all 5 parameters pass this check. Daily Autotune reports should be filed in the GC/MS QA/QC binder. Reviewing tune reports allows the analyst to track instrumentation performance over time and also allows the analyst to catch sudden changes in instrumentation performance, which may indicate the need for maintenance or a service call.

## ***Method Generation***

Before acquiring any GC/MS run data, it is necessary to create a data acquisition method. The data acquisition method sets all of the parameters for the GC/MS to optimize the instrument conditions for the analysis of the specific sample types being analyzed in the laboratory. The method which is used for TO-15 analysis has been adapted from the technical assistance document for TO-15 analysis by Tekmar-Dohrmann. Complete data acquisition method generation parameters can be found in the GC/MS flowchart.

## ***BFB Environmental Tune Check***

The EPA requires that a sample containing 50ng of 4-Bromofluorobenzene (BFB) must be run each time a set of samples is analyzed on the GC/MS instrumentation. A canister is prepared quarterly by injecting 2.4ul of a solution containing 2000ug/ml of BFB in methanol into the canister and pressurizing the 6-liter canister to 2 atm with zero grade air. Each 125ml sample taken from the canister contains 50ng of BFB.

The instrument must be tuned properly to ensure that the BFB passes the EPA mandated tuning requirements. This is accomplished by manually tuning the instrument or by performing a BFB target tune from the instrument tune menu and saving the instrument tuning parameters in a file called BFB.U. Manually tuning the instrument for BFB can be accomplished using the procedure which is found in the Environmental GC-MS DOS Operation course manual, volume 1, Section 2, pages 2-24 through 2-26. Manually tuning the instrument for BFB generally yields better results than using the BFB target tune provided in the Enviroquant software. Any time maintenance is performed on the system (new column installed, source cleaned, etc.) it is necessary to re-tune the instrument to pass the BFB tuning requirements. After running the Autotune, load the tune parameters from the BFB.U file and execute 3 to 4 spectrum scans. After the 3<sup>rd</sup> or 4<sup>th</sup> spectrum scan, the abundance of the base peak at 69 amu should stabilize, as well as the abundance of the other peaks. The 131 and 219 amu peaks should have approximately equal abundance and be between 35 and 40% of the base peak at 69 amu. Small adjustments to the repeller voltage may be necessary if the criteria are not met. In order to assure good continuing calibration results, check the abundance of the 69 amu base peak- it should be

380,000 +/- 5%. If this is not the case, adjust the electron multiplier (EM) voltage to bring the 69 amu abundance to 380,000 +/- 5%.

After the sample containing the 50ng of BFB has been analyzed, it is necessary to evaluate the tune in order to verify that it passes the EPA environmental tuning requirements. Passing the tune requirements ensures that the instrument is set up properly to analyze samples containing volatile organic compounds (VOCs) and will be in at least rough equivalence with any other laboratory's instrumentation so that equivalent analytical results can be obtained.

### ***Initial Calibration of the GC/MS***

The GC/MS must be properly calibrated in order to ensure quality analytical results. Calibration is performed using a 62 compound standard from Spectra Gases. This standard is the TO-15 subset standard, which contains both polar and non-polar volatile organic compounds. The standard contains each of the 62 compounds at a concentration of 100 parts per billion (ppb) in nitrogen and is contained in a lecture-bottle-sized cylinder. The stability of standard concentration in the cylinder is guaranteed for 6 months only, so the standard must be replaced twice per year.

The range of most volatile organic compounds in ambient air samples generally ranges from around 10 parts per trillion up to 5 parts per billion approximately. In order to calibrate in this range, the standard is diluted by using 1 part standard to 10 parts zero air, which yields a concentration of 10 parts per billion in the canister. Restek Silco cans seem to work better than the usual SUMMA canisters provided by other vendors. Silco cans have a more inert inner surface inside of the canister, which allows for better recovery and reproducibility of standard analysis.

The standard is analyzed at six levels (1ppb, 2ppb, 2.5ppb, 3ppb, 4ppb and 5ppb) with the analysis of a zero air blank providing a "zero" level. The mid-point of the calibration curve (2.5ppb) is given a duplicate entry in the calibration table and labeled as "cc". This level of standard is used to evaluate the continuing calibration response of the instrument any time samples are analyzed. Rather than further dilution of the standard to provide the necessary concentration levels, the Tekmar Autocan is programmed to trap appropriate amounts of the standard in order to provide the correct concentration levels (50cc, 100cc, 125cc, 150cc, 200cc, and 250cc). Each analysis is run twice, and the resulting data files are evaluated for proper peak identification and proper quantitation. The analyst must choose a target ion for the identification and quantitation of each compound, as well as up to 3 qualifier ions to aid in the proper identification of each compound. The target ion chosen is generally one of the most abundant ions in the mass spectrum of the given compound, while the qualifier(s) chosen should be as specific to the given compound as possible, or at least unique for any compound which may elute within the expected retention window. The EPA includes a list of suggested target and qualifier

ions for each compound in the TO-15 method. The calibration curves are generated using the average responses for the two sets of runs. Each compound should have a calibration curve ideally within 10% of being linear. Some of the more polar compounds may have curves that are only within 20 to 30% of linear. Once the initial calibration has been performed and the calibration curves have been evaluated, the method should be saved using a file name with eight characters starting with the letters "TO" followed by the current 6-digit date. Any time the initial calibration is changed due to re-tuning or maintenance, the new method should be saved with the current date. This file-naming procedure will enable the analyst to reevaluate old data using the proper method if necessary.

### ***Continuing Calibration Check***

The mid-level standard (2.5ppb concentration) has been designated as the level for performing the GC/MS continuing calibration check each time samples are run on the instrumentation. After the BFB tune evaluation standard has been run in each sequence, the following run should be the 2.5ppb level 62 compound calibration standard. The resulting chromatogram from this run should be evaluated using the Qedit quant results option of the Enviroquant data analysis software. All peaks should be properly identified and integrated. The analyst may manually identify and integrate any peaks, which are not properly handled by the initial quantitation by the data analysis software. The modified result file should be saved to ensure that any changes by the analyst are properly recorded. The modified result file is then evaluated as a continuing calibration file to the printer and the response factors calculated for the specific file are compared to the initial calibration response factors. All compounds should ideally be within +/- 20% of the initial response factors. For some of the more difficult or polar compounds, +/- 30% is acceptable. If the continuing calibration report does not meet these requirements, troubleshooting and maintenance may be needed. If maintenance is performed, it may also be necessary to retune and recalibrate the instrument prior to proceeding with sample analysis.

### ***Data Acquisition***

Ambient air samples (and complaint monitoring samples) can be analyzed in batches of up to 16 samples using the Autocan autosampler. The Autocan uses Teklink software to control the sequencing of the autosampler. Samples are loaded on the autocan in positions 1 to 16. Samples are generally arranged from the least concentration of total non-methane organic compounds (NMOC) to the highest. This helps to eliminate carry-over from one sample to the next. The BFB tuning standard and the calibration standard are connected to the ports at the bottom of the autosampler (ports A, B, & C are available for BFB, standards, spikes, etc.)

Teklink is used to create schedules for analyzing the sample batches. The schedule is created with one entry for each blank, standard, BFB tune check, and sample. Each entry is created using the appropriate 2-letter code (TO for TO-15 standard, BF for BFB, BL for blank, or the appropriate 2-letter site code for samples) followed by the six-digit code for the sample date. Each entry must specify the location of the sample (ports 1-16 or A-C) and the desired sample volume to be taken from the can. Save the Autocan sequence using the current date as the file name.

In order to synchronize the Autocan with the GC/MS, a sequence for the GC/MS must be written using the Chemstation software. To ensure proper functioning of the equipment, it is necessary to use the same file names in the same order as they appear in the Teklink schedule controlling the Autocan. The GC/MS sequence is also saved using the current date as the file name.

The first run of the sequence must be started on the Autocan prior to starting the GC/MS sequence to ensure that the instruments are synchronized. Allow the Autocan to proceed through the sample pressure, special bake, and sample trapping stages. Once the Autocan begins the dry-purge step of the cycle, the Run Sequence button can be clicked in the GC/MS Chemstation software. After the initial run, the autosampler and the GC/MS will remain synchronized throughout the rest of the batch. Refer to the GC/MS flow chart for detailed steps in creating these sequences.

### ***Data Analysis of GC/MS Results***

The actual sample analysis data collected on the GC/MS must also be evaluated by the analyst to ensure that all compounds are properly identified and integrated. The analyst can make use of several tools within the Enviroquant software as aids in determining the proper identification and integration of the components in the sample. Extracted Ion Chromatograms can be used to look for trace amounts of a target compound by searching for selected target ions and looking for maximization of those ions in the proper retention time range. In addition, the mass spectral library database contains spectra of more than 250,000 organic compounds. Spectra of unknown peaks in the sample matrix can be compared to the library database which will show the best matching compounds from the library. The experience of the analyst must be the final determining factor in the decision to manually integrate or re-identify a peak in the sample chromatogram. Once the data have been verified, the changes to the result file must be saved. A hard copy of the result file can then be generated using the Quant→Generate Report option. DO NOT USE Quant→Calculate/Generate report! This will undo any changes made to the result file by the analyst! The hard copy of the result file should be filed in the appropriate folder along with the corresponding NMOC data (and Perkin Elmer system data in the case of the Gary IITRI site). The electronic data must be converted to the proper format for entry into the Oracle Toxics database. This is accomplished using the procedure outlined in the flowchart for creating a custom report and saving the results in .csv (comma separated variable) format

using Microsoft Excel. Electronic data are transferred to the Oracle database in addition to being archived on CDROM for a five-year period.



## **Appendix D**

### **Standard Operating Procedure**

#### **PM-10, TSP Filter Weighing**

### **Part 1: Preparation**

Exposed filters should arrive from the field in individual envelopes from the mail or from loop runners. Take them into the Clean Room. Remove the first filter and look inside for any particulate that may remain. If any is found, shake it onto the filter and discard the envelope. If the envelope is clean, place it the drawer near Atul's desk in the main lab. It can be used in the field again. Repeat this procedure for the remaining filters.

Weighing of exposed filters begins with alphabetizing them according to the order of the sites in the Particulate/Log Book. Please note that the sites are in the logbook alphabetically by city and then site name.

It is very important to look at the whole name of the site listed on the card to ensure proper order. This is because there are colocated sites that may appear to be the same site but are different. PM-10 sites are in the book first, then TSP. If you have any questions, the AQS code for each site is listed on the filter card as well as on the log sheets. Remember that a reporting site and its colocated partner will have the same AQS code.

### **Part 2: Logging in the filters**

With your filters in proper order, you are ready to begin the log-in procedure. You will need a calculator, the particulate logbook and two filter weight books. There is a quartz fiber weight book (for PM-10 filters) and a glass fiber weight book (for TSP). These are usually in the cabinet.

Find the appropriate page for the first filter in your stack and log in the first five items (sample date through and including initial filter weight):

Make sure the **sample date** given on the card follows sampling schedule (posted on all four walls of the room). All sites follow this six-day sampling schedule listed. If you have a filter that seems to be out of place chronologically, leave a space for it. In other words, if a 4/15 filter

has already been logged in at a 6-day site and the next one you have is a 4/27, leave a line open in the log book for the 4/21 filter. It is probably delayed in the mail.

Be sure the **filter number** listed matches the actual number of the filter in the card. If wrong, put a strike through the number and put your initials by your changes. A PM-10 filter will have a number that begins with a Q. TSP filters may begin with G or just have numbers without letters.

Item 3, **true flow corrected to SRC**, is a two decimal place value for PM-10 sites. This value will be the same as the date before as long as no recalibration has occurred. The **true flow** is always 1.3 for TSP sites. Do not record any value in this column if the current calibration is more than 3 months old. Notify Steve to get the motor redone.

Item 4 is the **time in minutes**. These readings come from subtracting the initial elapsed time (ET) from the final. Any such calculations already done by the operator should be checked. These ET readings may need to be adjusted due to audits by QA. In the clean room are a number of sheets telling which sites have had audits performed, the date of the audit, the amount of time the audit took and what filter is affected. Subtract any time listed on these sheets from the ET on the filter. Be sure to note this subtraction on the filter card. We have a stamp on the Clean Room desk that is convenient to use for this. If an ET clock reading hours is being used at the site, convert the reading to minutes before entering in the book. Also, write this converted result on the card.

The final item that can be filled in is the **initial weight**. PM-10 filters are found in the quartz fiber filter weight book. The TSP filters are in the glass fiber weight book.

Repeat these steps for each of the filters received. Place them in the slots in the wooden blocks in the desiccator by the balance. They should be spread out as much as is practical. Try to put no more than two per slot. Also, the folded edge of the filter should be in the crease of your filter card. This helps them open up. They must sit in the room for 24 hours (bet you wish you read this before you started).

### Part 3: Filter Weighing

The weighings are performed on the Sartorius AC211S balance. It is the one with the stainless steel lid. You must check the balance before beginning. Turn the balance on by pressing down on the top left button that says "I/0." When zeros show up, you are ready. Checking the balance is done using the Troemner set of Class I weights on the desk. When the "g" designation at the right side of the readout comes on, the balance has stabilized enough for the reading to be

recorded. In a drawer you will see the balance calibration logbook used for recording this check. You will see a paper clip near the page of interest. Follow the example of the previous entries to do the check. The digital readout on the wall mounted Liebert unit may be used for the humidity and temperature readings.

Once a week the internal weight should be used to do an internal calibration on the Sartorius. The weight is in a plastic bag kept on the table near the balance. Instructions for doing this calibration are on a piece of yellow paper taped to the wall near the balance. Document this calibration in the balance calibration logbook.

You are now ready to weigh the filters. Take your first filter, remove the lid and place the filter on the weighing pan of the balance. Wait a few seconds until the “g” light goes on before you record a weight (we record the weight out to 3 places) in the final weight column. Also, record the date and put your initials in the date weighed column. I usually check the zero between each filter. When you are done weighing the filter, the folded side of the filter should be on the folded edge of the card.

## Part 4: Quality Assurance

After all the filters are done, find one of the QA people and tell them you need exposed filter QA. They will weigh at least 3 of the filters over again. Their weights and yours must agree within 0.005 g (5 mg). After this, you can give the filters to the QA section for inspection.

## Part 5: Filter reconciliation, calculations and filing

QA will take your filters and check them to make sure they are valid. They will return the pile to you. Now you will go through them all to make sure the filters are turned over in the cards. In other words, the open end of the filter goes into the crease of the card. You also have to make sure that your filter invalidations match QA's. Filters deemed invalid will have a comment in the remarks section and the initials of the person who invalidated it. Record these invalidations in the logbook (somewhere to the right of the **final weight** column), strike a line through the area reserved for the **concentration**, strike a line through the **valid initials** column and write the reason given for the **invalidation**.

The filters can now be filed in the cabinet in the organic prep room. Follow the pattern of the ones in there already.

Calculations of the concentrations of the filters are done using the computer. You will need to go to the Excel

database to find the G:\Everyone\Particulatedata\PM10\xxpm10calc.xls file (xx indicates the year) to do this calculation. This is now the logbook for the final concentrations on all particulate data.

These calculations are currently being done using SRC flows (a flow corrected to Standard Reference Conditions). Results are rounded to the nearest ug/m3. The formula for the concentration is:

$$\text{ug/m}^3 = \frac{\text{weight gain} \times 10^6}{\text{true flow} \times \text{time}}$$

Enter the data from the logbook into the computer. Be sure you have selected the tab for the proper site. The columns called weight gain, SRC, concentration and corrected act. flow are calculated fields and should be left alone. All the other fields through Date Weighed must be entered manually. For a valid sample, there should be a number to put in all the columns through Date Weighed.

Weather data for the sample runs is available from Oliver. We keep it in a folder called state weather data in Mark's cubicle. The sheet Oliver puts out has weather data for Gary and Indy on it. This is generally available shortly after the end of a month. Gary data should be used for any of the sites in the Northwest. This data goes into the Sample Temp and Sample Pressure columns.

After all of the data for a particular run is entered, the computer will calculate the SRC concentration. This database is also set up to automatically kick out data outside our acceptable limits and print "inv" for the concentrations. These triggers are in the columns U through Z. They work by testing values in certain columns. If the value is within our acceptable range, nothing happens. If not, the computer puts a 1 into the cell.

Column U has the weight gain flag. If the initial weight of the filter exceeds the final, the computer puts a 1 in this column. Column V has the ET flag. A sample time outside the range of 1380 to 1500 minutes will trigger this to read "False". Column W is the flag for the corrected actual flow (CAF). This flow must be within the range of 1.02 to 1.24. **Our database is the only source of this CAF information. If you see an invalid resulting from the CAF flag, be sure to notify Jan and Steve Lenz.** Column X is the miscellaneous invalidation flag. This looks for an "x" in Column S. If you have any other type of invalidation that has not been covered in the flags listed previously, put an x in Column S. You will be prompted to enter a reason for the invalidation in Column R. Columns Y (called Flag for any Inv) and Z are the summations of the other flag columns. If column Z says true, the sample is valid.

In 1999, EPA required us to submit concentrations calculated two ways. The first was what we are still doing now, the SRC flow calculation. They also had us submit the concentration resulting from using the actual flow. Remnants from this actual flow calculation are still in the database in hidden columns. Do not delete these columns because these flows are used to calculate our corrected actual flow.

## **Appendix E**

### **Clean Room SOP**

#### **Entry/Exit:**

The most important thing to remember about the clean room (Shadeland Room 153, also known formerly as the microscopy room) is that the two doors should **never** be open at the same time. To enter the room, open the outer door and step into the ante-room. Pull the outer door almost shut and then give it a good pull, making sure the click of the latch was heard. Next, step on the flooring and then onto the sticky mat. This flooring is grounded and this step will eliminate static electricity. Walk across the sticky mat to eliminate debris from your shoes. Now open the inner door to the room and shut it the same way as the outer door.

#### **Room Condition Monitoring Devices:**

The room has four devices to measure humidity and temperature. The first is the Liebert unit located on the east wall above the Mettler microbalance. This unit toggles between a temperature and RH reading once every five seconds or so. The sensor for the unit is located on the south wall near the return air ducts. The second is a hand-held Mannix brand Thermo-hygrometer. This currently is on the north wall near the Sartorius PM-10 balance. Device number three, on the east wall, is the HOBO Pro Temperature/RH data logger. This is a recording device which will archive the room conditions every five minutes. The fourth device, located on the west bench, is our dual pen hygrothermograph.

#### **Room and Monitor Maintenance:**

OAM personnel handle maintenance of this room. There is no need for any of the Western Select staff to enter. The floor of the room should be swept at least monthly and damp-mopped at least once every three months. Countertops should be wiped down as well. The HOBO Pro Temperature/RH data logger will need to have its data downloaded every two to three days. See the SOP at G:/analyt/SOPs/PM25hobodatalogger.doc for this procedure. The hygrothermograph needs to have its chart replaced every month.

#### **Operation:**

The room was designed to have only 2 people in at a time. Please do not enter the room when PM 2.5 filters are being weighed. If you need to discuss something with the room operator, the phone number in the room is 308-3245.

Do not try to slam the door from more than a distance of about three inches. This creates pressure in the ante-room which can blow the ceiling panels out of place. Even though this is a Class 10000 clean room, some settling of dust particles does occur. For this reason, always condition filters in the desiccators (notice, the doors are gone) or in the shelves of the wall cabinets.

## Appendix F

### STANDARD OPERATING PROCEDURE CANISTER CLEANING AND CERTIFICATION

After the analysis all canisters are cleaned and certified prior to re-use of the canisters in the field. Canister cleaning and certification is critical to ensure the highest possible quality of data from canister sampling and analysis. The following procedure has been developed in order to ensure efficient cleaning and certification of air sampling canisters:

1. Enter the information about the canisters to be cleaned in the canister cleaning and certification logbook.
2. Turn on the Fisher Maxima vacuum pump located in the fume hood and open the ballast on the pump. Allow the pump to warm up with the ballast open for ten to fifteen minutes and then close the ballast on the pump.
3. Remove the 1/4" caps from the canisters to be cleaned using a 9/16" open-ended wrench and remove all old sampling tags from the canisters. File the sampling tags in the appropriate file boxes.
4. Connect the canisters to the cleaning assembly in the Precision Scientific oven. Tighten the connecting nuts to finger tight and then tighten 1/4 turn past finger-tight using the 9/16" open-ended wrench. The cleaning assembly holds up to eight canisters. In the event that fewer than eight canisters require cleaning, place a 1/4" plug in any unused cleaning assembly ports and tighten to 1/4 turn past finger-tight using the 9/16" open end wrench.
5. Make sure that both valves on the moisturizer connected to the external canister cleaning assembly on the lab bench are open and that there is sufficient HPLC grade water in the moisturizer to ensure humidification of the zero air used to clean the canisters. Add water to the moisturizer if necessary. Humid zero air is more efficient than dry zero air for canister cleaning.
6. Make sure that the zero air cylinder connected to the canister cleaning assembly has a primary pressure above 500 psi. If the cylinder pressure falls below 500 psi, the canisters may become contaminated.



7. Set the delivery pressure on the two-stage regulator for the zero air tank to about 25 psi.
8. Make sure that the on/off valve on the external cleaning assembly on the lab bench is in the on position and that the unused ports on the external cleaning assembly are closed with 1/4" plugs.
9. Make sure that the arrow of the three-way valve located beneath the first port of the external cleaning assembly points toward the cleaning assembly, which will allow flow to the cleaning assembly in the oven.
10. Open the canister valves by turning counter-clockwise until slight resistance is felt.
11. Close the oven doors and turn the oven on. It should be set to 90 degrees C.
12. The zero air flow control valve is located above the solenoid switch. Turn this valve slowly so that the arrow points straight down. The flow of zero air to the canisters is at a maximum in this position.
13. The programmable timer controls the solenoid valve and roughing pump of the cleaning assembly. It is programmed to run EVERY DAY from 9:25 AM through 12:25 PM. Ten pressurization/evacuation cycles are performed in this time period. **DO NOT CHANGE THE PROGRAM! ADJUST THE TIME ON THE CLOCK TO START THE CLEANING CYCLE.**
14. The solenoid valve starts in the OFF position. In this position, the pump is OFF, and the valve is in a position which allows zero air to flow into the canisters. The timer should be displaying a symbol like this: [O]. This is the "always off" position. The cleaning cycle program is ignored in this position. Press and hold the button which looks like a small clock face, and use the hour and minute buttons to re-set the time to about 9:23 AM on the timer. Use the button shaped like a hand until the timer shows a symbol like a small clock with an open circle next to it. The program is now active.
15. The timer will automatically run 10 cleaning cycles (evacuate 5 minutes, pressurize 15 minutes). It is necessary to program a second set of cleaning cycles to ensure that the canisters will certify as clean.
16. After the second set of cleaning cycles, turn the oven off, open the doors, and allow the canisters to pressurize to about 20psi on the absolute pressure gauge.
17. Close the canister valves and allow the canisters to cool to room temperature.

18. Select one canister from the batch and test the canister for total non-methane organic carbon (NMOC) using the procedure outlined in the standard operating procedure for NMOC determination.
19. Ideally, the cleaned canister will have no peaks when analyzed for total NMOC. In some cases, there will be a small peak. Analyze the canister twice and record the average area count from the two analyses in the canister cleaning log book. The average of the two total NMOC values in the canister should be 10 ppbC (parts per billion of carbon) or less.
20. If the canister fails this certification procedure, run one more set of cleaning cycles and re-test the same canister. Repeat as necessary until the canister meets the certification requirement. Generally, the canister will pass on the first certification attempt. If the canister repeatedly fails attempts at certification, change the in-line hydrocarbon trap which helps to purify the air from the zero air cylinder, and check the moisturizer to verify that it has sufficient water.
21. After the canister has been certified as clean, hook up the canister to the cleaning assembly again and re-open all of the canister valves. Use the large vacuum control valve to open the flow path to the large Fisher Maxima pump in the hood. Evacuate all canisters to 0 psi absolute and hold for five minutes.
22. Close the canister valves and the vacuum control valve. Remove the canisters from the cleaning assembly. Place a new sampling tag on each canister and place the canisters in one of the designated locations in the Air Toxic Monitoring laboratories for storage of clean canisters which are ready to be used for sampling.

## **Appendix G**

### **Canister Handling SOP**

1. All clean canisters used for network or complaint sampling must be signed out by the person transporting the canisters to the monitoring location.
2. There will be a specific location chosen in the Air Toxic Monitoring lab for the submission of canister samples. Canisters must be submitted **DIRECTLY** to a staff member of the Air Toxic Monitoring Section for immediate sample log-in. A sample request form must be completed by the person submitting complaint samples for analysis. The sample request form will be filed in an appropriately labeled binder as part of the complaint sample log-in procedure. A copy of the sample request form will be stored in the 3-ring binder used for complaint sample analysis.
3. All non-complaint samples must be logged in to the Oracle Toxics Data Capture database. Filing of the sample request form for complaint samples constitutes sample log-in for complaints. If a network sample is invalid, the Oracle database provides a drop-down menu of invalid reasons which translate into the proper AIRS invalid code in the database.
4. The database also includes entries for the canister number, sample date, sample location, sampling time elapsed, site operator, person who received the sample in the lab, sample pressure in the canister, absolute pressure measured in the canister, and dilution factor. The Oracle database **REQUIRES** entry of the dilution factor for **ALL** samples! If no dilution is done, a "1" must be entered in this field. NMOC value must be entered in the sample log form in Oracle after the NMOC analysis has been done. All fields in the database must be completed for valid samples.

All samples must be logged in immediately when they arrive in the lab. Failure to log in a sample will result in the inability to automatically transfer Perkin Elmer and GC/MS data into the Oracle database for that sample until the log entry has been completed.

Each site now has its own 3-ring binder for filing of raw data generated by each instrument. The NMOC analysis for a sample is filed in front, followed by the Perkin Elmer data, and finally the GC/MS data. The most recent data are filed in the front.

When analysis has been completed for a given sample and the analysis has been verified by the Section Chief, the canister should be placed in an area of the lab which has been designated for canisters which are ready for cleaning. Canisters should be cleaned as soon as a sufficient number of canisters are available to load the canister cleaning assembly.

This SOP should be followed in order to ensure timely updates of the Toxwatch web page and availability of the data for trend analysis by the Air Programs Branch.

## Appendix H

# Office of Air Quality Air Monitoring Quality Management Plan



**Revision: 3**

7/11/2006

**Indiana Department of Environmental Management**

Indiana Government Center-North

100 N. Senate Ave.

Indianapolis, IN 46204

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**Office of Air Quality Air Monitoring Quality Management Plan Approvals**

Name/Title	Name (Signed)	Date
Paul Dubenetzky Acting Assistant Commissioner IDEM Office of Air Quality		
Dick Zeiler Branch Chief Air Monitoring Branch		
Steve Blaser Branch QA Coordinator		
David Parry IDEM Quality Assurance Manager		

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## Management and Organization

### **Q/A Policy**

#### *Importance of Q/A System*

The major functions of the Monitoring Branch are to collect, analyze, and report air quality data. Every aspect of these functions contains QA/QC activities.

#### *Q/A System Goals*

To ensure that the air quality data meets data quality objectives as determined for the monitoring projects by regulation or data need.

#### 1. Criteria Pollutants

Priority: Maintain Indiana's ambient air monitoring networks for criteria pollutants

Process: Enhance the fine particulate networks

- a) Continuous speciation monitors
- b) Nephelometer & aethalometer applications
- c) Visibility monitoring/cameras

Measure: Annual VDR, Milestones met, Percent complete

#### 2. Air Toxics

Priority: Monitor for air toxics

Process: School #21 continuous gas chromatograph

SW Indianapolis Special Project

NW Indiana Photo-chemical Assessment Monitoring Site

Measure: Annual VDR, Milestones met, Percent complete

#### 3. Regional Monitoring Strategy

Priority: Participate in the Regional Monitoring Strategy Development

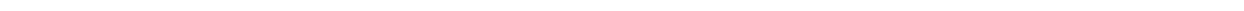
Process: Coordination of State, Regional, & Federal Monitoring Strategy

Measure: Milestones met, Percent complete

#### 4. LEADS

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Priority: Provide timely & high quality information on Air Quality to the Public  
Process: Implement LEADS (Leading Environmental Analysis & Display System)  
Measure: Milestones met, Percent complete



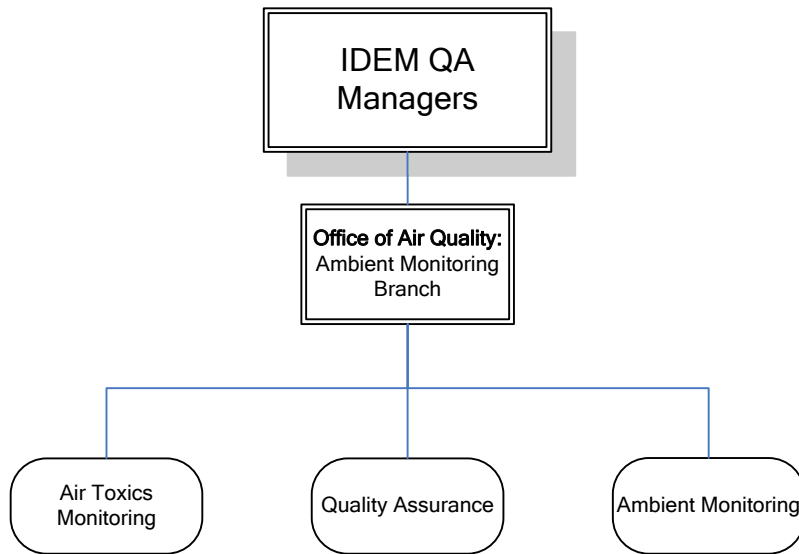


## Q/A Resources

Activity	Section	QA Staff Resources	QA Role & Tools or Standards Used
Monitoring plan development Safety Training & Implementation	Air Monitoring Branch	Chief 1 – Environmental Branch Chief 6	Oversight of QAPPs/Monitoring Plans and Training as well as program implementation. Tools: Employee Work Profile(s) IDEM OAQ QA Manual Standard Operating Procedures EPA Guidance
Administrative operations Equipment Tracking	AMB Support	Shipping/Receiving 1 – Administrative Assistant 4 1 – Secretary 3	QA/QC Documentation routing Tools: Employee Work Profile Requisition Program Procedures U.S. EPA Directive 2160 - Records Management Manual
Monitoring plan development Safety Training & Implementation	Air Toxics	Chief 1 – Senior Environmental Manager Supervisor 3	QC oversight of sample preparation & analysis Tools: Employee Work Profile(s) IDEM OAQ QA Manual Standard Operating Procedures EPA Guidance
Sample Preparation Sample Analysis	Air Toxics	Laboratory Personnel Several Chemist 1 & Chemist 2s	QC of sample preparation, analysis, and data tracking Tools: Employee Work Profile(s) IDEM OAQ QA Manual Standard Operating Procedures – TO Compendium of Methods EPA Guidance
Monitoring plan development Safety Training & Implementation	Ambient Monitoring	Chief 1 – Senior Environmental Manager Supervisor 3	QC oversight of monitoring operations including data transmission Tools: Employee Work Profile(s) IDEM OAQ QA Manual Standard Operating Procedures EPA Guidance
Sampler/Analyzer/Equipment Setup Maintenance and cleaning of monitoring and analysis equipment Sample Acquisition Sample Transport	Ambient Monitoring	Field Personnel 2 – Senior Environmental Manager 1s Several Environmental Manager 2s	QC of field operations - document sampling, analysis and transport of samples through maintenance checks and check sheets. Tools: Employee Work Profile(s) IDEM OAQ QA Manual Standard Operating Procedures EPA Guidance
Data Analysis Data Transmission	Ambient Monitoring	Information Manager 1 – Senior Environmental Manage 1	QC of sample data. Ensures data transmission is secure and correct. Tools: Employee Work Profile IDEM OAQ QA Manual Standard Operating Procedures EPA Guidance
Sample Transport	Ambient Monitoring	Shipping/Receiving 1 – Administrative Assistant 4	QC of sample transport – documentation. Tools: Employee Work Profile IDEM OAQ QA Manual Standard Operating Procedures EPA Guidance
Monitoring plan development Safety Training & Implementation	Quality Assurance	Chief 1 – Senior Environmental Manager Supervisor 3	Oversight of QAPPs/Monitoring Plan development and entire QA program implementation. Tools: Employee Work Profile(s) IDEM OAQ QA Manual Standard Operating Procedures EPA Guidance
QA Documentation Sampler/Analyzer/Equipment Setup Sampler/Analyzer/Equipment performance evaluation	Quality Assurance	QA Laboratory Personnel 1 – Senior Environmental Manager	QA/QC of QA Standards Laboratory including maintaining standard and equipment certification documentation. Tools: Employee Work Profile(s)

		1 Several Environmental Manage 2s	IDEM OAQ QA Manual Standard Operating Procedures EPA Guidance
QA Documentation Sampler/Analyzer/Equipment performance evaluation	Quality Assurance	Field Personnel Several Environmental Manage 2s	QA evaluation of field monitoring instruments, monitoring plans, and monitoring data. Tools: Employee Work Profile(s) IDEM OAQ QA Manual Standard Operating Procedures EPA Guidance

**Q/A Org Chart**



**Q/A Staff Contacts and Roles**

Name/Title	Section	Role
Steve Blaser		Branch QA Coordinator
Steve Blaser	Quality Assurance	Section QA Contact
Balvant Patel	Air Toxics Monitoring	Section QA Contact
Cole Remsburg	Ambient Monitoring	Section QA Contact

**Programs Covered by Q/A System**

*Technical Programs Subject to QA/QC Processes*

Technical Program	Environmental Activity
Field Monitoring	<ul style="list-style-type: none"> <li>• Sample Acquisition</li> <li>• Sample Transport</li> <li>• Site information</li> <li>• Sampler/Analyzer/Equipment Setup</li> <li>• Monitoring plan development</li> </ul>
Laboratory analytical analysis of samples	<ul style="list-style-type: none"> <li>• Sample Preparation</li> <li>• Sample Analysis</li> </ul>
Data Processing	<ul style="list-style-type: none"> <li>• Data Analysis</li> <li>• QA Documentation</li> <li>• Data Transmission</li> </ul>
Standards laboratory – comparisons	<ul style="list-style-type: none"> <li>• Sampler/Analyzer/Equipment performance evaluation</li> </ul>
Laboratory and office operations	<ul style="list-style-type: none"> <li>• Maintenance and cleaning of monitoring and analysis equipment</li> <li>• Safety Training &amp; Implementation</li> <li>• QA Personnel Documentation</li> <li>• QA Operations Policy</li> <li>• Equipment Tracking</li> <li>• Training Equipment Operations</li> <li>• Administrative operations</li> </ul>

Field Monitoring – site selection, site setup, ongoing operations

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Laboratory analytical analysis of samples

Data Processing – Collection, evaluation, corrections, submittal, etc.

Standards laboratory –comparisons

*Internal Coordination*

When monitoring is required Monitoring activities are coordinated. Since oversight of the monitoring is done by AMB and data reports are submitted to the AMB, significant monitoring interruptions or concentrations above the standards require notification of QA/QC compliance personnel.

**1.4.2 Internal Coordination:** The IDEM QA Managers asked AMB staff to provide the names of other IDEM units (offices, branches, sections) with which the AMB program should be coordinating QA/QC activities. AMB stated in the response to the element that the Branch coordinates with OAQ compliance – but it seems likely that AMB coordinates with other agency branches and workgroups. Does AMB coordinate with OAQ permits? Local air agencies? Coordination takes place with many groups including EPA, IT, Macs, etc. however QA/QC activities are dealt with by the entity or the AMB.

*Oversight of Contractors and Extramural Organizations*

Some laboratory analysis is done by contract laboratories. Local Agencies perform some environmental monitoring under agreement with IDEM. Some industries are required to monitor for various reasons. While this monitoring is not delegated to them they are subject to QA/QC requirements and oversight by the AMB

<b>Contract/Extramural entity name</b>	<b>Data or Service provided</b>	<b>Means of oversight</b>
Insert name of contract and/or extramural entity	Example: Fish tissue sampling data in support of the Fish Consumption Advisory	Examples of some lab quality control checks:  Quarterly reproducibility testing of lab (in terms of RPD) based on equivalency of laboratory results for a known concentration sample. 1 in 20 samples split, sent to two different labs to check for parity (Within RPD limits specified in a QAPP).



Eastern Research Group (ERG)	Analysis – Carbonyls, PAMS SW Indy – Metals, Carbonyls, Chrome 6 PM2.5 Speciation	EPA contract Lab – EPA provides QA/QC
<b>Local Agencies</b>		
Indianapolis Office of Environmental Services (IOES)	Monitoring, QA and QC of SO2, O3, NOx, PM10, CO, TSP(Pb), AQI	Local Agency Agreement  Monitoring/QA plan – OAQ QA Manual  Systems Evaluation by OAQ QA (Annually)  Quarterly QA data submittal review
Evansville EPA	Monitoring, QA and QC of PM10 & AQI plus monitoring assistance – site visits and checks	Same as above
Vigo Co APC	Monitoring, QA and QC of PM10 & AQI plus monitoring assistance – site visits and checks	Same as above
<b>Industries</b>		
American Electric Power (AEP)	Monitoring, QA and QC of SO2	Monitoring/QA plan – OAQ QA Manual  Systems Evaluation by OAQ QA (Annually)  Quarterly QA data submittal review
Aluminum Company of America (ALCOA)	Monitoring, QA and QC of SO2	Same as above
CINERGY - (PSI)		Same as above

Naval Air Warfare Center - Crane Division	Monitoring, QA and QC of Pb	Same as above
Exide	Monitoring, QA and QC of Pb	Same as above
Hoosier Energy	Monitoring, QA and QC of SO2	Same as above
IPL (AES)	Monitoring, QA and QC of SO2	Same as above
Northern Indiana Power & Service Company (NIPSCO)	Monitoring, QA and QC of SO2	Same as above
Richmond Power & Light (RPL)	Monitoring, QA and QC of SO2	Same as above
Southern Indiana Gas & Electric Company (SIGECO)	Monitoring, QA and QC of SO2	Same as above
SDI-Bar (Steel Dynamics)	Monitoring, QA and QC of SO2, NOx, PM10, CO	Same as above
SMD-SDI (Steel Dynamics)	Monitoring, QA and QC of PM10	Same as above
Waupauca	Monitoring, QA and QC of PM10	Same as above

### ***Communication***

Hands-on training is continuous for all employees. The IDEM OAQ Quality Assurance Manual is update as necessary and SOPs are developed and distributed to affected parties. The QA Manual contains description of the monitoring that is done by the AMB and provides guidance regarding the most common monitoring activities.

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## Quality System Components

### Quality System Description

#### Documentation

Provide a listing of documentation used as part of your quality system.

Name of QA Document	Description	Type	Effective Date	Name of Section to which it applies	Name of Environmental Activity to which it applies
<a href="#">IDEM OAQ QA Manual</a>	<a href="#">General monitoring and analysis guide</a>	<a href="#">SOPs/QAPP</a>		<a href="#">Ambient Monitoring</a>	<a href="#">All Monitoring Activities</a>
Grab Sample Collection	To collect air toxic samples in canisters	<a href="#">SOP</a>	ongoing	Air Toxics	<a href="#">Sample Acquisition</a>
Chain of Custody and logging	for canister system only	<a href="#">SOP</a>	ongoing	Air Toxics	<a href="#">Sample Transport</a>
Canister cleaning and certif.	to clean dirty canisters, prepare for reuse	<a href="#">SOP</a>	ongoing	Air Toxics	<a href="#">Sample Preparation</a>
NMOC analysis	Analysis for non-methane organic carbon	<a href="#">SOP</a>	ongoing	Air Toxics	<a href="#">Sample Analysis</a>
GC/MS Analysis	Method TO-15 Analysis		11/15/01 rev.	Air Toxics	<a href="#">Sample Analysis</a>
Perkin Elmer GC	Auto GC for PAMS	<a href="#">SOP</a>	pending	Air Toxics	<a href="#">Sample Analysis</a>
Metals Analysis	Analysis of filters on Atomic Absorption	<a href="#">SOP</a>	1/23/2002	Air Toxics	<a href="#">Sample Analysis</a>
PM 10, TSP Filter Weighing	Particulate Analysis, 8 x 10 filters	<a href="#">SOP</a>	1/5/2004	Air Toxics	<a href="#">Sample Analysis</a>
PM 2.5 using GLIMS	Gravimetric Analysis of 2.5 using GLIMS	<a href="#">SOP</a>	12/28/2005	Air Toxics	<a href="#">Sample Analysis</a>
Manipulating HOBO Data	Downloading Clean Room data into Excel	<a href="#">SOP</a>	3/1/2001	Air Toxics	<a href="#">Data Analysis</a>
Clarus SOP	GC at School 21	<a href="#">SOP</a>	pending	Air Toxics	<a href="#">Sample Acquisition</a>
Clean Room SOP	maintenance and cleaning of Clean Room	<a href="#">SOP</a>	pending	Air Toxics	<a href="#">Maintenance and cleaning of monitoring and analysis equipment</a>
Chemical Spill Kits	inspection and maintenance	<a href="#">SOP</a>		Air Toxics	<a href="#">Safety Training &amp; Implementation</a>
Handling Compressed Gases	safety for gas cylinders	<a href="#">SOP</a>		Air Toxics	<a href="#">Safety Training &amp; Implementation</a>
Spill Kit, Flammables	clean up of flammable solvent spills	<a href="#">SOP</a>		Air Toxics	<a href="#">Safety Training &amp; Implementation</a>
Spill Kit, Acids	clean up of acid spills	<a href="#">SOP</a>		Air Toxics	<a href="#">Safety Training &amp; Implementation</a>
Spill Kit, Caustics	clean up of caustic spills	<a href="#">SOP</a>		Air Toxics	<a href="#">Safety Training &amp; Implementation</a>
Spill Kit, Mercury	clean up of mercury spills	<a href="#">SOP</a>		Air Toxics	<a href="#">Safety Training &amp; Implementation</a>
<a href="#">How to Format SOPs</a>	<a href="#">Standard Operating Procedures</a>				

Preparation & Distribution of Invalid Data Memos		SOP	6/30/06 rev.	Quality Assurance	QA Documentation
Formatting of the QA Correspondence Letters and Memos		SOP	6/30/06 rev.	Quality Assurance	QA Documentation
Printing and Distribution of QA Manual		SOP	6/30/06 rev.	Quality Assurance	QA Documentation
Evaluation Process	Systems Evaluation Procedures	SOP	8/15/1997	Quality Assurance	QA Personnel Documentation
Acting Supervisor Designation		Policy	6/30/06 rev.	Quality Assurance	QA Operations Policy
Performance Appraisal Preparation		SOP	10/25/2000	Quality Assurance	QA Personnel Documentation
Loaning Out Quality Assurance Equipment		SOP	4/11/2006 rev.	Quality Assurance	Equipment Tracking
Satellite/TV/AVCR Operations		SOP	6/30/06 rev.	Quality Assurance	Training Equipment Operations
QA Section Vehicles		SOP	7/8/1999	Quality Assurance	Equipment Tracking
Cylinder Inventory		SOP	6/6/1993	Quality Assurance	Equipment Tracking
Evaluating Ambient/QA Monitoring Plan		SOP	10/25/1996	Quality Assurance	Data Analysis
Site Description Book		SOP	5/11/2004	Quality Assurance	Site information
Review of Precision & Accuracy Data		SOP	5/11/2004	Quality Assurance	Data Analysis
Meteorological Audit Procedure		SOP	2/22/1995	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Certification Facility Program Procedures		SOP	6/1/1995	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Interlab Audit Program		SOP	10/4/1996	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Quarterly PARS Data Transfer		SOP	6/5/1995	Quality Assurance	Data Transmission
Seasonal Monitoring Calibration Requirement		SOP	10/27/1995	Quality Assurance	QA Documentation
Exceedance Review Reporting System		SOP	9/27/1995	Quality Assurance	Data Analysis
Procedures for Querying PARS		SOP	4/27/1996	Quality Assurance	Data Analysis
Submitting P&A Reporting		SOP	8/15/1997	Quality Assurance	Data Transmission
Data Checks	Review Process	SOP	3/8/2001	Quality Assurance	QA Documentation
Molbox Certification Procedures		SOP	8/17/1999	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Vacuum Checks on Manifolds		SOP	6/29/06 rev.	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Barometer Certification/Calibration Procedures		SOP	10/1/1998	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
CO Calibration		SOP	8/2/1999	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Calibration of Ozone Analyzer		SOP	5/19/1999	Quality Assurance	Sampler/Analyzer/Equipment Setup
Thermometer/Temperature Probe Certification		SOP	7/14/1999	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Orifice Calibrations		SOP	7/29/1999	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Verification of SO2 Calibrations		SOP	7/22/1999	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Multimeter Certification/Calibration		SOP	9/1/1999	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Audit Method for Analysis of Lead Strips		SOP	10/11/2001	Quality Assurance	Sample Analysis
GMIS Designation		SOP	10/11/2001	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
CO Certification		SOP	8/20/1999	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Elapsed Time Meter Certification		SOP	10/12/2001	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
SO2 Analyzer Calibration		SOP	10/12/2001	Quality Assurance	Sampler/Analyzer/Equipment Setup
Anemometer Certification		SOP	1/11/2000	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Bios Verification		SOP	9/9/1999	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
NO Calibration		SOP	9/16/1999	Quality Assurance	Sampler/Analyzer/Equipment Setup
SO2 Certification		SOP	1/20/1999	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
NO Certification		SOP	1/11/2000	Quality Assurance	Sampler/Analyzer/Equipment

					performance evaluation
Particulate Filter Quality Assurance		SOP	1/20/1999	Quality Assurance	Data Analysis
Ozone Certification and Calibration		SOP	5/14/2001	Quality Assurance	Sampler/Analyzer/Equipment Setup
Ozone Loss Test		SOP	1/11/2000	Quality Assurance	Sampler/Analyzer/Equipment Setup
"S" Weights		SOP	6/30/06 rev.	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Stop Watch Certification		SOP	6/30/06 rev.	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Factory Cert/Cal for Photo Tachometer		SOP	6/30/06 rev.	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Factory Cert/Cal for Radiation Sensors		SOP	1/11/2000	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Factory Cert/Cal for Voltage Calibrators		SOP	6/30/06 rev.	Quality Assurance	Sampler/Analyzer/Equipment performance evaluation
Retrieval of PM2.5 Field Blank Data		SOP	1/12/2000	Quality Assurance	Data Transmission
Operating Epson PhotoPC 750z Digital Camera		SOP	4/22/2002	Quality Assurance	Sampler/Analyzer/Equipment Setup
Epson PowerLite 7250 A/V Projector Setup		SOP	1/23/2004	Quality Assurance	Sampler/Analyzer/Equipment Setup
Requisition Program Procedures		SOP	1/23/2004	Quality Assurance	Administrative operations
Procedures for Disposal of Hazardous Waste		SOP	10/9/1998	Quality Assurance	Safety Training & Implementation
Safety Program Procedures		SOP	6/5/1995	Quality Assurance	Safety Training & Implementation
U.S. EPA Directive 2160 - Records Management Manual (July 13, 1984)		EPA Guidance	7/13/1984	Air Monitoring Branch Quality Assurance Air Toxics Ambient Monitoring	Administrative Operations
EPA Requirements for Quality Assurance Project Plans (QA/R-5)		EPA Guidance	5/2006	Air Monitoring Branch	Monitoring Plan Development
Guidance for Quality Assurance Project Plans (G-5)		EPA Guidance	2/1998	Air Monitoring Branch	Monitoring Plan Development
Data Quality Assessment: Statistical Tools for Practitioners (QA/G-9S)		EPA Guidance	2/2006	Air Monitoring Branch	Data Analysis
Data Quality Assessment: A Reviewer's Guide (QA/G-9R)		EPA Guidance	2/2006	Air Monitoring Branch	Data Analysis
Guidance on Environmental Data Verification and Data Validation (QA/G-8)		EPA Guidance	11/2002	Air Monitoring Branch	Data Analysis
Guidance for Preparing Standard Operating Procedures (QA/G-6)		EPA Guidance	3/2001	Air Monitoring Branch	Administrative Operations
"Data Quality Objectives (DQOs) for Relating Federal Reference Method (FRM) and Continuous PM <sub>2.5</sub> Measurements to Report an Air Quality Index (AQI)" EPA-454/B-02-002, November 2002		EPA Guidance	11/2002	Air Monitoring Branch	Monitoring Plan Development
PM2.5 "Data Flagging Guidance"		EPA Guidance	6/27/2000	Air Monitoring Branch	Data Analysis
Guideline for Reporting of Daily Air Quality - "Air Quality Index (AQI)" 40 CFR parts 50, 53 and 58		EPA Guidance	5/2006	Ambient Monitoring	Data Transmission
"Guidance for Network Design and Optimum Site Exposure for PM2.5 and PM10", EPA-454R-99-022, December 1997		Federal Regulations	Thru 1/1/2006	Air Monitoring Branch	All Monitoring Activities
Guideline on Data Handling Conventions for the PM NAAQS		EPA Guidance	12/1997	Air Monitoring Branch	Monitoring Plan Development
EPA's "Visibility Monitoring Guidance" document, EPA-454/R-99-003		EPA Guidance	4/1999	Air Monitoring Branch	Data Analysis
Technical Assistance Document (TAD) for Sampling and Analysis of Ozone Precursors; EPA/600-R-98/161		EPA Guidance	6/1999	Ambient Monitoring	Monitoring Plan Development
QA Handbook for Air Pollution Measurement Systems: Volume I & II		EPA Guidance	9/1998	Ambient Monitoring	Sample Acquisition
TO Compendium of Methods		EPA	Updated to current versions	Ambient Monitoring	All Monitoring Activities
		EPA	Updated to	Air Toxics	Sample Preparation

		Guidance	current versions		Sample Analysis
"Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)"		EPA Guidance	5/1987	Quality Assurance Ambient Monitoring	Data Analysis
"Guideline on the Identification and use of Air Quality Data Affected by Exceptional Events", EPA-450/4-86-007		EPA Guidance	7/1986	Air Monitoring Branch	Data Analysis
"Office of Air Quality Planning and Standards Air Monitoring Strategy For Criteria Pollutants"		EPA Guidance	1987	Quality Assurance Ambient Monitoring	Monitoring Plan Development
AQS Data Coding Manual		EPA Guidance	6/30/2005	Air Monitoring Branch	Data Transmission
AQS Data Dictionary		EPA Guidance	6/20/2006	Air Monitoring Branch	Data Transmission
AQS User Guide		EPA Guidance	1/23/06	Air Monitoring Branch	Data Transmission
AQS Data Retrieval Guide		EPA Guidance	10/21/05	Air Monitoring Branch	Data Transmission

#### *Planning and Annual Review*

The Office of Air Quality (OAQ) Ambient Monitoring Branch (AMB) does not perform annual quality system reviews or assessments that lead to any planning activities to improve the quality system.

#### *Management Assessments*

OAQ AMB does not perform management assessments.

#### *Training*

OAQ AMB does not perform quality system trainings.

#### *Systematic Planning of Projects*

For major monitoring projects a QAPP is developed using the standard QAPP preparation approach. For small projects no systematic approach is currently being implemented. A streamlined systematic approach for small projects needs to be defined and implemented. Projects are identified in the AMB Strategic plan and the EnPPA.

#### *Project-specific Quality Documentation*

AMB develops QAPPs for EPA-driven projects that require a QAPP. When such a project is proposed, usually an EPA contractor develops a "skeleton" QAPP and distributes it to state air monitoring bodies for review. The contractor receives comments and then releases a "skeleton" or "template" QAPP. OAQ AMB modifies the QAPP, as needed, to reflect AMB operations and QA procedures. AMB submits these to EPA.

#### *Project and Data Assessments*

Does your program area assess the project activities and the data collected during, or upon completion of the project? Yes, however most of the projects are ongoing. Monitoring activities are adjusted base on results of the data. Most of the data that is acquired is used to assess environmental conditions at a moment in time (e.g. hourly or daily). Data is also used to evaluate compliance with long term objectives such as area reduction of concentrations or maintaining standards which have limits based on data (highest values) from several years.

Data is assessed using data acquisition software and via manual QA/QC as in Chapter 12 “Data Reduction & Audit Procedures” and Chapter 13 “Quality Assessment and Statistical Analysis of Air Monitoring Data” of the OAQ QA Manual. Flagging of data for various reasons (low flow, power failure, etc.) is explained in Chapter 7 parts 1 and 5. The flags allow data availability in the AQS (AIRS) database, but qualify data with a descriptive flag (number) to allow users to include or exclude the data for their specific use.

### ***Quality System Tools***

Q/A Tools include the following:

- Quality Management Plans
- QA Project Plan
- Data Verification and Validation (data assessments);

### ***Quality Assurance Project Plans (QAPPs)***

*Environmental Programs that Use QAPPs*

- List programs that use Quality Assurance Project Plans

*Review and Approval Procedures*

Provide explanation of review and approval procedures for QAPPs. Alternatively, you may use an external reference.

## **Personnel Qualification and Training**

### ***Description of Training Policy***

OAQ AMB does not use a written training policy or plan for training of management and staff.

### ***Training Q/A Procedures***

*Ensuring Appropriate Training*

OAQ AMB does not have a formal process for identifying, ensuring, and documenting that personnel have and maintain the appropriate knowledge and skills. Training needs are sometimes identified during annual performance appraisals.

*Meeting Requirements for Formal Training*

OAQ AMB does not employ staff that require formal training and licensing.

*Identifying Need for Retraining*

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OAQ AMB does not have a systematic means of determining when staff should be retrained or be provided with training updates. Retraining is initiated based on employee performance and when significant technical changes have occurred.

## **Procurement of Items and Services**

### ***Reviewing and Approving Q/A Documents***

Equipment, contracts, and other procurement costs are estimated in the annual Ambient Monitoring Branch (AMB) budget. Purchase of these items is proposed based on program needs. Items include ambient analyzers, calibration equipment, data acquisition systems, vehicles, property rent, service contracts, analytical equipment, computer programming, software, etc. AMB technical staff develop specifications for requisitions of technical equipment. The specifications must meet program technical and quality requirements contained in the Quality Assurance Manual and in EPA guidance. The specifications are incorporated into the requisition by assigned staff. Next, the requisition is reviewed by the respective OAQ AMB Section Chief. The AMB Branch Chief provides final branch approval for requisitions below 100,000. After AMB Branch Chief approval, requisitions are sent to OAQ Procurement for processing. Requisitions above 10,000 need approval from the OAQ Assistant Commissioner. Requisitions with remunerated values of above 100,000 also need approval from the Office of External Affairs AC. To ensure that data are of the necessary quality, all external sources producing air quality monitoring data must prepare a Monitoring/QA Plan. The plan contains all the elements of a QAPP and is submitted prior to commencement of monitoring or analysis. The plans are reviewed for applicability and completeness based on monitoring and QA requirements of the IDEM OAQ Quality Assurance Manual, the CFR, and Federal guidance documents, and approved by the OAQ Air Monitoring Branch Quality Assurance Section Chief.

### ***Post-procurement Product/Service Q/A Procedures***

Upon delivery specifications are checked by initiator of the procurement. Quantity, material and performance are tested. Testing varies based on product or service. Section Chiefs and the Branch Chief review procurement documents and approve prior to submittal to the Purchasing Department. EPA approved equipment is verified against grant applications (tied to EnPPA priorities).

OAQ AMB evaluates technical equipment “on the bench” before use. If the equipment is defective, AMB can withhold payment and/or send the instrument back for repair under warranty.

## **Documents and Records**

### ***Identification of Q/A-related Records***

OAQ Ambient Monitoring Branch does not use a systematic process for identifying QA-related records subject to control. In general, Air Compliance Branch retains any document bearing an original signature and all records used as the basis for decision-making. AMB retains all records concerning data validity, including calibration records, data audits, and siting process records.

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AMB also retains records of contractual arrangements with landowners and external monitoring entities.

[Staff name and position] works with the file room and [other program staff names and positions] to maintain document retention policy. [Staff name/position] identifies Q/A related records in consultation with [other program staff names and positions], OLC, and [applicable rules/statutes and associated program]."

The answer above the generic statement is correct. AMB has identified QA/QC documents and their retention schedule in a spreadsheet but the development and application of this document retention process in conjunction with the agency document retention schedule was put on hold pending the electronic document control system being initiated by IDEM upper management. Files are not stored in a central file system (File Room) therefore completing the Record Handling Process table below is not applicable. There is a general file area and many individual file areas kept by staff members.

The Document/Record Handling Process would be better defined through an electronic spreadsheet or database rather than a hard copy listing such as below in 5.2 and 5.3.

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## Record Handling Processes

Series #	Document Name	Preparation	Review	Approval
Series # from file-room listing (if applicable)	Name of document type.	Information related to file preparation, including the following: <ul style="list-style-type: none"> <li>The policy on what goes to the file room. Do you have written policy? If yes, please summarize and reference. If not, please provide a summary of your oral policy in your response.</li> <li>Documents are coded by the programs before they are sent to the file room. Reference any guidance containing the coding system currently used by your program.</li> <li>What staff position does the file coding and preparation?</li> <li>Do you have confidential records, and/or exceptions to confidentiality associated with this record series? If yes, please explain.</li> </ul>	Describe processes associated with Q/A document review. <ul style="list-style-type: none"> <li>Who (by name and position) reviews materials to be sent to the file room?</li> <li>What do they look for, and how do they determine if the records are complete?</li> <li>Are there written processes (SOPs), or checklists?</li> </ul>	Describe processes associated with Q/A document approval. <ul style="list-style-type: none"> <li>Are there particular levels of approval for a document before it is sent to the file room?</li> <li>What positions participate in the approval?</li> <li>If, in your area, the level of approval needed depends upon document type, please provide the alternate review scenarios in your response.</li> </ul>
	All documents below except as noted.	<ul style="list-style-type: none"> <li>AMB has no written policy regarding filing. The item drives the file location through job responsibilities.</li> <li>Files are sent to secretary for filing in central files or filed by the staff member in an appropriate area.</li> <li>Files are not coded. They are filed by subject or by county-facility-date.</li> <li>There are no confidential files other than personnel files.</li> </ul>	<ul style="list-style-type: none"> <li>Group Leaders (Environmental Manage 2Ws) or Senior Environmental Manager 1s review documents initially and Section Chiefs or Branch Chief provide final review if necessary.</li> <li>Documents are reviewed for completeness and correctness. Completeness is has no missing information in areas that require response. If a response is missing it must be documented in comments. Correctness is evaluated by checking to make sure the entries are in the correct range and that calculations produce correct values.</li> <li>There are no written SOPs for the review although there is guidance for acceptable completion of the documents.</li> </ul>	<ul style="list-style-type: none"> <li>Very few QA documents require sign-off approval other than the originator and for communications the Section Chief or Branch Chief.</li> <li>Documents that do require approval generally follow the review path described to the left whit sign-off.</li> <li>When signature approval is needed it will be noted below.</li> </ul>
79-2748	Correspondence - Industry/ External Customers	As indicated above	Section Chiefs or Branch Chief provide final review for correspondence	Section Chiefs and Branch Chief approve/sign correspondence
80-479	Annual Reports - AT Data Summaries	As indicated above	As indicated above	As indicated above
80-1234	Documentation - Motor Pool	As indicated above	As indicated above	As indicated above
80-1255	Reference documents- Quarterly Reports - Reports to Section Chief - Requisition Justifications - Justifications for Equipment,	As indicated above	As indicated above	As indicated above

	Site Files			
80-1284	Excel files - purchase requisitions, siting images	As indicated above	As indicated above	As indicated above
80-1285	QA Reference Files - Certification Stickers, QAPPs, Methods, General Information	As indicated above	Section Chiefs and Branch Chief provide final review for QAPPs	Section Chiefs and Branch Chief approve
80-1286	Chap 17 Manual - Monitoring Analysis QA	As indicated above	As indicated above	As indicated above
80-1287	Miscellaneous Files - Areas of Responsibility, Site inspections, procedure references, forms	As indicated above	As indicated above	As indicated above
80-1300	Requisitions - Siting Information, Local Agency reference files	As indicated above	Section Chiefs and Branch Chief provide final review for Requisitions	Section Chiefs and Branch Chief approve Requisitions
80-1304	Particulate Sampler - Performance Records	As indicated above	As indicated above	As indicated above
80-1327	Reference documentation - site monitoring lists	As indicated above	As indicated above	As indicated above
80-1345	Industry Monitoring Plans - Discontinued Monitoring Plans, NADP Reports	As indicated above	As indicated above	As indicated above
80-1368	Background Information - Subject Reference Files, Site Safety Evaluations	As indicated above	As indicated above	As indicated above
80-1370	Audits/Cals/Invalidations, Branch Activities, certifications	As indicated above	As indicated above	As indicated above
80-1389	Instrument Manuals	As indicated above	As indicated above	As indicated above
80-1390	Quality Assurance Manual - All Chapters, AMB SOPs	As indicated above	Section Chiefs and Branch Chief provide final review	Section Chiefs and Branch Chief approve
80-1411	Reference documents - speciation procedures	As indicated above	As indicated above	As indicated above
80-1412	Forms - Filter Weight Check, Equipment Photos, reference files	As indicated above	As indicated above	As indicated above
80-1414	OAMD Manual - OAMD Reference Guide	As indicated above	As indicated above	As indicated above
80-1430	Speciation Audits - Procedures-Forms-	As indicated above	As indicated above	As indicated above
80-1435	EPA Reference Procedures - Quality Assurance Methods	As indicated above	As indicated above	As indicated above
80-1440	Invalid Memos - Office Memos	As indicated above	As indicated above	As indicated above
80-1446	QA Laboratory - Certification Reports	As indicated above	As indicated above	As indicated above
80-1455	Summary documents - Network Review site summary docs, PARS Program Files	As indicated above	As indicated above	As indicated above
80-1462	Monitoring Site Maps - Site Addresses, Site Summaries, Data Checks, Data Summaries	As indicated above	As indicated above	As indicated above
80-6813	Equipment Maintenance - General Program	As indicated above	As indicated above	As indicated above
83-483	Lab SOPs - QA Cert Facility-Lab SOPs, field operational	As indicated above	As indicated above	As indicated above
83-485	Local Agency Evaluations - Performance Records	As indicated above	As indicated above	As indicated above
83-540	Inter-QA Lab Audits - Local and Industrial	As indicated above	As indicated above	As indicated above

Series #	Document Name	Issuance	Use	Authentication	Revisions
Series # from file-room listing (if applicable)	Name of document type.	Describe processes associated with Q/A document issuance. With respect to permits and other decisions, what are the processes for the following: <ul style="list-style-type: none"> <li>Whom is notified of the issuances?</li> <li>Where to store the documents bearing the decision filed?</li> <li>Where the underlying, or working, documents associated with the issuance are filed or stored?</li> </ul>	Describe processes associated with Q/A document use (i.e. when to use, who uses). <ul style="list-style-type: none"> <li>Are there protocols (SOPs) for using existing records (current permits, DMRs, inspection reports) in decision-making and/or the development of new documents (renewed permits, future inspection lists, etc)?</li> </ul>	Describe processes associated with Q/A document authentication (for documents that need to be managed in print form). Please provide: <ul style="list-style-type: none"> <li>Process to ensure that the current versions of Q/A documents are signed and dated.</li> <li>Reference any associated routing sheets.</li> </ul>	Describe processes associated with Q/A document revisions, including revision timelines and roles). <ul style="list-style-type: none"> <li>Describe triggers (regulatory changes, judicial decisions, EPA policy changes, changes to SIPs, etc) that initiate revisions to this document type, and associated work tools and daily forms?</li> <li>SOPs are discussed separately under QMP Element #8</li> </ul>
		<ul style="list-style-type: none"> <li>Not applicable</li> </ul>	<ul style="list-style-type: none"> <li>Document use is described in the OAQ QA Manual and in some SOPs..</li> </ul>	<ul style="list-style-type: none"> <li>There is a tracking spreadsheet for tracking SOPs and QAPPs that have routing through signature and a distribution database. Other QA documents are not tracked or routed, but updated as needed. Distribution to applicable parties upon update.</li> </ul>	<ul style="list-style-type: none"> <li>Revisions are made to documents based changes in Federal or State law, technical guidance, new methods, Agency policy, QA policy changes, physical site, and for convenience of use.</li> </ul>
79-2748	Correspondence - Industry/ External Customers	Not applicable	As indicated above	As indicated above	No Revisions
80-479	Annual Reports - AT Data Summaries	Not applicable	As indicated above	As indicated above	No Revisions
80-1234	Documentation - Motor Pool	Not applicable	As indicated above	As indicated above	No Revisions
80-1255	Reference documents- Quarterly Reports - Reports to Section Chief - Requisition Justifications - Justifications for Equipment, Site Files	Not applicable	As indicated above	As indicated above	No Revisions except site files are updated as physical changes occur or about annually.
80-1284	Excel files - purchase requisitions, siting images	Not applicable	As indicated above	As indicated above	No Revisions
80-1285	QA Reference Files - Certification Stickers, QAPPs, Methods, General Information	Not applicable	As indicated above	As indicated above	As indicated above
80-1286	Chap 17 Manual - Monitoring Analysis QA	Not applicable	As indicated above	As indicated above	As indicated above, but on 2 year revision schedule
80-1287	Miscellaneous Files - Areas of Responsibility, Site inspections, procedure references, forms	Not applicable	As indicated above	As indicated above	As indicated above
80-1300	Requisitions - Siting Information, Local Agency reference files	Not applicable	As indicated above	As indicated above	No Revisions except site files are updated as physical changes occur or about annually.
80-1304	Particulate Sampler - Performance Records	Not applicable	As indicated above	As indicated above	As indicated above
80-1327	Reference documentation - site monitoring lists	Not applicable	As indicated above	As indicated above	As indicated above
80-1345	Industry Monitoring Plans - Discontinued	Not applicable	As indicated above	As indicated above	As indicated above

	<b>Monitoring Plans, NADP Reports</b>				
80-1368	Background Information - Subject Reference Files, Site Safety Evaluations	Not applicable	As indicated above	As indicated above	No Revisions
80-1370	Audits/Cals/Invalidations, Branch Activities, certifications	Not applicable	As indicated above	As indicated above	No Revisions
80-1389	Instrument Manuals	Not applicable	As indicated above	As indicated above	No Revisions
80-1390	Quality Assurance Manual - All Chapters, AMB SOPs	Not applicable	As indicated above	As indicated above	As indicated above, but on 2 year revision schedule
80-1411	Reference documents - speciation procedures	Not applicable	As indicated above	As indicated above	As indicated above
80-1412	Forms - Filter Weight Check, Equipment Photos, reference files	Not applicable	As indicated above	As indicated above	No Revisions – photos updated when change occurs.
80-1414	OAMD Manual - OAMD Reference Guide	Not applicable	As indicated above	As indicated above	No Revisions
80-1430	Speciation Audits - Procedures-Forms-	Not applicable	As indicated above	As indicated above	No Revisions
80-1435	EPA Reference Procedures - Quality Assurance Methods	Not applicable	As indicated above	As indicated above	As indicated above
80-1440	Invalid Memos - Office Memos	Not applicable	As indicated above	As indicated above	No Revisions
80-1446	QA Laboratory - Certification Reports	Not applicable	As indicated above	As indicated above	No Revisions
80-1455	Summary documents - Network Review site summary docs, PARS Program Files	Not applicable	As indicated above	As indicated above	No Revisions
80-1462	Monitoring Site Maps - Site Addresses, Site Summaries, Data Checks, Data Summaries	Not applicable	As indicated above	As indicated above	No Revisions
80-6813	Equipment Maintenance - General Program	Not applicable	As indicated above	As indicated above	No Revisions
83-483	Lab SOPs - QA Cert Facility-Lab SOPs, field operational	Not applicable	As indicated above	As indicated above	As indicated above
83-485	Local Agency Evaluations - Performance Records	Not applicable	As indicated above	As indicated above	No Revisions
83-540	Inter-QA Lab Audits - Local and Industrial	Not applicable	As indicated above	As indicated above	No Revisions

**Document Maintenance**

Series #	Document Name	Transmittal	Distribution	Retention	Access
		Processes associated with transmittal of Q/A related documents. <ul style="list-style-type: none"> <li>When, how, and to where are completed work documents transmitted?</li> </ul>	Processes associated with distribution of Q/A related documents. <ul style="list-style-type: none"> <li>Who gets what?</li> <li>What is the protocol for what work product goes to the public (including via the Internet), to the file room, or to non-file room, but internal program files?</li> </ul>	Processes associated with retention of Q/A related documents. <ul style="list-style-type: none"> <li>What are your record retention policies?</li> </ul>	Processes / network locations associated with access of Q/A related documents. <ul style="list-style-type: none"> <li>What are the access points (both internal and external) for this document type?</li> </ul>
		A comprehensive document management system is under development.	A comprehensive document management system is under development.	Agency Document Retention Schedule – A comprehensive document management system is under development.	A comprehensive document management system is under development.
79-2748	Correspondence - Industry/ External Customers	As indicated above	As indicated above	As indicated above	As indicated above
80-479	Annual Reports - AT Data Summaries	As indicated above	As indicated above	As indicated above	As indicated above
80-1234	Documentation - Motor Pool	As indicated above	As indicated above	As indicated above	As indicated above
80-1255	Reference documents- Quarterly Reports - Reports to Section Chief - Requisition Justifications - Justifications for Equipment, Site Files	As indicated above	As indicated above	As indicated above	As indicated above
80-1284	Excel files - purchase requisitions, siting images	As indicated above	As indicated above	As indicated above	As indicated above
80-1285	QA Reference Files - Certification Stickers, QAPPs, Methods, General Information	As indicated above	As indicated above	As indicated above	As indicated above
80-1286	Chap 17 Manual - Monitoring Analysis QA	As indicated above	As indicated above	As indicated above	As indicated above
80-1287	Miscellaneous Files - Areas of Responsibility, Site inspections, procedure references, forms	As indicated above	As indicated above	As indicated above	As indicated above
80-1300	Requisitions - Siting Information, Local Agency reference files	As indicated above	As indicated above	As indicated above	As indicated above
80-1304	Particulate Sampler - Performance Records	As indicated above	As indicated above	As indicated above	As indicated above
80-1327	Reference documentation - site monitoring lists	As indicated above	As indicated above	As indicated above	As indicated above
80-1345	Industry Monitoring Plans - Discontinued Monitoring Plans, NADP Reports	As indicated above	As indicated above	As indicated above	As indicated above
80-1368	Background Information - Subject Reference Files, Site Safety Evaluations	As indicated above	As indicated above	As indicated above	As indicated above
80-1370	Audits/Cals/Invalidations, Branch Activities, certifications	As indicated above	As indicated above	As indicated above	As indicated above
80-1389	Instrument Manuals	As indicated above	As indicated above	As indicated above	As indicated above
80-1390	Quality Assurance Manual - All Chapters, AMB SOPs	As indicated above	As indicated above	As indicated above	As indicated above

80-1411	Reference documents - speciation procedures	As indicated above	As indicated above	As indicated above	As indicated above
80-1412	Forms - Filter Weight Check, Equipment Photos, reference files	As indicated above	As indicated above	As indicated above	As indicated above
80-1414	OAMD Manual - OAMD Reference Guide	As indicated above	As indicated above	As indicated above	As indicated above
80-1430	Speciation Audits - Procedures-Forms-	As indicated above	As indicated above	As indicated above	As indicated above
80-1435	EPA Reference Procedures - Quality Assurance Methods	As indicated above	As indicated above	As indicated above	As indicated above
80-1440	Invalid Memos - Office Memos	As indicated above	As indicated above	As indicated above	As indicated above
80-1446	QA Laboratory - Certification Reports	As indicated above	As indicated above	As indicated above	As indicated above
80-1455	Summary documents - Network Review site summary docs, PARS Program Files	As indicated above	As indicated above	As indicated above	As indicated above
80-1462	Monitoring Site Maps - Site Addresses, Site Summaries, Data Checks, Data Summaries	As indicated above	As indicated above	As indicated above	As indicated above
80-6813	Equipment Maintenance - General Program	As indicated above	As indicated above	As indicated above	As indicated above
83-483	Lab SOPs - QA Cert Facility-Lab SOPs, field operational	As indicated above	As indicated above	As indicated above	As indicated above
83-485	Local Agency Evaluations - Performance Records	As indicated above	As indicated above	As indicated above	As indicated above
83-540	Inter-QA Lab Audits - Local and Industrial	As indicated above	As indicated above	As indicated above	As indicated above

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Series #	Document Name	Tracability	Retrieval	Removal of Obsolete Documentation	Archiving and/or Disposal
		Processes associated with tracking of Q/A related documents. <ul style="list-style-type: none"> <li>List tracking tools (forms, routing sheets, software, etc)</li> <li>List any written SOPs or policies that address the use or maintenance and/or use of these tracking tools.</li> </ul>	Processes associated with retrieval of Q/A related documents. <ul style="list-style-type: none"> <li>What is the protocol/SOPs for retrieving non-file room documents? (That is, documents that must be maintained, but are not sent to the file room and which may be public or confidential?)</li> </ul>	Processes associated with removing obsolete Q/A related documents. <ul style="list-style-type: none"> <li>Describe process for purging records that have exceeded scheduled retention timetables?</li> </ul>	Processes associated with archiving and/or disposing of Q/A related documents. <p>[What we want is: what is your process for addressing disposal of documents that may have special disposal requirements due to confidentiality? Regarding archiving, that might overlap somewhat with 5.4.5. above, on document preservation?]</p>
		Agency Document Retention Schedule – A comprehensive document management system is under development.	Agency Document Retention Schedule – A comprehensive document management system is under development.	Agency Document Retention Schedule – A comprehensive document management system is under development.	Agency Document Retention Schedule – A comprehensive document management system is under development.
79-2748	Correspondence - Industry/ External Customers	As indicated above	As indicated above	As indicated above	As indicated above
80-479	Annual Reports - AT Data Summaries	As indicated above	As indicated above	As indicated above	As indicated above
80-1234	Documentation - Motor Pool	As indicated above	As indicated above	As indicated above	As indicated above
80-1255	Reference documents- Quarterly Reports - Reports to Section Chief - Requisition Justifications - Justifications for Equipment, Site Files	As indicated above	As indicated above	As indicated above	As indicated above
80-1284	Excel files - purchase requisitions, siting images	As indicated above	As indicated above	As indicated above	As indicated above
80-1285	QA Reference Files - Certification Stickers, QAPPs, Methods, General Information	As indicated above	As indicated above	As indicated above	As indicated above
80-1286	Chap 17 Manual - Monitoring Analysis QA	As indicated above	As indicated above	As indicated above	As indicated above
80-1287	Miscellaneous Files - Areas of Responsibility, Site inspections, procedure references, forms	As indicated above	As indicated above	As indicated above	As indicated above
80-1300	Requisitions - Siting Information, Local Agency reference files	As indicated above	As indicated above	As indicated above	As indicated above
80-1304	Particulate Sampler - Performance Records	As indicated above	As indicated above	As indicated above	As indicated above
80-1327	Reference documentation - site monitoring lists	As indicated above	As indicated above	As indicated above	As indicated above
80-1345	Industry Monitoring Plans - Discontinued Monitoring Plans, NADP Reports	As indicated above	As indicated above	As indicated above	As indicated above
80-1368	Background Information - Subject Reference Files, Site Safety Evaluations	As indicated above	As indicated above	As indicated above	As indicated above
80-1370	Audits/Cals/Invalidations, Branch Activities, certifications	As indicated above	As indicated above	As indicated above	As indicated above
80-1389	Instrument Manuals	As indicated above	As indicated above	As indicated above	As indicated above
80-1390	Quality Assurance Manual - All Chapters, AMB SOPs	As indicated above	As indicated above	As indicated above	As indicated above
80-1411	Reference documents - speciation	As indicated above	As indicated above	As indicated above	As indicated above

	procedures				
80-1412	Forms - Filter Weight Check, Equipment Photos, reference files	As indicated above	As indicated above	As indicated above	As indicated above
80-1414	OAMD Manual - OAMD Reference Guide	As indicated above	As indicated above	As indicated above	As indicated above
80-1430	Speciation Audits - Procedures-Forms-	As indicated above	As indicated above	As indicated above	As indicated above
80-1435	EPA Reference Procedures - Quality Assurance Methods	As indicated above	As indicated above	As indicated above	As indicated above
80-1440	Invalid Memos - Office Memos	As indicated above	As indicated above	As indicated above	As indicated above
80-1446	QA Laboratory - Certification Reports	As indicated above	As indicated above	As indicated above	As indicated above
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80-1462	Monitoring Site Maps - Site Addresses, Site Summaries, Data Checks, Data Summaries	As indicated above	As indicated above	As indicated above	As indicated above
80-6813	Equipment Maintenance - General Program	As indicated above	As indicated above	As indicated above	As indicated above
83-483	Lab SOPs - QA Cert Facility-Lab SOPs, field operational	As indicated above	As indicated above	As indicated above	As indicated above
83-485	Local Agency Evaluations - Performance Records	As indicated above	As indicated above	As indicated above	As indicated above
83-540	Inter-QA Lab Audits - Local and Industrial	As indicated above	As indicated above	As indicated above	As indicated above

### ***Ensuring that Documents Accurately Reflect Completed Work***

OAQ Ambient Monitoring Branch does not perform operations for which documents are produced to report on completed work. The primary role of AMB is to perform monitoring - there is no opportunity to check monitoring work performed against documentation. Documentation produced as a result of monitoring includes field reports and data – these documents are not reflective of a completed work product. Monitoring data is subject to rigorous QA/QC as described in element 6.4.

### ***Compliance with Statutory/EPA Recordkeeping Requirements***

Upon promulgation of new legislation that has potential to alter or present new monitoring and recordkeeping requirements, Air Monitoring Branch forms a workgroup of program staff to analyze regulatory requirements. Monitoring Branch then identifies documents used to establish data validity and as the basis for decision-making under such legislation and works with OLC to develop or use an existing retention schedule for such documents.

### ***Procedures for Implementing Chain of Custody for Evidentiary Records***

OAQ Ambient Monitoring Branch Chain of Custody requirements are addressed in detail in the AMB Quality Assurance Manual, Chapter 10. The manual also contains Chain of Custody forms that are routed with samples, including:

- Continuous Monitoring Chain of Custody Record
- Intermittent Sampling Chain of Custody Record
- Request for Laboratory Analysis
- Single Filter PM<sub>2.5</sub> Data Sheet

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\* An unbroken trail of accountability that ensures the physical security of samples, data, and records.

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## Computer Hardware and Software

### Hardware/Software Q/A Processes

Name	Type (Hardware or Software)	Testing requirements	Usage requirements	Maintenance requirements	Control	Documentation
Provide a list of hardware/software subject to Q/A processes Unique software/hardware requirements and management practices may apply to the following: <b>Software</b> <ul style="list-style-type: none"> <li>• Computer modeling applications and simulations</li> <li>• Program-specific database applications (documentation, details on usage, and</li> </ul>		Processes associated with software/hardware testing.	Processes associated with software/hardware use.	Processes associated with software/hardware maintenance.	Processes associated with software/hardware control (i.e. access control; security).	List documentation associated with hardware/software.

<p>your program's role in development and maintenance)</p> <p><b>Hardware</b></p> <ul style="list-style-type: none"> <li>• Lab instrumentation</li> <li>• GPS devices</li> <li>• Automated data acquisition devices</li> </ul>						
<p>There are large number of software applications and special database and spreadsheet programs used to acquire, track, or store monitoring data. Testing of software or software applicability is done on case by case basis. There are too many to list. Listing the hardware is also problematic. There are hundreds of pieces of equipment that is used to acquire, transmit, or check monitoring data. Equipment meets design specifications but again there are too many items to realistically list them.</p>						

### ***Hardware/Software Usage Assessment and Documentation***

AMB does not have a formal process for hardware or software usage assessment and documentation. AMB addresses usage assessment and documentation on a case-by-case basis.

### ***Hardware/Software Evaluation***

AMB does not have a formal process for hardware or software evaluation. The Branch evaluates specialized database software (and upgrades to such software) during the design stages. AMB relies on the Office of External Affairs Business Services division to coordinate software testing.

### ***Data QA/QC***

<b>Data Stream</b>	<b>QA/QC methods and acceptance criteria</b>	<b>% of total data undergoing QA/QC</b>
<b>Not sure how to answer this question. All of the Quality Assurance Section functions are related to QA/QC 10% or the rest of the Branch personnel are involved in QA/QC. The entire Quality Assurance Manual defines and sets the criteria for QA/QC. I will just try to list some things in general. Examples below:</b>		
Continuous Data Checks	Hourly average comparisons within 2% if recording device.	About 8.5%
Continuous SO <sub>2</sub> , O <sub>3</sub> , NO <sub>x</sub> , CO Monitoring Data	Field Audits - 15% of standard.	100%
Intermittent Particulate PM <sub>10</sub> , TSP data	Field Audits - 7% of standard.	100%
Sequential particulate PM <sub>10</sub> , PM <sub>2.5</sub> flow audits		7% of batch
Intermittent particulate PM <sub>10</sub> , TSP filter weights	Weight comparison within	7% of batch
Sequential particulate PM <sub>10</sub> , PM <sub>2.5</sub> filter weights	PM <sub>2.5</sub> reweigh within 30 ug, PM <sub>10</sub> exposed 5 mg, PM <sub>10</sub> unexposed 2.8 mg	7% of batch
Intermittent particulate data card checks	Run time = 1380 -1500, Signature, missing filter < 9mm sq, <10 bugs	100%
There are so many that listing is impractical. They are defined throughout the QA Manual		

## Planning

### ***Systematic Planning Process Description***

Air Monitoring Branch develops QAPPs for EPA-driven projects that require them. When such a project is proposed, usually an EPA contractor develops a “skeleton” QAPP and distributes it to state air monitoring bodies for review. The contractor receives comments and then releases a “skeleton” or “template” QAPP. OAQ AMB modifies the QAPP, as needed, to reflect AMB operations and QA procedures described in the OAQ AMB Quality Manual. AMB approves modifications to “skeleton” project QAPPs internally. Because AMB develops QAPPs only when provided a template from EPA (presumably prepared by the contractor using DQO), AMB does not directly employ the DQO process in the preparation of QAPPs.

### ***QAPP Development Process***

QAPPs are assigned to a QA staff member for development (writing).

The QA Section Chief reviews the QAPP as does the AMB Chief. The Assistant Commissioner reviews the QAPP if it is a grant require QAPP. The Agency Quality Manager will review the QAPP and it then goes to EPA for review.

Each of the reviewers provide sign-off approval.

Describe your branch QAPP development process, from the planning stages (using a Systematic Planning Process) to final approval.

EPA recommends the use of the Data Quality Objectives process for planning Environmental Data Operations. If your area uses a different process, it must include the following:

- the identification and involvement of the project manager, sponsoring organization and responsible official, project personnel, stakeholders, scientific experts, etc. (e.g., all customers and suppliers);
- a description of the project goal, objectives, and questions and issues to be addressed;
- the identification of project schedule, resources (including budget), milestones, and any applicable requirements (e.g., regulatory and contractual requirements);
- the identification of the type and quantity of data needed and how the data will be used to support the project's objectives;
- the specification of performance criteria for measuring quality;

### ***Processes Associated with Using External Data***

AMB receives external data through consulting companies that operate monitoring stations on behalf of power plants and other sources. AMB must approve siting/instrumentation/methods before data transfer. Review processes and operating requirements for external monitoring networks are contained in Chapter 15 of the AMB Quality Assurance Manual.

Once received at OAQ AMB, external data undergoes the same QA/QC processes as specified in 6.4. Data QA/QC.

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## Implementation of Work Processes

### ***Processes for Ensuring Work Follows Planning and Technical Documents***

Duties are assigned and AMB uses Performance Appraisals as a means of oversight. The AMB QA section also evaluates work product with QA checks; poor work or poor monitoring results prompt investigation which leads to operational correction or systematic corrections (repair or replacement of equipment – training and/or correction regarding policies or procedures).

### ***Identification of Operations Needing SOPs/Technical Documents***

OAQ AMB identifies the needs for new SOPs and technical documents when undertaking any new project or activity. The Branch considers the following questions before deciding to write an SOP or technical guidance for an activity:

1. Is the process of sufficient complexity to warrant the use of an SOP? Does the process require some degree of expertise or training? If yes, the process may need an SOP.
2. Is the process repetitive? Non-repetitive processes are difficult to document with SOPs
3. Does the process have a high potential impact to a work product and/or customer? For example, are there potentially environmental or litigious repercussions for performing the task incorrectly?
4. Will the office benefit from standardizing the activity?

### ***Handling of SOPs/Technical Documents***

AMB uses the following agency-wide policies for the management of SOPs and technical documentation:

A-006-OEA-05-P-R0 Project and Process Documentation Policy (AKA: SOP and QAPP Policy)

A-004-OEA-05-P-R0 Administrative Documentation Policy (AKA: Policy on Policies)

## Assessment and Response

### ***Assessment***

#### *Assessment Tools*

List the assessment tools in use by your area. Available assessment tools include quality systems audits, management systems reviews, peer reviews, technical reviews, performance evaluations, data quality assessments, readiness reviews, technical systems audits, and surveillance.

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<b>Tool</b>	<b>Frequency</b>	<b>Personnel and Processes</b>
Peer reviews	Ongoing review	Oversight by QA personnel and supervisors of AMB activities.  Calibration - review  Data - review
Technical reviews	Ongoing review  % of every batch  All filters process varies  % of data monthly	Oversight by QA personnel and supervisors of AMB activities.  Filter weighing & calculation  Filter invalidation verification  Data Checks & calculations
Performance evaluations	Ongoing review  Bi-weekly, monthly or quarterly as applicable  Quarterly	Oversight by QA personnel and supervisors of AMB activities.  Instruments are audited for Precision and Accuracy  Site safety and operational evaluations.
Data quality assessments	Prior to project start	Adjustments made in initial

	Annually for ongoing projects.	stages of project by Ambient Section or Toxic Section personnel.  Network adjustments (number of monitoring sites and location are the resultant output).
Readiness reviews	Before site start-up and weekly  Instrument performance tests	Site checks - Oversight by QA personnel and supervisors  These documented tests verify operational parameters.
Technical systems audits		
Surveillance	Ongoing review	Every aspect of equipment and site operation along with data obtained are verified against criteria in the Quality Assurance Manual. Oversight by QA personnel and supervisors

*Frequency of Assessments*

What is your program area's process for assessing the adequacy of the quality system at least annually?

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This is an ongoing process as described in the above table, but all the review and assessment information is used to prepare the network description and future network change proposals. This is usually tied to grant proposals.

*Selection of Assessment Personnel*

What is your program area's process for determining the level of competence, experience, and training necessary for the personnel conducting quality system assessments to ensure that they are:

- 1) technically knowledgeable,

Hands on training provided along with any applicable external training combined with QA staff performance evaluations.

- 2) have no real or perceived conflict of interest, and

QA personnel are isolated by section functions under a QA Section Chief supervisor. While QA Section Chief is in the review chain of the Air Monitoring Branch Chief, the QA Section Chief is the Quality Assurance Officer for air monitoring in the State of Indiana and has final data quality authority for monitoring.

- 3) have no direct involvement or responsibility for the work being assessed?

Responsibility for site setup and operation is not the responsibility of QA personnel although they may assist with some duties. The assessment work assigned and done by all QA staff members is independently assessed by the QA Section Chief.

*Assessment Planning*

What is your program area's process for planning, implementing, and documenting assessments and reporting assessment results to management including:

- 1) how to select an assessment tool,
- 2) the expected frequency of their application to environmental programs, and
- 3) the roles and responsibilities of assessors?

For QA personnel 1-3 above are defined by the Quality Assurance Section Chief based on QA requirements defined in the QA Manual and as necessary. Other assessments are conducted as described in the table above.

*Implementation*

See "Assessment Planning" above.

*Documentation*

See "Assessment Planning" above.

*Assessment Personnel Authority and Organizational Independence*

What is your program area's process for ensuring that personnel conducting quality system assessments have sufficient authority, access (to programs, managers, documents, and records), and organizational freedom to;

- 1) identify both quality problems and noteworthy practices,
-

- 2) propose recommendations for resolving quality problems, and
- 3) independently confirm implementation and effectiveness of solutions?

Staff are trained and encouraged to provide direct feedback regarding quality problems and provide potential solutions (with notification of supervisors). If they are uncomfortable providing direct feedback the information is transmitted by the QA Section Chief through his position as Quality Assurance Officer for air monitoring in the State of Indiana. Responsibility for effective solutions falls on the Branch managers.

#### *Reporting Results to Management*

What is your program area's process for ensuring that management will review and respond to quality assessment findings?

Safety and significant site operational problems require a written memo to a defined distribution list. Invalid data problems also require a written memo to a defined distribution list. The consequences for not addressing serious issues is normally invalidation of the data collected. Since the primary objective of the Air Monitoring Branch is collection of as much quality valid data as possible, any significant impediment to meeting this objective is addressed as soon as possible.

## **Response**

#### *Corrective Actions*

What is your program area's process for identifying how and when corrective actions are to be taken in response to the findings of the assessment?

The type data involved, amount of data in jeopardy, availability of equipment and personnel all weigh on supervisory decisions regarding corrective actions. We are currently updating to automated calibration/audit systems at all sites. This automation will change the approach we take for analysis of problems and the corrective actions taken.

#### *Dispute Resolution*

What is your program area's process for addressing any disputes encountered as a result of assessments?

If there is any doubt about the assessment another assessment is conducted with different personnel and/or equipment. Branch supervisors then discuss disputes over the assessment information and a conclusion is reached that satisfies all parties. If a mutually satisfactory resolution cannot be reached then the QA Section Chief, as the Quality Assurance Officer makes the final decision.

## **Quality Improvement**

#### ***Point of Contact***

Who (within your program area) is responsible for identifying, planning, implementing, and evaluating the effectiveness of quality improvement activities?

Steven Blaser, Chief Quality Assurance Section

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### ***Process(es) for Continuous Quality Improvement***

What is your program area's process for ensuring continuous quality improvement (including the roles and responsibilities of management and staff)?

Standard Operating Procedures including the Quality Assurance Manual are continually updated as new or improved techniques develop. Training and retraining of all branch staff members is ongoing based on program and personnel needs.

### ***Process(es) for Preventing or Ameliorating Conditions Averse to Quality***

#### *Prevention*

What is your program area's the process for ensuring that conditions adverse to quality are prevented?

To the extent possible most operations and site setups are standardized and meet predefined parameters. Techniques for analysis are also modified as little as possible and technicians specialize in a particular area of monitoring or analysis.

#### *Identification*

Process for ensuring conditions averse to quality are identified promptly including a determination of the nature and extent of the problem.

There are a wide variety of checks of site parameters, equipment functions, and data integrity to ensure issues are identified by both QA personnel and Ambient personnel (QC). To the best extent possible these checks are being set up to be automated.

#### *Correction*

### **Implementation**

Processes for implementing corrective actions from start to finish. Include actions to prevent reoccurrence.

1. Issue is identified
  2. A verbal or written report is presented to the parameter site operator (from the site if possible – cell phone). If parameter site operator can't be contacted one of the Monitoring Branch supervisors is notified.
  3. Site operator or supervisor determines the immediate action to be taken by onsite individual (diagnostics, part replacement, calibration or other effort).
  4. If resolution is not possible the repair/replacement task is assigned to the ambient monitoring staff person responsible for the particular area of work.
  5. The next site visitor will evaluate operations to determine if any serious issues are pending.
  6. Issues are entered into the site logbook and/or the electronic log.
  7. On occasion problems are identified via the data being gathered by telemetry or lack thereof. For these issues a Branch wide email is sent regarding the assistance needed so that the next onsite visitor can perform minor repairs of
-

maintenance. This type process will become more prevalent as sites become more automated.

### **Documentation**

Processes for documenting corrective actions from start to finish.

In most cases documentation is done via email or memo and in the site logbook.

### **Tracking to Closure**

Processes for tracking corrective actions to closure.

Closure tracking is not actually necessary since each site visit verifies operations. Any significant problem starts the corrective action process in motion

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