QUALITY ASSURANCE PROJECT PLAN

FOR

PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS (PAMS)

AND

AIR TOXICS SAMPLING NETWORK

Louisiana Department of Environmental Quality
Office of Environmental Compliance

Revision: 9
August 2012

Document Review and Revision Record

Note: Actions older than 5 yrs may be removed from this record

Date	Revision No.	Record of Activity
3/5/2001	1	Initial document approved. This QAPP for the VOC analysis of PAMS was separated from a previous larger combined QAPP. The LDEQ Air Toxics Program was added to this QAPP.
7/7/2005	4	Completed changes to organizational chart to reflect additional shift in personnel. Clarified responsibility for data verification & validation. Other minor changes performed throughout the document.
6/15/2008	5	Completed changes to organizational chart to reflect additional shift in personnel. Made changes to accommodate the new sampling & analysis schedule.
7/08/2009	6	Added three-hour canister sampling during June-September at Dutchtown and 24-hour canister sampling at New Road; updated information about AQS code and parameters monitored at three PAMS sites; made other minor changes throughout the document.
8/26/2010	7	Made changes to accommodate LDEQ's re-organization and the contract lab for canister sample analyses; removed Baker and Gross Tete sites; removed the speciated auto GC monitoring.
8/16/2011	8	Added NOy to Capitol site; dropped the text related to strip chart recorders; clarified years of records keeping (10 year for lab VOC analyses and 5 years for others); made changes to reflect LDEQ's re-organization including the contract lab's name change; made other minor changes throughout the document.
7/3/2012	9	Added Lists of Tables and Figures in Table of Contents; added latitude/longitude for the four PAMS sites; clarified event-based "strike" sampling at Pride and Dutchtown; clarified the maximum holding time between sample collection and analysis in B3.2; made other minor changes
8/31/2012	9	Specified onsite performance auditing activities in Section A4.0, removed all references to EPA's activities in Section D3.2 and made some other minor changes asked by EPA region 6 after their initial review.

A PROJECT MANAGEMENT

Track 12-401

A1 Title and Approval

**QUALITY ASSURANCE PROJECT PLAN
FOR
PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS
AND
TOXICS SAMPLING NETWORK**

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A3 Distribution List

An electronic copy of this QAPP will be maintained on the LDEQ's QA Intranet Website. It will be available to all LDEQ personnel. The following individuals will be notified of the posting:

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All PAMS and Air Toxics Monitoring Network Field
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A printed or PDF versions of the QAPP will be distributed to the following:

Donna Cleland, Project Officer
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LDEQ's Contractor for Analyses of PAMS and Air Toxics Canister Samples,
Houston Laboratory, *Accutest GC,* Inc.

A4 Project/Task Organization

The Louisiana Department of Environmental Quality (LDEQ) is responsible for establishing the air monitoring stations statewide, which includes the Photochemical Assessment Monitoring Stations (PAMS) and air toxics monitoring stations. The purpose is for gathering data to demonstrate compliance with Louisiana Ambient Air Standards (LAAS) and National Ambient Air Quality Standards (NAAQS) as required by the Clean Air Act Amendment (CAAA) of 1990.

LDEQ's Office of Environmental Compliance (OEC) shall develop and manage the Quality Assurance Project Plan (QAPP), and perform operation of the air-monitoring network. The OEC's Assessment Division (AD) is responsible for the network's field operation, data assessment, data management and reporting. The OEC's Inspection Division (ID) is responsible for reviewing, validating and managing data generated by LDEQ's contract laboratory for analyses of the canister samples for speciated volatile organic compounds (VOCs), including ozone precursors and air toxic compounds.

This document focuses on the monitoring/sampling activities related to canister samples for speciated VOCs, continuous gas chromatography with flame ionization detector (GC/FID) for hourly total non-methane organic compounds (TNMOCs) at the PAMS sites and meteorological parameters that pertain to the LDEQ PAMS and Air Toxics sampling network. Figure A1 shows the organization chart responsible for this project. Activities related to ozone and oxides of nitrogen monitoring that are referred to in this QAPP can be found in LDEQ's *Quality Assurance Project Plan for the Ambient Air Monitoring Network.*

A4.1 Description of Organization

A4.1.1 Air Field Services Section

The AD Air Field Services (AFS) Section is supervised by an Environmental Scientist Manager and is assisted by Engineer Supervisors, Environmental Scientist Supervisors.

This section provides engineering for proper sampling station siting, construction and installation. Each year, an evaluation of each monitoring site is conducted to ensure that site documentation is updated and that all siting criteria continue to be met.

The GC Field Unit is responsible for the field operation of the continuous GC/FID for hourly TNMOCs and canister samplers at the PAMS sites. The canister samplers at these PAMS sites are those for regular 3-hour samples for ozone VOC precursors, 24-hour samples for ozone VOC precursors and VOC air toxic compounds, and event based samples for ozone VOC precursors and VOC air toxics. The event based samplers are "triggered" whenever 10-minute average

TNMOC readings of a continuous methane/TNMOC analyzer (Thermo Electron 55C) exceed the preset value.

The Network Operation Unit is responsible for the field operation of meteorological equipment and continuous methane/TNMOC analyzers for all the sites across the state. It is also responsible for the field operation of 24 regular and event based canister samplers for the other sites across the state not covered by the GC field unit.

The Data Management Unit in this section consists of an Engineer Supervisor, an Engineer, Environmental Chemical Specialists, Environmental Scientists and Instrument Support Staff. This unit is responsible for all operations concerned with collection, verification, validation and reporting of data from LDEQ ambient air monitoring sites. Reduced data from continuous GC/FID TNMOC analysis and from VOC analysis of canister samples are submitted to this unit for evaluation. The evaluated and validated data are submitted to the US EPA in Air Quality Systems (AQS) database format. The Instrument Support Staff are responsible for repairing malfunctioning equipment brought to the electronics repair lab.

The onsite performance audits for AFS are done by URS Corp under contract. The monitoring operations not covered by URS are audited by AFS staff. The auditing staff must be Environmental Scientists (3) or above and not be the staff who perform the audited operations.

A4.1.2 Inspection Division

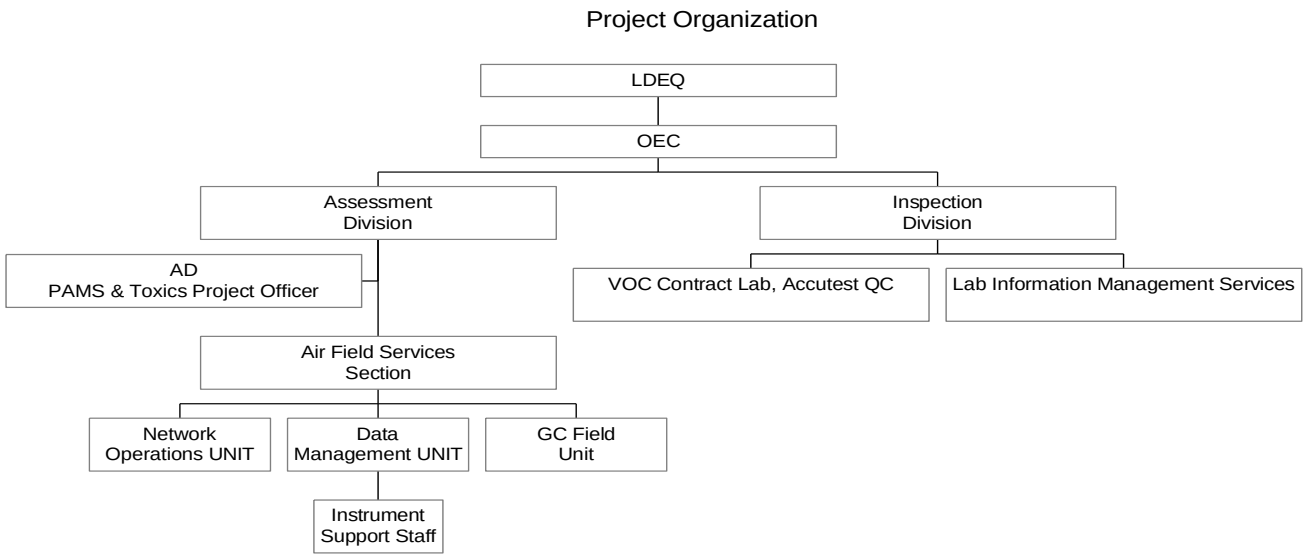
The LDEQ contractor, Houston Laboratory, Accutest GC, Inc. (its previous name was Southern Petroleum Laboratories, Inc.), will be responsible for analysis of all canister samples. Houston Laboratory is accredited by Texas's Environmental Lab Accreditation Program under National Environmental Laboratory Accreditation Conference (NELAC). Specific air methods for LDEQ's canister samples are accredited by Louisiana Environmental Laboratory Accreditation Program (LELAP).

ID's Laboratory Information Management Services received speciated VOC data from the contract lab. The data will be reviewed and validated by the ID staff. The validated data are stored in LDEQ's EQuIS database. The data is then sent to AD for assessment. After final assessment, AD staff will submit PAMS data to EPA.

Laboratory Information Management Services manages the EQuIs database and all the documents, electronic or printed, from the contract lab.

LDEQ is responsible for ensuring all activities included in this QAPP, including any corresponding contracted out work, meet the latest 40 CFR Part 58 and the QA Handbook Volume II requirements.

Figure A1



A5 Problem Definition/Background

A5.1 Louisiana PAMS Network

Between 1900 and 1970, the emissions of six principal pollutants increased significantly. These six principal pollutants are particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone and lead. They are also called criteria pollutants. In 1970, the Clean Air Act (CAA) was signed into law. The CAA and its amendments provide the framework for all pertinent organizations to protect air quality. The framework provides for the monitoring of these criteria pollutants by state and local organizations through the LDEQ ambient air-monitoring program. The background and rationale for ambient air monitoring can be found in the Code of Federal Regulations Title 40, Part 58.

Louisiana meets all of the state and federal National Ambient Air Quality Standards for the criteria pollutants particulate matter, lead, carbon monoxide, nitrogen oxides and sulfur dioxide. Louisiana had one area that was in non-attainment of the NAAQS for ozone. This non-attainment area is the Baton Rouge, Louisiana metropolitan and

includes the parishes of East Baton Rouge, West Baton Rouge, Iberville, Livingston, and Ascension. This area was classified as severe for ozone non-attainment since it failed to achieve attainment by the 1999 target date as defined in the Clean Air Act Amendment (CAAA) of 1990 for the one-hour standard. The EPA recognized the state for reaching the 1-hour and the 1997 8-hour ozone standards. In 2011, the EPA formally re-designated Baton Rouge and its surrounding parishes as in attainment with the 1997 8-hour standard. With the more stringent 2008 standards, more areas including Baton Rouge in the state are still designated as nonattainment.

The PAMS network is required to measure ozone precursors in each ozone non-attainment area that is designated serious, severe, or extreme. Currently, the designation of the Baton Rouge area is marginal under 2008 ozone standards. According to the provisions of anti-backsliding and in line with the current 10-year maintenance plan for the 1997 8-hour ozone standard, LDEQ still has obligations to continue PAMS network operation. In the 10-year maintenance plan the LDEQ committed to continue to operate an appropriate and adequate air quality monitoring network throughout the maintenance period in accordance with 40 CFR Part 58. The current ozone monitoring network in Baton Rouge, which includes the enhanced ozone monitoring PAMS network, is currently considered appropriate and adequate by both the LDEQ and EPA.

LDEQ has established the PAMS network in the ozone non-attainment area of the Baton Rouge metropolitan area. This network has been established to meet the requirements of Title I, Section 182, of the Clean Air Act Amendments of 1990 (CAAA) and the ambient air quality surveillance regulations of 40CFR, Part 58. The network provides enhanced ambient air monitoring of ozone (O_3) and oxides of nitrogen (NO_x), monitoring of VOCs and TNMOCs, and measurement of meteorological parameters. The purpose is to determine the extent of the effect ozone precursor compounds have on the formation of ozone.

The objectives of the PAMS network are as follows:

- NAAQS Attainment and Control Strategy Development
  - ✓ Provide an air quality database to help assess ozone attainment status.
  - ✓ Extend the air quality database for future attainment demonstrations.
  - ✓ Characterize ozone and precursor transport.
  - ✓ Support photochemical model input requirements and model performance for future attainment demonstrations and control strategy development.

- State Implementation Plan (SIP) Control Strategy Evaluation
  - ✓ Evaluate effectiveness of various control strategies.
  - ✓ Assist in developing cost-effective VOC and NOx reductions.
  - ✓ Provide additional information to demonstrate “Reasonable Further Progress” (RFP) toward attainment of NAAQS for ozone.
  - ✓ Corroborate and assess accuracy of VOC and NOx emission inventories.

- Trends
  - ✓ Prepare long-term ozone, VOC, NOx and toxic air pollutant trends.
  - ✓ Improve effectiveness of the trends database.

- Exposure Assessment
  Characterize population exposure to ozone and toxic air pollutants.

With the end use of the air monitoring data as a prime consideration, the PAMS network is designed to meet one or more of the six basic monitoring objectives listed below:

- Determine the highest concentrations to occur in the area covered by the network.
- Determine representative concentrations in areas of high population density.
- Determine the impact on ambient pollution levels of significant source or source categories.
- Determine general background concentration levels.
- Determine the extent of regional pollutant transport among populated areas, and in support of secondary standards.

A5.2 Louisiana Air Toxics Program

There are currently 187 hazardous air pollutants (HAPs), or air toxics, regulated under the Clean Air Act (CAA) that have been associated with a wide variety of adverse health effects, including cancer, neurological effects, reproductive and developmental effects, as well as ecosystem effects. These air toxics are emitted from multiple sources, including major stationary, area, and mobile sources, resulting in population exposure to these air toxics as they occur in the environment. While in some cases, the public may be exposed to an individual HAP, more typically people experience exposures to multiple HAPs. Exposures of concern result not only from the inhalation of these HAPs, but also, for some HAPs, from multi-pathway exposures to air emissions.

In 1989, LDEQ proposed 100 air toxics to be regulated under ACT 184 of Louisiana. These 100 air pollutants were chosen because they represented approximately 99% of industrial toxic air release in the state. For these 100 pollutants, LDEQ not only set the Minimum Emission Rates (MER), but ambient air standards, which surpassed the federal regulations for air toxics promulgated later. ACT 184 allows the list to be revised by either additions or deletions and the standards to be updated. The current standards are listed in Title 33 Part III Table 51.2 of the State Environmental Regulatory Code.

Emissions data, ambient concentration measurements, modeled estimates, and health impact information are all needed to fully assess air toxics impacts and to

characterize risk. Specifically, emissions data are needed to quantify the sources of air toxics impacts and aid in the development of control strategies. Ambient monitoring data are then needed to understand the behavior of air toxics in the atmosphere after they are emitted. Since ambient measurements cannot practically be made everywhere, modeled estimates are needed to extrapolate our knowledge of air toxics impacts into locations without monitors. Exposure assessments, together with health effects information, are then needed to integrate all of these data into an understanding of the implications of air toxics impacts and to characterize air toxics risks.

To address the concerns posed by air toxics emissions and to meet the state's strategic goals, LDEQ has developed an Air Toxics Monitoring Program designed to characterize, prioritize, and equitably address the impacts of HAPs on the public health and the environment.

The principal objective for the Air Toxics Monitoring Program is to determine and ensure that all major urban and industrial areas of the state are in compliance with the state Ambient Air Standards. The monitoring network will primarily emphasize long-term measures of air quality. The major part of the effort to develop air quality and emissions data, therefore, will focus on year-round information. To provide maximum flexibility in data use, however, the data collection will be based on regular (e.g., every sixth day) collection of 24-hour samples throughout the year. Individual 24-hour data will be stored in LDEQ's EQuIS database.

A6 Project/Task Description

The following are the sampling stations in Baton Rouge ozone non-attainment area and the parishes they are located in:

- LSU site in East Baton Rouge Parish (AQS code: 220330003; monitoring for O_3, NOx, TNMOC, wind direction and wind speed)
- WLUX, Port Allen site in West Baton Rouge Parish (AQS code: 221210001; monitoring for O_3, NOx, TNMOC, wind direction and wind speed)
- USPHS, Carville site in Iberville Parish (AQS code: 220470012; monitoring for O_3, NOx, TNMOC, wind direction and wind speed)
- Convent site in St. James Parish (AQS code: 220930002); monitoring for O_3.
- New Roads site in Pointe Coupee Parish (AQS code: 220770001); monitoring for O_3, wind direction and wind speed)
- French Settlement site in Livingston Parish (AQS code; 220630002; monitoring for O_3, NOx, TNMOC, outside temperature, wind direction and wind speed)
- Capitol site in East Baton Rouge Parish (PAMS Type 2 site)
- Pride site in East Baton Rouge Parish (PAMS Type 1/3 site)
- Bayou Plaquemine site in Iberville Parish (PAMS Type 3/1 site)

- Dutchtown site in Ascension Parish (PAMS Type 1/3 site)

The population for this ozone non-attainment area is between 500,000 to 1,000,000. Because of its population density, the Baton Rouge area was required to phase in and operate 3 PAMS monitoring stations by June 1, 1996.

The first PAMS monitoring station required is a Type 2 site. It is to be established near the predominantly downwind edge of the central business district or area of maximum precursor emissions from a large industrial area. The Capitol site (AQS site code 220330009; Latitude & Longitude: 30° 27' 43.13" N 91° 10' 45.19" W) best meets this description and was established as a PAMS Type 2 site on June 1, 1993. The parameters monitored at this site are:

- Ozone (O_3)
- Oxides of nitrogen ($NO/NO_x/NO_2$)
- Total reactive nitrogen compounds (NOy)
- Carbon monoxide (CO) – trace level
- Sulfur dioxide SO2 – trace level
- Continuous methane/TNMOC by Thermo Electron 55C
- Continuous hourly TNMOC by automated GC/FID
- 24-hour canister samples every six day
- Multi 3-hour canister samples
- Event-based “strike” canister samples
- Meteorological Parameters (MET):
  - ✓ Wind speed (WS)
  - ✓ Wind direction (WD)
  - ✓ Ambient temperature (T)
  - ✓ Relative humidity (RH)
  - ✓ Barometric pressure (BP)
  - ✓ Solar radiation (SR)
  - ✓ Ultra violet radiation (UVR)
  - ✓ Rainfall gauge
- Upper Meteorological Parameters of Mixing Heights

The second PAMS monitoring station required is a Type 1 site. It is to be located in the area of upwind background and transported ozone and ozone precursor concentrations. Measurements at this site are representative of the regional scale in the predominantly upwind direction from the local area of maximum precursor emissions during the sampling period. The third PAMS monitoring station required is a Type 3 site. It is required in a location directly downwind of the highest ozone precursor emissions site (Type 2 Site) and provides a maximum ozone measurement and total conversion of the ozone precursors. This site should be downwind of urban areas, along the most predominant wind direction during the sampling period and was chosen so that urban scale measurements are obtained. The Pride Site (AQS Site Code 220330013; Latitude

& Longitude: 30° 42' 3.31" N 91° 3' 22.01" W) best meets these descriptions (depending on wind directions) and was established as a PAMS Type 1/3 site on June 1, 1994. The parameters monitored in this site are:

- Ozone (O_3)
- Oxides of nitrogen ($NO/NO_x/NO_2$)
- Continuous methane/TNMOC by Thermo Electron 55 C
- Continuous hourly TNMOC by auto GC/FID
- 24-hour canister samples every six day
- Multi 3-hour canister samples and event-based “strike” canister samples
- Meteorological Parameters (MET):
  - ✓ Wind speed (WS)
  - ✓ Wind direction (WD)
  - ✓ Ambient temperature (T)
  - ✓ Relative humidity (RH)
  - ✓ Barometric pressure (BP)
  - ✓ Solar radiation (SR)

The Bayou Plaquemine Site (AQS Site Code 220470009; Latitude & Longitude: 30° 13'15.49" N 91° 18' 54.98" W) is designated as a PAMS Type 3/1 site and began operation on June 1, 1996. The parameters monitored in this site are:

- Ozone (O_3)
- Oxides of nitrogen ($NO/NO_x/NO_2$)
- Total reactive nitrogen compounds (NOy)
- Continuous methane/TNMOC by Thermo Electron 55C
- Continuous hourly TNMOC by auto GC/FID
- 24-hour canister samples every six day
- Multi 3-hour canister samples
- Event-based “strike” canister samples
- Meteorological Parameters (MET):
  - ✓ Wind speed (WS)
  - ✓ Wind direction (WD)
  - ✓ Ambient temperature (T)
  - ✓ Relative humidity (RH)
  - ✓ Barometric pressure (BP)
  - ✓ Solar radiation (SR)

Because of higher ozone readings at Dutchtown site (AQS code: AQS code: 220050004; Latitude & Longitude: 30° 13' 45.91" N 90° 57' 55.86" W) recently, canister sampling for speciated VOCs was added to this site beginning on May 1, 2009. This site has been designated as a PAMS Type 1/3 site. The parameters monitored at this site are:

- Ozone (O_3)
- Oxides of nitrogen ($NO/NO_x/NO_2$)
- Continuous methane/TNMOC by Thermo Electron 55C
- 24-hour canister samples every six day
- Multi 3-hour canister samples
- Event-based "strike" canister samples
- Meteorological Parameters (MET):
  - ✓ Wind speed (WS)
  - ✓ Wind direction (WD)
  - ✓ Ambient temperature (T)

A 24-hour VOC canister sample will be collected every sixth day at all the PAMS sites year round. Intensive PAMS sampling will take place during June (could start as early as in May), July, August and September (could end as late as in October) with more 3-hour samples collected. During this intensive sampling period, at the Capitol site, eight 3-hour samples will be collected daily between the hours from midnight to midnight, LST (local standard time); at Pride and Dutchtown sites, four 3-hour samples will be collected every 3rd day; at Bayou Plaquemine site, four 3-hour samples will be collected every day. For four 3-hour samples collected at Pride, Dutchtown and Bayou Plaquemine sites, two three-hour samples are collected from 3:00 am until 9:00 am and the other two three-hour samples are collected from 3:00 pm until 9:00pm, LST. In the rest of the year, eight 3-hour sample will be collected every sixth day. Canister samples will be analyzed by LDEQ's contract lab, Houston Laboratory, Accutest GC, Inc. 3-hour samples will generally be analyzed for ozone precursors only as shown in Table A1 by GC/FID. However, if some 3-hour samples have large amounts of untargeted compounds or some targeted compounds are suspected to be incorrectly identified, the samples will be analyzed by GC/MS for the purpose of identification and confirmation. 24-hour canister samples will be analyzed for ozone precursors by GC/FID and air toxic compounds shown as in Table A2 by GC/MS. The data for ozone precursors are reported in parts per billion carbon (ppbC) and for air toxics in parts per billion (ppb or ppbv to be distinguished from ppbC).

Hourly TNMOCs are continuously monitored year round at three PAMS sites, Capitol, Pride and Bayou Plaquemine, by GC/FID. The hourly continuous TNMOC data at the sites are collected by a computer interfaced with the analyzer and stored in a custom designed program. The data will be pulled into the computer in the office. Data for hourly TNMOC are reported as ppbC.

Thermo Electron 55 C provides continuous monitoring of methane/TNMOC. Time average TNMOC data in minutes can be produced. The data is collected by a data logger. 10-minute average TNMOCs are used to "trigger" a canister sampler. Whenever 10-minute average TNMOCs exceed the preset value, the data logger will send a signal to the canister sampler to collect the air sample for 25 minutes. The event

canister sample will be analyzed for both ozone VOC precursors and air toxics as shown in Table 1 and Table 2.

The data logger will collect data for meteorological parameters. Meteorological parameters are calculated in miles per hour (mph) for wind speed, degrees for wind direction, degrees Celsius (°C) for temperature, % for relative humidity, inches of mercury (in. Hg) for barometric pressure, and watts per square meter (w/m^2) for solar radiation and ultra violet radiation.

In addition to sampling at the PAMS sites above-mentioned, LDEQ collects 24-hour canister samples every sixth day in 12 monitoring stations across the state as shown as in Table A3. In some of these stations, event-triggered strike canister samples are also collected. These samples will be analyzed for ozone precursors and air toxics by LDEQ's contract lab.

Table A3 summarizes the sites for VOCs across the state.

A7 Data Quality Objectives and Criteria

A7.1 Purpose for Quality

Quality control activities are conducted on the PAMS and air toxics sampling network to assure that data of acceptable precision and accuracy are collected from each parameter to meet the goals of the network. LDEQ has established goals to produce data that are adequately documented in terms of completeness, precision, accuracy, representativeness and comparability.

A7.2 Quality Objectives

The Data Quality Objective (DQO) process described in EPA's QA/G-4 document provides a general framework for ensuring that the data collected by LDEQ meets the needs of the intended decision makers and data users. The process establishes the link between the specific end use(s) of the data with the data collection process and the data quality (and quantity) needed to meet a program's goals.

The Air Quality System (AQS) database is used as the national repository for PAMS data and can be used to assist State and local agencies in determining if the program objectives and Data Quality Objectives described in the PAMS Implementation Manual are met. Data submitted to AQS by LDEQ will be consistent with the PAMS monitoring DQOs and of adequate quality to meet Clean Air Act Title I objectives. The data will allow LDEQ to develop, evaluate, and refine new O_3 control strategies; determine NAAQS attainment or nonattainment for O_3; track VOCs and NO_x emissions inventory reductions; provide photochemical prediction

model input; evaluate photochemical prediction model performance; analyze ambient air quality trends; and characterize population exposure to VOCs and O_3.

Table A1

PAMS VOCS Determined by GC/FID
Using LDEQ SOP 1026 Based on EPA /600-R-98/161

Ethylene	2,3-Dimethylpentane
Acetylene	3-Methylhexane
Ethane	2,2,4-Trimethylpentane
Propylene	*n*-Heptane
Propane	Methylcyclohexane
Isobutane	2,3,4-Trimethylpentane
1-Butene	Toluene
1,3-Butadiene	2-Methylheptane
n-Butane	3-Methylheptane
trans-2-Butene	*n*-Octane
cis-2-Butene	Ethylbenzene
Isopentane	*m/p*-Xylene
1-Pentene	Styrene
n-Pentane	*o*-Xylene
Isoprene(2-Methyll-1,3-Butadiene)	*n*-Nonane
trans-2-Pentene	Isopropylbenzene (Cumene)
cis-2-Pentene	*n*-Propylbenzene
2,2-Dimethylbutane	*m*-Ethyltolene (1-Ethyl-3-Methylbenzene)
Cyclopentane	*p*-Ethyltolene(1-Ethyl-4-Methylbenzene)
2,3-Dimethylbutane	1,3,5-Trimethylbenzene
2-Methylpentane	*o*-Ethyltoluene(1-Ethyl-2-Methylbenzene)
3-Methylpentane	1,2,4-Trimethylbenzene
1-Hexene	*n*-Decane
n-Hexane	1,2,3-Trimethylbenzene
Methylcyclopentane -	*m*-Diethylbenzene
2,4-Dimethylpentane	*p*-Diethylbenzene
Benzene	*m*-Diethylbenzene
Cyclohexane	*n*-Undecane
2-Methylhexane	TNMOC

Table A2

Air Toxics VOCs Determined by GC/MS Using EPA Method TO-15

Freon-12	Carbon Tetrachloride
Chloromethane	2-Nitropropane
Freon-114	1,2-Dichloropropane
Vinyl Chloride	Trichloroethylene
1,3-Butadiene	Methyl Methacrylate
Bromomethane	*cis*-1,3-Dichloropropene
Chloroethane	4-Methyl-2-Pentanone
Acetonitrile	*trans*-1,3-Dichloropropene
Acetone	1,1,2-Trichloroethane
Freon-11	Toluene
Acrylonitrile	Ethyl Methacrylate
Diethyl ether	2-Hexanone
1,1-Dichloroethene	1,2-Dibromoethane
Methylene Chloride	Tetrachloroethylene
Allyl Chloride	Chlorobenzene
Carbon Dislufide	Ethylbenzen
Freon-13	*m/p*-Xylene
1,1-Dichloroethane	Styrene
MTBE	*o*-Xylene
Methacrylontrile	1,1,2,2-Tetrachloroethane
2-Butanone	1,3,5-Trimethylbenzene
cis-1,2-Dicloroethane	1,2,4-Trimethylbenzene
Methyl Acrylate	Benzyl Chloride
Chloroform	1,3-Dichlorobenzene
Tetrahydrofuran	1,4-Dichlorobenzene
1,2-Dichloroethane	1,2-Dichlorobenzene
Chloroacetonitrile	Nitrobenzene
1,1,1-Trichloroethane	1,2,4-Trichlorobenzene
Chlorobutane	1,3-Hexachlorobutadiene
Benzene	

Table A3

Monitoring Sites for VOCs

Site	Strike Sampling	24-hour Canisters for Air Toxics	24-hour Canisters for Ozone Precursors	AQS Site Code
Capitol	Yes	Yes	Yes	220330009
Bayou Plaquemine	Yes	Yes	Yes	220470009
Pride	Yes	Yes	Yes	220330013
Dutchtown	Yes	Yes	Yes	220050004
Carville	Yes	Yes	Yes	220470012
Port Allen	Yes	Yes	Yes	221210001
Southern	No	Yes	Yes	Special 2
LSU	No	Yes	Yes	220330003
New Roads	No	Yes *	Yes*	220770001
Madisonville	No	Yes *	Yes *	221030001
Westlake	Yes	Yes	Yes	220190008
Lighthouse	Yes	Yes	Yes	Special 3
Monroe	No	Yes	Yes	220730002
Shreveport	No	Yes	Yes	220150008
Hahnville	No	Yes	Yes	220890003
Chalmette Vista	Yes	Yes	Yes	220870009

**: Start in May, 2009*

PAMS and air toxics sampling sites are evaluated yearly (Section B1.4) to ensure that siting requirements are met. Hard copies of this evaluation are prepared and maintained in the site documentation files.

All data generated will be reviewed for internal consistency to identify values in the data set, which appear atypical when compared to values of the whole data set. Tests for internal consistency include the identification of outliers and extreme differences in adjacent values that require further investigation. A number of statistical tests will be used for internal consistency checks and determining outliers. Graphical and visual presentation of the data, such as review of summary report file information, scatter plots, time series, or fingerprints will also be used for consistency checks.

Once an outlier has been identified using any of the approaches identified above, treatment of the outlier must be decided. Outliers that are found to be errors will be corrected, if possible. If the correct value cannot be obtained, the value may be appropriately annotated and excluded from the data set. Alternatively, if the suspect data are retained in the data set, the necessary qualifying information in the form of a “flag” must be included with the value. There should be an explanation that warrants the exclusion or replacement of data along with documentation reflecting the action taken. If no explanation is available, the outlier should not be excluded. Data will only be excluded by LDEQ when the values are verified as not representative of ambient data, such as calibration runs, instrument malfunction, contamination, etc.

A7.3 Measurement Performance Criteria

The quality of analytical 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 (sampling, preparation, analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the DQOs. MQOs can be defined in terms of the following data quality indicators:

Precision -- a measure of mutual agreement among individual measurements of the same property usually under prescribed similar conditions. This is the random component of error. Precision is estimated by various statistical techniques using some derivation of the standard deviation.

Accuracy -- a measure of the closeness of an observed analytical value to the actual or referenced value.

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

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

Detectability -- the determination of the low range critical value of a characteristic that a method specific procedure can reliably discern (40 CFR Part 136, Appendix B).

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. Data completeness requirements are included in the reference methods (40 CFR Part 50).

Comparability -- a measure of confidence with which one data set can be compared to another.

The performance criteria for data precision, accuracy, completeness, representativeness and comparability used by LDEQ's PAMS and air toxics sampling network are presented in Table A4. Accuracy has been a term frequently used to represent closeness to "truth" and includes a combination of precision and bias error components. If possible, LDEQ will attempt to distinguish measurement uncertainties into precision and bias components. Data from each monitoring site must characterize and represent actual ambient air levels in the area or neighborhood of the monitoring site.

Method Detection Limits (MDL) for the laboratory analysis have been determined on various occasions and run below 0.2 ppbv for the GC/MS analysis and below 2.0 ppbC for the PAMS GC/FID analysis.

Data are maintained and submitted in consistent units into the AQS database, a nationwide summary designed for ease of use and comparison by various agencies. Table A5 lists preferred and alternate units and the number of decimal places reported to ensure data comparability with historical and other state reporting agencies.

A8 Special Training/Certification

A8.1 Training

LDEQ is made up of career civil service employees. Job qualifications and job duties are set forth in job descriptions, which are prepared by LDEQ and approved by Louisiana State Civil Service Commission. Personnel working for LDEQ meet the educational, work experience, responsibilities, and training requirements for their positions. Records on personnel qualifications and training will be maintained in personnel files. These files will be reviewed yearly, at the time of the employee's performance appraisal, to ensure that the employee remains qualified to perform his/her assigned job duties. Adequate education and training are integral to the air-monitoring program in order to obtain data that are reliable and comparable. Training courses are available for all employees, depending on the job.

Table A4

Summary of Precision, Accuracy, and Completeness Objectives

PARAMETER	*PRECISION*	*ACCURACY*	*COMPLETENESS*
Canister Sampler	±20%	±10%	85%
Continuous G.C.	± 20%	±10%	85%
Wind speed	±5%	±5%	85%
Wind Direction	±5°	±5°	85%
Temperature	±1.0°C	±1.0°C	85%
Relative Humidity	±3%	±3%	85%
Barometric Pressure	±1%	±1%	85%
Solar Radiation	±5%	±5%	85%
Ultra Violet Radiation	±5%	±5%	85%
Rainfall	±1%	±1%	85%
Laboratory GC/MS	±25%	±30%	85%
Laboratory GC/FID	±25%	±20%	85%

A8.1.1 Ambient Air Monitoring Training

Environmental Scientists hired as site operators receive on-the-job training from experienced site operators and supervisors. During this training period, their trainer and supervisor assess the progress. As training progresses the employee is allowed to work more independently until it is determined that this person can operate a monitoring station on his/her own. At this time, he/she is assigned one or more stations to operate.

A8.1.2 Quality Assurance Training

Field or lab quality assurance officers must be familiar with air monitoring equipment and experienced in operation of air monitoring sites and equipment, and lab instrument and analytical procedures. An assurance auditor who will be conducting audits must undergo the same training as a site operator or lab analyst for their first six months. After completing this phase of training, he/she is removed from daily site operations and trained in QA procedures by an experienced QA Officer. As becoming familiar with QA procedures, he/she will be allowed to work independently.

Table A5

Data Comparability

PARAMETER	***PREFERRED UNITS***	***NUMBER OF DECIMAL PLACES***	***ALTERNATE UNITS***	***NUMBER OF DECIMAL PLACES***
VOC, NMOC	ppbC or ppbv	2*	--	--
Wind Speed	mph	0	--	--
Wind Direction	Degrees	0	--	--
Temperature	°C	1	--	--
Relative Humidity	%	0	--	--
Barometric Pressure	in Hg	2	--	--
Solar Radiation	Watts/m^2	0	--	--
Ultra Violet Radiation	Watts/m^2	0	--	--
Rainfall	in	2	--	--

**: The data have 3 significant figures, but by convention, data will be reported to two digits after the point.*

A8.1.3 Contract Laboratory Training

The Contract lab's key staff is required to attend special training on LDEQ's ozone precursor and air toxics analytical methods before the contract is awarded. The training is provided by LDEQ's staff. Other general training of the contract laboratory follows the guidelines under NELAC.

A8.1.4 Training Courses

Appropriate training is available to employees, commensurate with their duties. Such training may consist of classroom lectures, workshops, teleconferences, and self-instructional courses.

A number of courses have been developed for personnel involved with ambient air monitoring and quality assurance. Formal QA/QC training is offered through the following organizations:

- Air Pollution Training Institute (APTI)
- Air and Waste Management Association (AWMA)

- American Society for Quality Control (ASQC)
- EPA Quality Assurance Division (QAD)
- EPA Regional Offices

Many of the courses assume little or no experience in air monitoring or QA/QC. Courses are selected according to individual responsibilities, available resources and employee's experience level.

Quality assurance employees at a minimum are required to take the following training offered by EPA Region 6 or EPA Air Pollution Training Institute when these training courses are made available:

- APTI SI:471, General Quality Assurance Considerations for Ambient Air Monitoring
- APTI 470, Quality Assurance for Air Pollution Measurement Systems (when available)
- EPA Region 6, Orientation to Quality Assurance Management
- EPA Region 6, Data Quality Objectives Workshop
- EPA Region 6, QMP/QAPP Seminar

A9 Documentation and Records

The LDEQ PAMS and air toxics sampling network perform environmental sampling, analysis and project reporting. The procedures for the timely preparation, review, approval, issuance, use, revision, and maintenance of documents and records, whether they be electronic or hard copy, must comply with 40 CFR 58, Appendix A. Data verification, validation, management and reporting are the responsibility of the data management unit of the OEC/AD Air analysis section.

The VOC data from the canister analyses are entered into LDEQ's EQuIS database. Reports from EQuIS are generated and submitted each quarter to the data management unit for submission into AQS.

A9.1 Data Reporting Information

A9.1.1 Routine Data Activities

The data management unit has a structured records management retrieval system referred to as the consolidated air database that is based on the EPA's AQS database. This system allows for the efficient archiving and retrieval of records. It follows the same coding scheme as AQS in order to facilitate retrieval of information during EPA technical systems audits and network reviews.

A9.1.2 Annual Summary Reports to EPA

An annual summary of all ambient air monitoring data is required by 40 CFR, Part 58. This report is submitted to the EPA Administrator through the EPA Region 6 Office by May 1 (beginning in 2010) for all of the previous calendar year. It must contain the following information:

- Site and Monitoring Information
  - ✓ City name (when applicable)
  - ✓ County name and street address of site location
  - ✓ AQS site code
  - ✓ AQS monitoring method code

- Summary Data
  - ✓ An air quality review, by parameter, detailing if there were any violations of the NAAQS primary or secondary standard
  - ✓ An overview of the ambient air monitoring network
  - ✓ A report for each parameter with the following:
    - – Yearly report
    - – Daily maximum hourly report
    - – Graphical report
    - – Five year trend report
    - – Daily maximum hourly report (ozone only)
    - – Design value report (ozone only)
    - – Exceedance report and daily plot (when applicable)
    - – Data completeness and data deficiency report

The Engineer Supervisor over the Data Management Unit certifies that the annual summary is accurate to the best of his knowledge. This certification is based on the various assessments and reports generated by the data from the PAMS monitoring network.

The AD Project Officer shall generate an annual summary report which includes all the air toxics data collected within that calendar year. The report will be completed by April 1 of each year for the data collected from January 1 to December 31 of the previous year. The report will contain the following information:

- Site and Monitoring Information
  - ✓ City name
  - ✓ Parish name and street address of site location
  - ✓ AQS site code and AQS monitoring method code.

- Summary Data
  - ✓ Annual arithmetic mean and applicable Louisiana Ambient Air Standard,
  - ✓ Sampling schedule used as once every 6-day schedule.

The AD Project Officer will certify that the annual summary is accurate to the best of his knowledge. This certification will be based on the various assessments and reports performed by the organization.

A9.2 Data Reporting Package Format and Documentation Control

A9.2.1 Field Data Forms

Field data forms are used for canister samples. Field data forms are filled out in indelible ink. To make corrections on field data forms, operators must strike through the incorrect data with only one line and initial the correction. If that cannot be done legibly, then the correct entry may be placed on a new line.

A9.2.2 Logbooks

Site Logbooks: A logbook is assigned to each air monitoring station. These logbooks have numbered pages with detachable carbon copies. Each site visit must be recorded in the logbook along with details of all events occurring at the site that may affect the data quality. Each week site operators send in the carbon copy page of log entries to their supervisor for review and enter site operation information into an Access database. The original logbook page remains in the logbook at the site. Completed site logbooks are maintained for a minimum of 5 years, from the final dated entry in the logbook, at the site shelter.

The department maintains separate logbooks at the PAMS sites for recording operations at the site as they pertain to the continuous GC and canister samplers. A supervisor reviews the logbook entries.

Laboratory Logbooks: Sample log-ins and data recording are all done in accordance with the governing SOPs.

A9.2.3 Data Collection

A computer directly interfaced to the continuous GC/FIDs at the sites collects the raw data (chromatograms). These data are downloaded via modem every day from the site computer to a computer at the lab where the sample results are computed and formatted into a spreadsheet that is then imported into a database system. Meteorological data is downloaded from the site data logger into office

computers. For canister samples, a computer that is interfaced with GC/FID or GC/MS collects the analysis data. These data are then stored in a result file. The data from the result files are converted into spreadsheets and imported into EQuIS. These spreadsheets are also submitted to the AD data management unit for conversion and submission into AQS.

A9.3 Data Reporting, Archiving and Retrieval

Electronic data from ambient air monitoring, TNMOC, VOC analysis is maintained by the Data Management Unit and submitted into AQS databases. Site operators fill out and turn in to the Data Management Unit all of the calibration, precision checks, and sample data sheets for monitoring equipment at their sites. These data are also submitted into the AQS database. Quality assurance reports are printed from the Excel spreadsheet program and are sent quarterly to the Data Management Unit for submission into the AQS database.

All data forms, logbook sheets, sample forms, and audit reports must be retained for at least five years (ten years for the records of lab VOC analyses). If any litigation, claim, negotiation, audit or other action involving the records has been started before the end of the five-year (10-year for the records of lab VOC analyses) period, the records must be retained until completion of the action and resolution of all issues, which arise from this action.

B DATA GENERATION AND ACQUISITION

B1 Sampling Process Design

B1.1 Purpose

This section will describe all of the relevant components of the monitoring network to be operated by LDEQ including the network design for evaluating the quality of the data. This entails describing the key parameters to be estimated, the rationale for the locations of the monitors, the frequency of sampling at the samplers, the types of samplers used at each site, frequency and performance evaluations. The network design components comply with the regulations stipulated in the EPA document *Network Design and Site Exposure for Selected Noncriteria Air Pollutants.*

LDEQ operates four (4) PAMS sites in the Baton Rouge metropolitan area and twelve (12) additional air toxics sampling sites throughout the state. The PAMS sites have been established in locations that were determined in relation to ozone precursor source areas and predominant wind directions associated with high ozone events. The purpose is to determine the extent of the effect ozone precursor compounds have on ozone formation.

The locations of the ambient air monitoring stations take into account the basic monitoring objectives for the site location. The general criteria for identifying stations that most closely match one or more of the monitoring objectives are based on a spatial scale. These spatial scales are defined from 40CFR58 as:

- Micro scale – defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
- Middle scale – defines the concentration typical of areas up to several city blocks with dimensions ranging from about 100 meters to 0.5 kilometers.
- Neighborhood scale – defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range.
- Urban scale – defines the overall, citywide conditions with dimensions on the order of 4 to 50 kilometers. This scale would usually require more than one site for definition.
- Regional scale – defines usually a rural area of reasonably homogeneous geography and extends from tens to hundreds of kilometers.
- National and Global scales – these measurement scales represent concentrations characterizing the nation and the globe as a whole.

The relationships between monitoring objectives and scale of representativeness are found in Table B1. For the purpose of PAMS monitoring, the sites are classified as either Neighborhood or Urban scales.

Table B1

Monitoring Station Scale of Representativeness

Site	Parish	AQS Code	Scale of Representativeness
Capitol	EBR	220330009	Neighborhood Scale for O_3, CO, SO_2 , NO_2, VOCs, PM 2.5
Bayou Plaquemine	Iberville	220470009	Urban Scale for O_3, NO_2, NO_y, VOCs, PM2.5
Pride	EBR	220330013	Urban Scale for O_3, NO_2, VOCs
Dutchtown	Ascension	22005004	Urban Scale for O_3, NO_2, VOCs

B1.2 Sampling Activities

The monitoring equipment used to sample for compliance is designated as continuous or non-continuous. Continuous monitors operate 24 hours a day on a year round basis collecting consecutive hourly averages with the exception of periods of routine maintenance or periods of instrument calibration. Meteorological parameters and TNMOCs with auto continuous GC/FIDs operate on a continuous basis. Non-continuous samplers are operated year round on a national six (6) day schedule for 24 hours and 3 hours from midnight to midnight local time. Sampled on a non-continuous basis are VOCs using evacuated Summa canisters for PAMS and air toxics. Intensive PAMS sampling will take place during the ozone season (June through September. See Section A6). The event based canister samplers are operated throughout the year at the PAMS sites. The purpose of these samplers is to capture canister samples during peak concentrations of VOCs.

To determine compliance with the NAAQS, criteria have been established to represent data completeness. For the parameters sampled, data completeness criteria are shown in Table A4.

The purpose of the air toxics sampling network is to ascertain the spatial/temporal variability of hazardous air pollutants within the state. By complying with the sampling frequency requirements of the EPA document *Network Design and Site Exposure Criteria for Selected Noncriteria Air Pollutant,* the LDEQ 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 outlined in *Network Design and Site Exposure Criteria for Selected Noncriteria Air Pollutants*, the LDEQ can be confident that the concentrations within its jurisdiction are adequately characterized.

B1.3 Network Design Assumptions

The Louisiana ambient air monitoring network, which includes the PAMS and air toxics sampling network, is designed so that the selection of specific monitoring sites includes these four major activities:

- Developing and understanding the monitoring objectives and appropriate data quality objectives.
- Identifying the spatial scale most appropriate for the monitoring objectives of the site.
- Identifying the general locations where the monitoring site should be placed.
- Identifying specific monitoring sites.

The ambient air quality data collected at the monitoring stations are used for one or more of the following purposes:

- To judge compliance with and/or progress made towards meeting ambient air quality standards.
- To activate emergency control procedures that prevent or alleviate air pollution episodes.
- To observe pollution trends throughout the region, including non-urban areas.
- To provide a database for research evaluation of effects; urban, land-use, and transportation planning; development and evaluation of abatement strategies; and development and validation of diffusion models.

Sampling site locations and parameters sampled are based on the information obtained from isopleth maps, population density maps and source locations following these guidelines:

- Locate one or more stations in the priority area, the zone of highest pollution concentration within the region.
- Give close attention to densely populated areas within the region, especially when they are near heavy pollution.
- Assess the quality of air entering the region using stations on the periphery of the region; meteorological factors (e.g., frequencies of wind directions) are most important in locating these stations.
- Sample in areas of projected growth to determine the effects of future development on the environment.
- It is important to locate stations so as to facilitate evaluation of progress made toward air quality goals.
- Some information on air quality should be available to represent all portions of the regions.

Some monitoring stations are capable of fulfilling more than one of these guideline objectives. Ambient air monitoring sites in those areas that are in non-compliance for the NAAQS, namely ozone in the Baton Rouge area, are set up for rapid data collection, retrieval and analysis with automated equipment whenever an excursion occurs. These monitoring sites are located to maximize the measurements of pollutant concentration over the range of the affected area and, as near as possible, are located in areas when human health and welfare are most threatened. A minimal number of monitoring sites are set up over as large an area as possible, while still meeting the monitoring objectives to track air pollution trends. The objective is to determine the extent and nature of the air pollution and to determine the variations in the measured levels of atmospheric contaminants in respect to the geographical, socio-economic, climatological, and other factors. The data collected is useful in planning epidemiological investigations and in providing the background air quality data.

In interpreting trend data, limitations imposed by the network design are considered. Precautions are taken to ensure that each sampling site is as representative as possible of the designated area, and that measurements obtained are not unduly influenced by local factors. Such factors can include topography, structures, sources of pollution in the immediate vicinity of the site, and other variables.

Air monitoring sites set up to determine health effects are composed of integrating samplers both for determining pollutant concentrations for ≤24 hours and for developing long term (≥24 hour) ambient air quality standards. The monitoring sites are located so that the resulting data will represent the population group under evaluation, so that data correlations are made between observed health effects and observed air quality exposures.

Requirements for monitoring in support of health studies are as follows:

- The stations are located in or near the population under study.
- Pollutants sampling averaging times are sufficiently short to allow use in acute health effect studies that form the scientific basis for short-term standards.
- Sampling frequency, usually daily, is enough to characterize air quality as a function of time.
- The monitoring system is flexible and responsive to emergency conditions with data available on short notice.

B1.4 Siting Criteria

B1.4.1 Network Siting Requirements

The Louisiana air-monitoring network is designed so that the siting criteria for the monitoring stations meet one or more of the following monitoring objectives:

- Locate the network in areas of expected highest concentrations.
- Measure representative concentrations in areas of high population density.
- Determine impact of significant sources or source categories on ambient pollution levels.
- Obtain general background concentration levels.
- Determine extent of regional pollutant transport in populated areas, and in support of secondary standards.
- Determine welfare-related impacts in more rural and remote areas.

These six objectives are used to ensure that the monitoring station locations in the network are representative of the spatial scale defined for the station parameters.

The sampling equipment falls into one of the two following categories:

- Continuous -- where pollutant concentrations are measured using automated methods and the data are collected and recorded continuously.
- Integrated or non-continuous -- where pollutant concentrations are collected by a manual method for 24 hours on a fixed schedule.

The continuous automated methods are an integral part of the air pollution episode warning system.

Monitoring stations are sited to match the appropriate spatial scale, as defined in Section B1.1, for the monitoring objective of the station. The relationship of the monitoring objectives to the spatial scales is shown in Table B2.

Table B2

Relationship among Monitoring Objectives and Scales of Representativeness

Monitoring Objective	Appropriate Siting Scale
Highest Concentration	Micro, middle, neighborhood, sometimes urban
Population	Neighborhood, urban
Source impact	Micro, middle, neighborhood
General/background	Neighborhood, regional
Regional Transport	Urban/regional
Welfare-related	Urban/regional

B1.4.2 Site Location

Monitoring sites are located in order to best fit the sampling objectives defined in Section B1.1. Other factors that affect site location are:

- Economics
- Security
- Logistics
- Traffic Patterns
- Atmospheric Considerations
- Topography
- Pollutant Considerations

These factors along with the sampling objectives and the information provided in 40 CFR Part 58, Appendix D are used in determining site locations for Local Agency Monitoring Stations (SLAMS), (National Air Monitoring Stations (NAMS), Special Purpose Monitoring Stations (SPMS), PAMS and Air Toxics monitoring. Monitoring station information is found in Section A6 of this document.

B1.5 Monitor/Sampler Placement

Placement of the monitor or sampler site depends on physical obstructions and activities in the immediate area; accessibility, availability of utilities and other support facilities; and correlation with the defined purpose of the specific monitor and monitor design. Obstructions such as trees and fences can significantly alter the airflow; monitors are placed away from obstructions. Airflow around the monitor is representative of the general airflow in the area to prevent sampling bias.

Detailed information on urban physiography (e.g. buildings, street dimensions) is determined through visual observations, aerial photography and surveys. This information is important in determining the exact locations of pollutant sources in and around the prospective monitoring areas. This information is maintained in the site documentation file. Sampling locations are chosen to avoid undue influence by ground level dust and are located away from the source, such as an unpaved road.

Depending on the defined monitoring objective, the monitors are placed according to exposure to pollution, but due to physical or meteorological constraints, monitoring sites are located to optimize representativeness of sample collection. Table B3 is the summary of probe and monitoring path siting cretiria.

Any changes to the PAMS monitoring network regarding site locations, sampling frequency and sampling methods will not occur until approved by EPA Region 6.

Table B3

Summary of Probe and Monitoring Path Siting Criteria

POLLUTANT	SCALE (maximum monitoring path length, meters)	Height from ground to probe or 80% of monitoring path (meters)	Horizontal and vertical distance from supporting structures to probe or 90% monitoring path (meters)	Distance from trees to probe of monitoring path (meters)
Ozone precursors for (PAMS)	Neighborhood and urban (1km)	3-15	>1	>10

B1.6 Classification of Measurements as Critical or Non-critical

All of the measurements of the pollutants sampled by the PAMS and air toxics sampling network are considered to be critical. The measurements meet federal monitoring requirements to show compliance with the NAAQS. To meet these requirements, continuous sampling is specified for O_3 and NO_2 and field GC. 3-hour and 24-hour measurements are required for VOC canisters. The 3-hour and 24-hour samples are collected midnight-to-midnight local time on a national schedule to permit the use of the data in standard summaries. Meteorological data are used to supplement the sampling of the criteria pollutant parameters. The data collected from PAMS sites are submitted to AQS. The minimum amounts of data for appropriate summary statistics are taken with at least 75% of total possible observations present for summary statistical calculation. The minimal collection requirements are given in Table A1.

B1.7 Validation of any Non-Standard Methods

The PAMS Network is operated according to the CFR, the EPA, *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II,* and the EPA, *Technical Assistance Document for Sampling and Analysis of Ozone Precursors*. Since the operation of the PAMS network is under these requirements, there will not be any non-standard methods used. Modifications to standard methods, if any, must be scientifically defensible and be highlighted in the SOPs and explained.

B2 Sampling Methods

B2.1 VOC Canister Sampling

B2.1.1 Site Selection

Site selection for VOC canister samplers will be done in accordance with the EPA QA Handbook, Volume II, Part I, Section 6.0.

B2.1.2 Sampling Method

- A XonTech 911A Sampler with an evacuated Summa® Canister is used to sample 24-hour 6-day samples.
- A XonTech 911A Sampler attached to one to three XonTech 912 multi-canister sampling adapters for 8 3-hour samples.
- A XonTech 911A Sampler combined with a continuous Thermo Electron 55C methane/TNMOC analyzer is used to collect event-based canister samples. The sampling period is 25 minutes.

B2.1.3 Sampling Volume

The volume of air to be sampled is specified in the manufacturer's specifications. The total volume of air collected is based upon a canister size and the canister final pressure. The volume sampled in a 6-liter canister with zero final pressure is sufficient for two analyses: ozone precursors and air toxics. In case of a power outage, a valid sample run will be no less than 75% of the scheduled sample time. If the sample time is less than this, the sample will be invalidated & flagged.

B2.2 Continuous GC/FID for Hourly TNMOCs

These GC/FIDs are located at the three PAMS sites, Pride, Bayou Plaquemine and Capitol. Air are continuously drawn into a trap using a XonTech Model 930 organic vapor concentrator and followed by thermally desorption into a Shimadzu gas chromatograph Model GC-14A with an FID detector. The system analyzes air in batches. Sampling time for each batch is 24 minutes and the sampling volume is 240 cc. The data from each batch is treated as half hour data. Hourly data are obtained by averaging two half hour data and submitted to EPA. The procedure is detailed in LDEQ's SOP # 1065 that has been developed based on EPA Compendium Method TO-12.

B2.3 Meteorological Parameters Sampling

Site selection for continuous meteorological parameter sampling will be done in accordance with EPA QA Handbook, Volume II, Part I, Section 6.0. Parameter

probe siting will be done in accordance with EPA QA Handbook, Volume IV. Meteorological sampling probes are attached to a 10-meter high sampling tower with electrical wiring connecting the probe to translator cards specific for each parameter and located inside the site shelter. The translator card is attached to the data logger where the electrical impulses are converted and stored as data.

B2.4 Support Facilities

The main support facility for the VOC sampling and field continuous GC is the laboratory, located at 5825 Florida Blvd., Baton Rouge, Louisiana. Equipment, supplies and other necessary materials for field operation are distributed to the field laboratory site operators from this location. Instrumentation requiring repair is returned to the laboratory for reconditioning to optimal working condition before being placed back into service at the PAMS stations.

B3 Sample Handling and Custody

B3.1 Sample Custody of Continuous TNMOC Samples

Continuous hourly TNMOC samples are taken and analyzed directly in the field using continuous auto GCs. The information about the sampling time, analysis time and sampling flow rate is recorded in electronic data files. There is no individual paper chain-of custody. A field logbook records all of the activities related to the site auto GCs' quality controls, maintenance, operators' site visits, etc.

B3.2 Sample Custody for Canister Samples

All air samples are collected under the guidelines established by LDEQ. Samples are picked up by the contract lab at LDEQ Headquarters and all of the LDEQ regional Offices as directed.

VOC samples are collected in stainless steel Summa canisters. Site operators complete the necessary information on the field data sheets and the sample identification tags that are attached to canisters. Canisters are delivered to LDEQ Headquarters and all of the LDEQ regional Offices for the contract lab to pick up. The maximum holding time between sample collection and analysis is 30 days.

When the sample arrives at the laboratory, the individual accepting the delivery signs and dates the chain of custody on the accompanying field data sheet.

The individual receiving the canister sample notes the overall conditions of the canister and compares the information on the chain of custody with the data recorded on the sample identification tag attached to the canister. Any

discrepancies must be noted on the field data sheet and in the sample log entry book.

A pressure gauge is attached to the canister inlet to check the pressure of the canister. The canister valve is opened briefly and the pressure (psig) is recorded in the appropriate location on the chain of custody. If the pressure on the canister is 2 psi less or larger than the projected pressure (normally 23 psig), the flow rate of the sampler may need to be adjusted. If the pressure is greater than the pressure threshold of the sampler, the canister will be recorded with an appropriate cautionary flag as governed by the laboratory SOP. This will be noted in the LIMS database.

All canister samples received by the laboratory must be assigned a unique laboratory number generated by the Laboratory Information Management System (LIMS). Any irregularities associated with the samples must be noted in the LIMS database.

Canister samples are required to have the following information:

- The LIMS Laboratory Number
- The site or location where the sample was collected
- The date the sample was collected
- The date the sample was received in the laboratory
- The analyst who received the sample
- The canister identification number (serial number)
- The initial pressure of the canister upon receipt in the laboratory
- The start hour the canister was sampled
- The duration canister was sampled
- The dilution factor (if any)
- A notation of any discrepancies and/or comments observed during the sample entry

Figure B1 is the field data sheet for canister samples.

When all information has been completed on the field data sheets and LIMS database, the samples and the accompanying field data sheets shall be directed to the analyst. The laboratory manager will regularly review the field data sheets and LIMS database to ensure consistency and eliminate data entry errors.

A canister sample may be declared invalid, flagged and/or annotated if any of the following conditions exists,

- The chain of custody does not contain all of the pertinent information.
- The canister has an obvious physical defect.

- The pressure in the canister is below -5 inches in. Hg.
- The pressure is equal or close to the pressure threshold of the sampler. Generally, the pressure threshold of a sampler is 25 psig. The canister pressure should be ~ 2 psi less than the pressure threshold.
- The sample was collected in an expired canister.
- The sample is beyond the prescribed holding time after sample collection.

Figure B1

Louisiana Department of Environmental Quality
Air Chain of Custody Record

Page ____ of ____

AI No: _____ AQS No. _____ Collection Date: _____

Location Name: _____
Address: _____
_____
Sample Collector(s): _____
_____

Sample ID	Sampler ID	Canister Serial #	Collection Start Time	Duration	Final Pressure	Parameters Requested with Method Reference: PAMS Method -GC/FID	TO-15 Method - GC/MS	Canister Clean & Certify	Rapid Turn-Around (days) (Same day,1,3,5,7,14,21)		Remarks

Additional Comments: _____
_____
_____

Relinquished by:	Date & Time:	Received by:

If the sample is declared invalid, the site operator or sample collector must be contacted via telephone for the problem. Depending on the severity or complexity of the problem, adjustments must be made to the sampling equipment under the advice of the field supervisor. All invalid samples must be logged into the LIMS and reasons for invalidation noted. At the discretion of the sample collector, his/her

supervisor or the AD project officer, these samples may not be analyzed. The laboratory shall be notified within 72 hours of sample submittal if the analysis is to be cancelled. Otherwise the samples will be analyzed. Any analyses performed on these samples shall be documented in the LIMS database with appropriate flagging and/or annotation to indicate the nature of any problems with the data. Data users may choose to exclude data sets that are flagged from being reported to the agency's EQuIS database or to AQS.

B3.3 Sampling Custody for Meteorological Parameters

There are no discrete samples handled by individuals for meteorological parameters. The data produced from the monitors are identified electronically within the instrument data logger, support computer and processing software. The site logbook will record the instrument maintenance and operators' site visits and activities.

B4 Analytical Methods

B4.1 Canister Analytical Method for VOC Ozone Precursors

LDEQ's contract lab, Houston Laboratory, Accutest GC, Inc., analyzes canister samples for ozone precursors shown in Table A1 in accordance with its SOP# SPL/HE/Air-M6.01 that has been developed based upon *Technical Assistance Document for sampling and analysis of ozone precursors (EPA/600-R-98/161).* The procedure uses an Entech cryogenic concentrator to concentrate the condensable portion of the air sample where the sample is cryogenically concentrated on the multi-bed cryo-trap, desorbed at a higher temperature, and cryofocused (-195^{0}C) on the head of the column of the Agilent 6890 GC equipped a flame ionization detector (FID) with pressure control. The hydrocarbons are separated and detected via a Restek Corporation, ™ Rtx® -1, capillary column with a 1-micron dimethylpolysiloxane phase thickness, an internal diameter of 0.32 mm, and a length of 100 meters.

B4.2 Canister Analytical Method for VOC Air Toxics

Numerous compounds, many of which are chlorinated VOCs, have been successfully tested for storage stability in pressurized canisters. The contract lab analyzes canister samples for VOC air toxic compounds shown in Table A2 in accordance with the contract's SOP# SPL/HE/Air-M7.01 that has been developed based upon EPA Compendium Method TO-15, *Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)*. The laboratory uses an Entech concentrator, Agilent 6890 Series gas chromatograph with a Restek Corporation, ™ Rtx® -1, capillary column with a 0.5-micron dimethylpolysiloxane

phase thickness, an internal diameter of 0.32 mm, and a length of 100 meters in conjunction with Agilent 5973 or 5975 quadruple mass selective detector.

B4.3 Analytical Method for Continuous Hourly TNMOCs

See B2.2.

B4.4 Analytical Method for Meteorological parameters

Meteorological measurement methods are in accordance with LDEQ's SOP# 1350 that has been developed based upon EPA's *Quality Assurance Handbook Volume IV*, March 2008.

B5 Quality Control

B5.1 Quality Control Policy and Objectives

Data quality objectives and criteria are discussed in Section A7.

PAMS and Air Toxics Sampling sites are evaluated yearly by OEC/AD to ensure that siting requirements are met. Hard copies of this evaluation are prepared and maintained in the LDEQ site documentation files. Continuous GCs for TNMOC are operated year round.

B5.2 Internal Quality Control Procedures

B5.2.1 Canisters

Canisters are cleaned in accordance with the contract lab's SOP# SPL/HE/Air-M5.01. Canisters are cleaned in batches (8 or 12 canisters per batch) using Xontech 960. The dirtiest canister (with the highest TNMOC) in each batch is selected for certification using GC/FID analytical results. The certification criteria are: individual ozone precursors must be less than 2 ppbC and TNMOC must be less than 20 ppbC. When the canister is used for sampling, its pressure must be less than -28 in. Hg and it must be cleaned within last 90 days.

B5.2.2 Samplers

All flow measuring devices used in calibrations, audits, and precision checks are calibrated every three months against an NIST traceable bubble flow apparatus.

VOC canister samplers are certified for volumetric flow on initial installation and set-up, and every 3 months thereafter.

Canister samplers are flow checked when a sample run is set up. Sample flows are adjusted so that the final canister pressure is ~2 psi lower than the sampler's manifold pressure threshold. The final canister pressure is generally of 20 psig ± 3 psig.

Samplers may be contaminated. The contaminated sampler is brought into the lab for cleaning. The cleaned sampler will be certified by sampling zero air through it and sending the sample for GC/FID analysis. The criteria specified in B5.2.1 must be met.

B5.2.3 Continuous GC/FIDs for TNMOCs

A zero air blank is run weekly. TNMOC must be less than 20 ppbC. A 300 ppbC of humidified working calibration standard is prepared in a 15-liter summa canister from a stock of propane standard every 30th day. This working standard is used for continuous calibration verification (CCV). The CCV standard is run once per week. The deviation must be within 10% of the initial calibration.

B5.2.4 Canister Analysis for Ozone VOC Precursors

The canister samples are analyzed in batches. Number of canister samples in each batch is up to 19. For each batch, the following quality control samples are run:

- One dry zero-air blank directly from a zero air cylinder and one humidified zero air blank are analyzed. For both zero air blanks, TNMOC must be less than 20 ppbC and all the target compounds must be less than 2 ppbC.
- One CCV standard is analyzed twice. Two runs bracket the samples in the batch. The standard is 100 ppbC of humidified propane and prepared in a 6-liter or 15-liter canisters every 30th day. The response factors (RF) of both CCVs must be within 90-110% of the RF obtained in the initial calibration.
- One humidified retention time standard containing all the targeted compounds is analyzed once. The retention times must be within ±0.1 min of the retention times in the initial calibration.
- At least one sample is randomly selected as a replicate sample. The relative percent difference (RPD) for the targeted compounds must be within 25% in the calibration range.
- One second-source LCS containing all the targeted compounds is run once. At least one compound from each carbon group must have the recovery of 80-120%. All compounds must have a recovery of 70-130%.

For any suspected identification, a GC/MS analysis will be conducted for confirmation. MDLs are run annually or after certain system maintenance that

may change the sensitivity of the instrument to the extent that the sensitivity will not meet the requirement for the method. MDLs must be less than 2 ppbC. Performance evaluation samples are analyzed at least twice per year. The results are sent to Louisiana Environmental Laboratory Accreditation Program for evaluation. The criteria from performance evaluation sample providers or in the lab control standard above-mentioned must be met.

B5.2.5 Canister Analysis for Air Toxics

The canister samples are analyzed in batches. Number of canister samples in each batch is up to 19. For each batch, the following quality control measures are conducted.

- Before the analysis of samples, the GC/MS must meet the mass spectral ion abundance criteria for the instrument performance check. The instrument performance check compound, p-Bromofluorobenzene (BFB) is added to each analysis as the internal standard. It is also used as a instrument performance compound. Before the batch continues, the GC/MS must meet the mass spectral ion abundance criteria specified in TO-15.
- One dry zero-air blank directly from a zero air cylinder and one humidified zero air blank are analyzed. For both zero air blanks, all the target compounds must be less than 0.2 ppbv.
- One CCV standard containing all the targeted compounds is analyzed twice. Two runs bracket the samples in the batch. The standard is humidified and prepared in a 6-liter or 15-liter canisters every 30th day. For both runs, the accuracy should be 100 $\pm$ 30%. Random two compounds are allowed to vary greater than 100 $\pm$ 30%, but must be less than 100 $\pm$ 40%.
- At least one sample is randomly selected as a replicate sample. RPD for the targeted compounds must be within 25% in the calibration range.
- One second-source LCS containing all the targeted compounds is run once. The accuracy should be 100 $\pm$ 30%. Random two compounds are allowed to vary greater than 100 $\pm$ 30%, but must be less than 100 $\pm$ 40%.
- The internal standard retention time must be within ± 0.33 minutes of the mean RT and the internal standard area must be ± 40% of the mean area of the 5 calibration points in the last multi-point calibration.
- BFB is used as a surrogate in this lab. Its recovery should be between 80 to 120% and must be between 70 to 130%.

MDLs are run annually or after certain system maintenance that may change the sensitivity of the instrument to the extent that the sensitivity will not meet the requirement for the method. MDLs must be less than 0.2 ppbv. Performance evaluation samples are analyzed at least twice per year. The results are sent to

Louisiana Environmental Laboratory Accreditation Program for evaluation. The criteria from performance evaluation sample providers or in the lab control standard above-mentioned must be met.

B5.2.6 Meteorological Instruments

On a weekly basis, site operators must make a visual and (where practical) a physical check of the sampling probes, record any noted problems in the logbook and report the problem to their supervisors. Once every three months, check the translator sensor cards (zero/span). Once every six months, check calibration of the meteorological instruments. Criteria and detailed procedure are described in Table A4 and LDEQ's SOP#1350.

B5.3 Precision Accuracy and Bias

Precision and accuracy data are submitted each quarter to EPA for inclusion in the AQS database. From the quarterly precision and accuracy reports each year EPA calculates and reports the properly weighted probability limits for precision for the calendar year from the equations found in 40 CFR 58, Appendix A. For each parameter, the upper 95 percent probability limit and lower 95 percent probability limit are calculated. Corrective action must be taken if a sampler exceeds the bias limits for precision and accuracy to ensure that future data collected meets this limit.

B6 Instrument/Equipment Testing, Inspection and Maintenance

B6.1 Purpose

To ensure that all equipment is in sound operating condition, procedures have been developed for testing new and repaired monitoring equipment.

B6.2 Testing, Inspection and Maintenance

Good practices are used to keep all equipment clean and free from dust and any adverse environmental conditions. Whenever laboratory equipment needs repairs, a service company, vendor, or the manufacturer is contacted; or, if the item cannot be repaired, a replacement is secured.

Repairs and service to the field equipment are provided as needed and usually done in house. However, if the analyst cannot take care of it, then a reputable technician must service it.

B6.2.1 Preventive Maintenance

LDEQ performs preventive maintenance on all samplers and monitors on a scheduled and/or as needed basis.

Preventive maintenance for sampling systems routinely performed on a regular basis includes the following:

- Check sample manifold exhaust motor to insure proper flow through sample system.
- Check sample line fittings for leaks.
- Change the in-line filter on the sampler line.
- Run a diagnostic check on the sampler or continuous GC.
- Check sample flow on the monitor.
- Check sample line and manifold for cleanliness, blockage, or moisture.

All sampling and analytical instruments must be checked by analysts /site operators daily for any malfunctioning parts, blown filaments, broken columns, or blown fuses. A small inventory of parts is maintained. If analysts/site operators can install a part, filament, or fuse, the maintenance is completed by them. If the part is not in inventory, or cannot be replaced, a service company is contacted for the needed repairs/service.

Preventive maintenance information is recorded in the field logbook for the VOC canister sampler or continuous GC. The site operator takes corrective action, whenever problems are encountered.

B6.2.2 Corrective Action

Corrective action measures will be taken to ensure good quality data. There is the potential for many types of sampling and measurement system corrective actions. Each of the SOPs will outline exact actions that will be taken if the analytical and sampling systems are out of control (see B5). Every unusual event that affects laboratory data quality will be reported through the laboratory corrective action system.

The performance of the instruments in the laboratory is defined by limits that fall into two categories: quality assurance limits and manufacturer's performance limits. Quality assurance limits are addressed in section A7 of this document. Manufacturer's performance limits are stated in the operations manual for each type of instrument.

Manufacturer's Performance Limits: The laboratory analyst/site operator makes the initial determination as to when the instrument is malfunctioning. Symptoms such as inadequate instrument response, broken columns, blown

fuses, inadequate sample flow, etc., may be found. The analyst should make every effort to repair, if possible. If the repairs are beyond the scope of the in-house personnel, then the instrument service technician is called in to make repairs.

The instrument is returned back into service after the instrument passes the calibration standard checks. MDLs are run on the instrument after a major part, instrument temperature parameter or other parameter crucial to the overall functioning of the instrument process has been replaced or altered. The manager of the laboratory will make the determination to run MDL checks.

Quality Assurance Limits: If any laboratory instrument fails quality assurance requirements, the following items must be checked before any adjustment or recalibration.

- Try to pinpoint the problem by using a systematic approach. Check the minor sources of potential problems first by examining the sample line for leaks, moisture or dust.
- Check for leaks in the calibration system sample lines, broken columns, broken filaments, clogged detectors, etc.

Verify that the problem is fixed by running quality control calibration standards with standards that are within method specifications.

If the instrument fails to meet quality assurance limits, the following items <u>must</u> be checked <u>before</u> any adjustment or recalibration on the analyzer: The quality control limits are defined in the relevant SOPs.

- Check sample line for leaks, moisture or dust.
- Check the calibration system, sample lines, sampler flow, vent and dry air source.

If the above items are normal, the instrument may then be adjusted or re-calibrated. If one or more of the above items is found to be defective, each item is replaced, or repaired, and the control checks are repeated.

Equipment brought in for repairs is given a thorough test to determine the exact cause of the failure. Information derived from testing is recorded in the instrument's maintenance record and is checked against past failures to determine if this is a recurring problem or a routine failure. Recurring problems are checked to determine if the last repair was adequate and to establish further steps in the repair process to ensure better reliability. All failures are checked against other instruments, of the same make, to isolate any type of engineering defect or other problem that the manufacturer should address. All repairs are made using spare parts maintenance stock, local vendor sources or

manufacturer-supplied parts. On occasion, a unit will be returned to the manufacturer due to an overload in the repair shop workload, for upgrading or for authorized manufacturer repairs that are beyond the capability of the repair shop. After repair, a unit must be calibrated and bench tested for an extended time (3 to 10 days) to ensure proper operation. If the unit has performed as specified in its operations manual, the unit is kept as a spare or placed back into use in the field. If the unit does not pass the test run, it is cycled back through the repair procedure. All information concerning the repair, outcome of the test run, and final diagnostic readings are recorded in the maintenance record.

B7 Instrument/ Equipment Calibration and Frequency

B7.1 Purpose

A calibration establishes the relationship between the actual pollutant concentration and the analyzer's response. This relationship is used to convert subsequent analyzer response values to corresponding pollutant concentrations until superseded by a new calibration.

B7.2 VOC Samplers

VOC canister samplers are certified for volumetric flow on initial installation and set up then every month thereafter. These samplers are flow audited at least twice a year.

B7.3 Canister Analytical GC/FIDs for Ozone VOC Precursors

The Agilent GC/FID is calibrated according to the guidelines stated in the contract lab's SOP # SPL/HE/Air-M6.01 referenced in the Appendix. A 5-point calibration of propane is run annually or after any major instrument maintenance. The correlation coefficient of the linear regression must be equal to or larger than 0.995. The calibration range is 5 to 500 ppbC. The response factor (ppbC/area counts) from this single compound calibration is entered into the calibration table and applied to all the target compounds and untargeted compounds. The concentrations calculated from this calibration for all the targeted and untargeted compounds are ppbC. A second-source standard that contains all the target compounds will verify the initial calibration. The criteria for the second source LCS in B5.2.5 is used for verification.

B7.4 Canister Analytical GC/MS for Air Toxic Compounds

The Agilent GC/MS is calibrated according to the guidelines stated in the contract Lab's SOP # SPL/HE/Air-M7.01 referenced in the Appendix. A 5-point calibration is performed. The average response factor is used for curve fitting. 30% relative standard deviation for the relative response factors must be met with at most 2

exceptions of at most 40%. The calibration range is 0.5 to 10 ppbv. A second source standard that contains all the target compounds will be used to verify the initial calibrations. The criteria for the second source LCS in B5.2.6 is used for verification. The initial calibration will be conducted whenever the quality control criteria for LCS and CCV mentioned in B5.2.6 are not met or any major maintenance is performed.

B7.5 Field Continuous GC/FIDs for TNMOCs

The field continuous GC/FIDs for TNMOCs are calibrated in accordance with the guidelines stated in LDEQ's SOP #1065 listed in the Appendix. A propane standard is the calibration gas. The concentration of propane is recorded for the column and a multiplication factor is calculated. The data are entered into the detector calibration table and applied to the total area response to calculate TNMOC concentrations in ppbC. Whenever a daily check of the propane standard reveals a variance of ±10% from the actual concentration recorded in the field propane standard calibration mix, a new multiplication factor is calculated and substituted for the multiplication factor in the calibration table.

B7.6 Meteorological Sensors Calibration Method and Frequency

Meteorological parameters are calibrated in accordance with guidelines stated in LDEQ's SOP# 1350. The calibrations must be performed with the appropriate calibration device for each parameter whenever:

- A new sensor is set up for operation
- Twice yearly on a six month schedule

B7.7 Laboratory Standard Materials Requiring Calibration and/or Certification

Standards and their use are described in the SOPs. They may not be used beyond their expiration date without recertification.

B8 Inspection/Acceptance of Supplies and Consumables

B8.1 Supplies Management

Spare parts that meet the manufacturer's specifications for the maintenance and repairs of the monitoring and sampling equipment are kept on hand at the electronic repair facilities at the laboratory. Adequate consumable supplies are kept on hand at the monitoring stations. That point is covered in section B2.4 of this document.

LDEQ is subject to state purchasing policies and is limited in the ability to choose suppliers. Often the items come from the vendor with the lowest bid, unless a

reason can be established that the lowest bidder does not meet required specifications. The state purchasing policies do allow purchase orders directed to reputable vendors for amounts less than $1,000 to be filled without competitive bidding. A list of consumable supply vendors is given below:

- Agilent
  Analytical Business Center MS37
  2850 Centerville Road
  Wilmington, DE 19808-1610

- SUPELCO, INC.
  Supelco Park
  P.O. Box B
  Bellefonte, PA 16823-9900

- Shimadzu
  7102 Riverwood Drive
  Columbia, Maryland 21046

- Scott Specialty Gases
  6141 Easton Road
  Plumsteadville, PA 18949-0310

- Anderson Instruments, Inc.
  500 Technology Court
  Smyrna, GA 30082-5211

- SGE, Inc.
  2007 Kramer Lane
  Austin, TX 78758

- Capitol Valve and Fitting Company
  9243 Interline Avenue
  Baton Rouge, LA 70809

- Tri-Gas, Inc.
  420 Allendale Drive
  Port Allen, LA 70767

- Fisher Scientific
  6614 Langley Drive
  Baton Rouge, LA 70809

- XonTech, Inc.
  6862 Hayenhurst Avenue
  Van Nuys, CA 91406

- Entech, Inc.
  950 Enchanted Way, #131
  Simi Valley, CA 93065

- Restek Corporation
  110 Benner Circle
  Bellefonte, PA 16823-8812

New supplies must be checked to see if they are damaged, clean, and if the quality and workmanship of the items meet specifications. If the specifications are not met, the items are sent back with the replacements required. The supplies are stored in a clean, adequately ventilated place.

B9 Non-Direct Measurements

The PAMS and air toxics sampling networks rely on data that are generated through field and laboratory operations; however, other significant data are obtained from sources outside the LDEQ or from historical records. This section addresses data not obtained by direct measurement from the PAMS and air toxics sampling networks and addresses quality issues related to the PAMS and air toxics sampling networks. These non-direct measurement data includes both outside data and historical monitoring data. Non-monitoring data and historical monitoring data are used in a variety of ways. Use of information that fails to meet the necessary data quality objectives (DQOs) for the PAMS and air toxics sampling networks can lead to erroneous trend reports and regulatory decisions. The policies and procedures described in this section apply both to data acquired through the LDEQ monitoring program and to information previously acquired and/or acquired from outside sources.

B9.1 Chemical and Physical Properties Data

Physical and chemical property 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. The following sources may be used without prior approval:

- National Institute of Standards and Technology (NIST)
- International Organization for Standardization (ISO), The International Union of Pure and Applied Chemistry (IUPAC), American National Standards

Institute (ANSI) and other widely-recognized national and international standards organizations

- U.S. EPA

- The current edition of certain standard handbooks may be used. Two that are relevant to the fine PAMS monitoring program are CRC Press' *Handbook of Chemistry and Physics*, and *Lange's Handbook.*

B9.2 Monitor/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. Department 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, the correct value will be determined by contacting the manufacturer. The field operators will correct all the operator manuals and the vendor will be contacted to issue an errata sheet discussing the changes. The Department will also contact the EPA Region 6 Office to inform them of these errors. 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
- Use of different reference conditions than those called for in EPA regulations

B9.3 Information for Location

Another type of data that will commonly be used is geographic information. For the current sites, LDEQ will locate these sites using global positioning systems (GPS) that meet EPA Locational Data Policy of 25 meters accuracy. U.S Geological Survey (USGS) maps are used as the primary means for locating and siting stations in the existing network. Geographic locations of LDEQ monitoring sites that are no longer in operation will not be re-determined.

B9.4 Historical Monitoring Information of the LDEQ

The Louisiana Department of Environmental Quality has operated a network of ambient air monitoring stations since the 1970's. Historical monitoring data and

summary information derived from that data may be used in conjunction with current monitoring results to calculate and report trends in pollutant concentrations. In calculating historical trends, it is important to verify that historical data are fully comparable to current monitoring data. If different methodologies were used to gather the historical data, the biases and other inaccuracies must be described in trends reports based on that data. Evidence must be presented to demonstrate that results of the two different methods are comparable before this data is reported. Trend reports, comparing current data with historical data, must be approved by the LDEQ before release. Direct comparisons of current data with historical data will not be reported or used to estimate trends.

B9.5 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 used 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 LDEQ data with 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 LDEQ measurements and that the original data generator had an acceptable QA program in place.

B9.6 U.S. Weather Service Data

Meteorological information is gathered from the U.S. Weather Service station in Slidell, LA. Parameters include temperature, relative humidity, barometric pressure, rainfall, wind speed, wind direction, cloud type/layers, percentage cloud cover and visibility range. Historically, these data have not been used to calculate pollutant concentration values for any of the monitoring sites, some of which each have the required meteorological sensors. However, National Weather Service (NWS) data are often included in summary reports. No changes to the way in which these data are collected are anticipated for the LDEQ PAMS and Air Toxics Sampling networks.

B10 Data Management

B10.1 Background and Overview

This section describes the data management operations pertaining to measurements for the PAMS and air toxics stations operated by LDEQ. This includes an overview of the mathematical operations and analysis performed on raw (“as collected”) data. These operations include data recording, validation, transformation, transmittal, reduction, analysis, management, storage and retrieval.

The data manager, usually the Engineer Supervisor or his designee, OEC/AD, is responsible for performing the following tasks on a regular basis:

- Merging/correcting the duplicate data entry files
- Running verification and validation routines and correcting data as necessary
- Generating summary data reports for management
- Uploading verified/validated data to EPA AQS

The sample tracking and chain of custody information are entered into the contract lab's LIMS. This information along with analytical data is delivered to ID's Laboratory Information management Services. VOC data from analyses of canister samples and TNMOC data from continuous field GC/FID are reported in parts per billion volume (ppbv) or parts per billion carbon (ppbC), depending upon which EPA method is used. The VOC data from canister samples are managed and stored in EQuIS. All final reports for canister samples are received from the contract lab in PDF format or are generated through LDEQ's EQuIS database. The TNMOC data from the continuous field GC/FID are stored in the computers in GC Filed Unit. Data are considered valid if they meet the Quality Control criteria specified in the corresponding. Any results not meeting the criteria are "flagged" with the explanations in the database.

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B10.2 Data Recording

Verified VOC data from the contract lab must be loaded into the LDEQ's EQuIS database. Environmental Scientist Staff in ID's Laboratory Information Management Services receive, review and verify VOC data from the contract lab. All analytical results including concentrations below the calculated detection limit will be reported. More information is gained when a result is reported even if the data are somewhat inaccurate. All data reported not meeting all QC requirements will be marked with the appropriate data qualifier flags.

B10.3 Data Validation

Data validation is a systematic process consisting of data editing, screening, checking, auditing, verification, certification, and review for comparing a body of data to an established set of criteria to provide assurance that the data are adequate for their intended use. For air quality samples, the purpose of data validation is to detect and then verify any data values that may not represent actual air quality conditions at the sampling station. Effective data validation procedures usually are handled completely independently from the procedures of initial data collection. All data shall be validated and reviewed to insure the overall quality of the measurement before inclusion in the AQS database.

Data validation is necessary to identify data with errors, biases, and physically unrealistic values before they are used for identification of exceedances, for analysis, or for modeling. If problematic data are identified, the data can be corrected or invalidated, and corrective actions can be taken for field or laboratory operations.

When the data are processed, certain completeness criteria must be met. For example, each canister sample must have a start time, end time, average flow rate, starting and ending canister pressure, dates 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.

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 every month before any data submission to AQS. Data validation is the process by which raw data are screened and assessed before they can be included in the main database.

The related records will be kept to help data validation. The records consist of notebooks, workbooks, copies of chains of custody, field data sheets, instrument reports, final reports, and the like. All of these records shall be retained for at least five years (the records for lab VOC analyses for 10 years). Copies of the data retained by electronic storage must be kept both at the laboratory site and at the DEQ headquarters building.

B10.4 Data Review

The data review is performed by the field/site operators and the data analysis personnel. It would be extremely difficult for the data analysis personnel to review the raw data without the notations, notes and calibration information provided by the site operators. The review process for the site operator includes:

- Reviewing calibration information and any flags that could affect data and recording any information in the logbooks that might be vital to proper review of the data.
- Reviewing special relationship between data generated and historical data to determine potential irregularities such as reviewing the average concentration for a station or set of stations over a period of time.
- Performing regular secondary reviews on monthly maintenance sheets and site log notes.

B10.5 Data Input

In 2001, EPA changed the Aerometric Information Retrieval System (AIRS) to a database that is solely related to tracking the compliance of stationary sources of air pollution with EPA regulations: the Air Facility Subsystem (AFS). Information about

air monitoring - the ambient concentrations of air pollutants - was moved out of AIRS to a separate database: the Air Quality System (AQS). AQS also contains meteorological data, descriptive information about each monitoring station (including its geographic location and its operator), and data quality assurance/quality control information.

All required data are submitted into the AQS database by the Data Management Unit.

Recommended procedures for coding, key punching, and data editing are described in various AQS user manuals.

One of the functions of the AQS is to read transactions coded by state, local, and regional users of AQS, validate these transactions, and use them to update the AQS database. To accomplish this, there are two primary players, AQS users and the AQS database administrator (ADBA).

The AQS users are responsible for the following steps in the update process:

- Load – transfer transactions (either from tape or a database) into a screening file.
- Edit – check the validity of the transactions in the screening file and produce a report to identify errors.
- Correct – alter, remove, or create transactions in the screening file to fix errors identified in the EDIT.
- Notify – inform the ADBA that transactions in the screening file are ready to be updated. This function can also be used to cancel a request to update a particular screening file for updating.
- Message – allow the user and the ADBA to track the above-mentioned functions performed to a screening file when they were performed, and who performed them.
- Delete – remove any transactions that exist in a screening file.

To update the ADBA the following functions are done:

- Scan – to produce a report used by the ADBA to coordinate the update processing across several screening files. This function also “locks” the screening file to prevent the user access to the screening file during the updating.
- Update – to change values and files on the AQS database identified during the SCAN process. This process also removes any transactions from the screening file that have been updated and releases the screening file back to the user.

C ASSESSMENT AND OVERSIGHT

C1 Assessments and Response Actions

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

Quality assurance assessments indicate whether the control efforts are adequate, or need to be improved. Data users use quality control documentation to assess the impact of control efforts on the data quality. Both qualitative and quantitative assessments of the effectiveness of these control efforts will identify those areas most likely to impact the data quality and to what extent. Periodic assessments of data quality must be reported to EPA. On the other hand, the selection and extent of the QA and QC activities, used by a monitoring agency, depend on a number of local factors. These include the field and laboratory conditions, the objectives for monitoring, the level of the data quality needed, the expertise of assigned personnel, the cost of control procedures, pollutant concentration levels, etc.

To ensure the adequate performance of the quality system, LDEQ will perform the following assessments as they pertain to the air monitoring network and they are summarized in Table C1:

C1.1 Network Reviews

Conformance with network requirements of the ambient air-monitoring network, including PAMS, set forth in 40 CFR Part 58 Appendices D and E are determined through annual network reviews of the ambient air monitoring system. An annual network review is used to determine how well the air monitoring network is achieving its objectives, and how it should be modified to continue to meet those objectives. Since the EPA Regions are also required to perform these reviews, LDEQ will coordinate its activity with Region 6 in order to perform the activity at the same time (if possible). The Engineering Manager and Environmental Chemical Specialists in Air Analysis Section will be responsible for conducting the network review.

The following criteria will be considered during the review:

- Date of last review
- Areas where attainment/nonattainment re-designations are taking place or are likely to take place
- Results of special studies, saturation sampling, point source oriented ambient monitoring, etc.
- Proposed network modifications since the last network review

In addition, pollutant-specific priorities may be considered (e.g., newly designated nonattainment areas, "problem areas", etc.).

Before the implementation of the network review, significant data and information pertaining to the review will be compiled and evaluated. Such information must include the following, where applicable:

- Network files (including updated site information and site photographs)
- AQS reports (AMP220, 225, 380, 390, 450)
- Air quality summaries for the past five years for the monitors in the network
- Emissions trends reports for major metropolitan areas
- 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 the monitoring network area

The information 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:

- Number of Monitors -- For PAMS, the number of monitors required depend upon the measurement objectives discussed in 40 CFR Part 58, Appendix D. Section B1 of this QAPP discusses the PAMS monitoring network. Adequacy of the network will be determined from the following information:

  - ✓ Maps of historical monitoring data
  - ✓ Maps of emission densities
  - ✓ Dispersion modeling
  - ✓ Special studies/saturation sampling
  - ✓ Best professional judgment
  - ✓ SIP requirements
  - ✓ Revised monitoring strategies

  For PAMS, areas to be monitored must be selected based on urbanized population and pollutant concentration levels. To determine whether the number of PAMS sites is adequate, the number of NAMS sites operating will be compared to the number of PAMS sites specified in 40 CFR 58 Appendix D. The number of the PAMS sites operating can be determined from the AMP220 report in AQS. The number of monitors required, based on concentration levels and population can be determined from the AMP450 report and the latest census data.

- Location of Monitors -- For PAMS, the monitor locations are specified in the regulations, in order to meet the monitoring objectives specified in 40 CFR Part 58 Appendix D. Adequacy of the locations can only be determined from 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 objective for each monitoring location or site (see section B1) will be "reconfirmed" and the spatial scale "re-verified" and then compared to each location to determine whether those objectives can still be attained at the present location.

- Probe Siting Requirements -- Applicable siting criteria for SLAMS, NAMS, and PAMS are specified in 40 CFR 58, Appendix E. The on-site visit will consist of the physical measurements and observations to determine compliance with the Appendix E requirements, such as height above ground level, distance from trees, paved or vegetative ground cover, etc. Since many of the Appendix E requirements will not change within one year, this check at each site will be performed every 3 years.

  Before the site visit, the reviewer must obtain and review the following:

  - ✓ Most recent hard copy of site description (including any photographs)
  - ✓ Data on the seasons with the greatest potential for high concentrations for specified pollutants
  - ✓ Predominant wind direction by season

  A checklist similar to that used by the EPA regional offices during their scheduled network reviews will be used. This checklist from the *SLAMS/NAMS/PAMS Network Review Guidance* is intended to assist the reviewers in determining conformance with Appendix E. In addition to the checklist items, the reviewer must perform the following tasks:

  - ✓ Ensure that the inlet is clean
  - ✓ Check equipment for missing parts, frayed cords, damage, etc.
  - ✓ Record findings in field notebook and/or checklist
  - ✓ Take photographs/videotape in the 8 directions (every 45°)
  - ✓ Document site conditions, with additional photographs/videotape

- Other Discussion Topics -- Other subjects for discussion regarding the network review and overall adequacy of the monitoring program include:

  - ✓ Installation of new monitors
  - ✓ 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
- ✓ Proposed regulations
- ✓ Funding

A report of the network review will be written within two months of the review and appropriately filed.

C1.2 Audit of Data Quality

An audit of data quality (ADQ) reveals how the data are handled, what judgments were made, and whether uncorrected mistakes were made. ADQs can often identify the means to correct systematic data reduction errors. An ADQ must be performed every year. Enough time and effort must be devoted to this activity, so that the auditor or team has a clear understanding and complete documentation of data flow. The ADQ will serve as an effective framework for organizing the extensive information gathered during the audit of laboratory, field monitoring, and support functions within the agency.

C1.3 Data Quality Assessments

A data quality assessment (DQA) is the statistical analysis of environmental data to determine whether the data quality is adequate to support decisions, which are based on the data quality objectives (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*, EPA QA/G-9 and is summarized below.

- *Review DQOs and sampling design of the program*. Review the DQO or develop one, if it has not already been done. Define statistical hypothesis, tolerance limits, and/or confidence intervals.
- *Conduct preliminary data review*. Review precision & accuracy and other available QA reports, calculate summary statistics, plots and graphs. Look for patterns, relationships, or anomalies.
- S*elect the statistical test*. Select the best test for analysis based on the preliminary review, and identify underlying assumptions about the data for that test.
- V*erify test assumptions*. Decide whether the underlying assumptions made by the selected test hold true for the data and the consequences
- Perform *the statistical test.* Perform test and document inferences. Evaluate the performance for future use

Data quality assessments must be included in the *QA Annual Report.* Details of these reports are discussed in Section D1.

Measurement uncertainty will be estimated for both automated and manual methods. Terminology associated with measurement uncertainty is found within 40 CFR Part 58, Appendix A. and includes precision, accuracy and bias for the field measurements.

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.

Table C1

Assessment Summary

Assessment Activity	*Frequency*	*Personnel Responsible*	*Report Completion*	*Reporting/ Resolution*
Network Reviews 40 CFR Part 58, App. D and App. E	1/ year 1/3 years	EPA Region 6/Air Division LDEQ/OEC/AD	30 days after activity	LDEQ Office of Environmental Compliance Asst. Secretary and AD Administrator
Audits of Data Quality	1/ year	OEC/AD	30 days after activity	LDEQ, OEC, Asst. Secretary, AD Administrator
Data Quality Assessment	1/year	OEC/AD	120 days after end of calendar year	LDEQ, OEC, Asst. Secretary, AD Administrator

C2 Reports to Management

Important benefits of regular QA reports to management include the opportunity to alert the management to data quality problems, to propose viable solutions to problems, and to get necessary resources. Quality assessment, including the evaluation of the technical systems, the measurement of performance, and the assessment of data, must be conducted to help ensure that measurement results meet program objectives and that necessary corrective actions are taken early, when they will be most effective.

Effective communication among all personnel is an integral part of a quality system. Regular, planned quality reporting provides a means for tracking: adherence to scheduled delivery of data and reports; documentation of deviations from approved QA and test plans and the impact of these deviations on data quality; analysis of the potential uncertainties in decisions based on the data.

C2.1 Frequency, Content, and Distribution of Reports

Required reports to management for ambient air monitoring in general are discussed in various sections of 40 CFR, Parts 50, 53, and 58. Guidance for management report format and content are provided in guidance developed by EPA's Quality Assurance Division (QAD) and the Office of Air Quality Planning and Standards (OAQPS). These reports are described in the following subsections.

C2.1.1 QA Annual Reports

Periodic assessments of SLAMS data quality must be reported to EPA, according to 40 CFR 58 Appendix A, Section 1.4, revised July 18, 1997. The LDEQ air monitoring *QA Annual Report* is issued to meet this requirement. This document describes the quality objectives for measurement data and how those objectives have been met. Any changes to the PAMS monitoring network regarding site locations, sampling frequency and sampling methods will not occur until approved by EPA Region 6.

The *QA Annual Report* must contain an annual review of the ambient air monitoring network to show that the system meets the monitoring objectives defined in 40 CFR Part 58, Appendix D. This review will identify needed modifications to the network such as termination or relocation of unnecessary stations or establishment of new stations that are necessary.

The *QA Annual Report* will include quality information for each ambient air pollutant in the LDEQ monitoring network. These sections are organized by ambient air pollutant category (e.g., gaseous criteria pollutants, PAMS VOCs). Each section includes the following topics:

- Program overview and update
- Quality objectives for measurement data
- Data quality assessment

For reporting measurement uncertainties, the *QA Annual Report* contains the following summary information required by 40 CFR 58 Appendix A:

- Accuracy of automated methods (O_3, $NO/NO_x/NO_2$)
- Precision of automated methods (O_3, $NO/NO_x/NO_2$)
- Flow Rate Audits
- Assessment of Bias

C2.1.2 Network Review Reports

The EPA Regional office reviews the annual network plans submitted by the LDEQ in accordance with 40 CFR Part 58.10. The purpose of the annual network reviews is to determine if the system meets the monitoring objectives defined in 40 CFR Part 58 Appendix D. The review identifies needed modifications to the network including termination or relocation of unnecessary stations or establishment of new stations, which are necessary. Information gathering for these reviews will be coordinated through the air monitoring Engineering Manager of OEA/EED. Supervisors and other personnel will assist as necessary to provide information and support. The Engineer Manager is responsible for assuring that such changes are included in planning. The Engineer Manager works with the laboratory Environmental Scientist Manager to implement all findings affecting data quality.

As required by 40 CFR Part 58 Appendix A, Section 4(a), revised July 18, 1997, the LDEQ has provided a list of all monitoring sites and their AQS site identification codes and submits the list to the EPA Regional Office, with a copy to AQS. The Air Quality System (AQS) is EPA's computerized system for storing and reporting of information relating to ambient air quality data. Whenever there is a change in this list of monitoring sites in a reporting organization, LDEQ will report this change to the EPA Region 6 Office and to AQS.

C2.1.3 Quarterly Reports

Each quarter, LDEQ will report to AQS the results of all precision, bias and accuracy tests it has carried out during the quarter. The quarterly reports will be submitted, consistent with the data reporting requirements specified for air quality data as set forth in 40 CFR Parts 58.26, 58.35 and 40 CFR Part 58 Appendix A, Section 4.

The data reporting requirements of 40 CFR Part 58.35 apply to those stations designated SLAMS or NAMS and include the PAMS stations. Required accuracy and precision data are to be reported on the same schedule as quarterly monitoring data submittals. The required reporting period and due dates are listed in Table C2.

Air quality data submitted for each reporting period will be edited, validated, and entered into the AQS using the procedures described in the *AQS Users Guide.* The Engineering Supervisor of the data management unit will be responsible for preparing the data reports and transmitting them to EPA.

Table C2

Quarterly Reporting Schedule

Reporting Period	Due on or Before
January 1-March 31	June 30
April 1-June 30	September 30
July 1-September 30	December 31
October 1-December 31	March 31 (following year)

C2.1.4 Response/Corrective Action Reports

The response/corrective action report procedure will be followed whenever a problem is found such as a safety issue, an operational problem, or a failure to comply with procedures. This report is in the form of a memo and will be used when problems are identified. The response/corrective action report is one of the most important reports to management, because it documents primary QA activities and provides valuable records that can be used in preparing other summary reports.

The response/corrective action report procedure is designed as a closed-loop system. The response/corrective action report identifies the originator, who reported and identified the problem. It states the problem, may identify a root cause, and may propose a solution. The form also must indicate the name of the person or persons assigned to the station where the problem occurred and the supervisor. The assignment of personnel to address the problem, and the schedule for completion will be assigned by the appropriate supervisor. The response/corrective action report procedure closes the loop by requiring that the recipient state in a memo how the problem was resolved and the effectiveness of the solution. Copies of the response/corrective action report will be distributed twice: first when the problem has been identified and the corrective action has been scheduled; and second when the correction has been completed. The action must not be viewed as complete until a root cause has been identified and a successful solution has been applied.

C2.2 Responsible Personnel

This section identifies the individuals responsible within the air monitoring organization for preparing quality reports, evaluating their impact, and implementing follow-up actions. Changes made in one area or procedure may affect another part of the project. Only by defining clear-cut lines of communication and responsibility can all the affected elements of the monitoring network remain current with such changes. The documentation for all changes must be maintained and included in the reports to management. The following are the key personnel involved with QA reporting:

- **Administrators, Office of Environmental Compliance**
  - ✓ *Office of Environmental Compliance (OEC)/Assessment Division*
  - ✓ *Office of Environmental Compliance (OEC)/Inspection Division*

  Each Administrator has subordinate units assigned to collect, analyze, review or report the data collected by the PAMS network.

- **Environmental Scientist Staff, Inspection Division**
  Environmental Scientist Staff in ID's Laboratory Information Management Services is responsible for receiving, reviewing and verifying VOC data from the contract lab. They are also responsible for managing QA/QC documents from the contract lab.

- **Environmental Scientist Manager, Assessment Division**
  The Environmental Scientist Manager in Air Field Services Section, AD is responsible for providing oversight and guidance to the ambient air network and for ensuring the operation and collection of the PAMS sites. The Environmental Scientist Manager is responsible for assuring the timely submittal of quarterly and annual data summary reports. The Environmental Scientist Manager works closely with ID's Laboratory Information Manage Services to ensure accurate and timely reporting of all data for the PAMS and Air Toxics network.

- **Data Management Engineering Supervisor, Assessment Division**
  The Data Management Engineering Supervisor in Air Field Services Section, AD is responsible for coordinating the information management activities for SLAMS/NAMS/PAMS data. Specific responsibilities related to management reports include:

  - ✓ Ensuring access to data for timely reporting and interpretation
  - ✓ Ensuring timely delivery of all required data to the AQS system

- **Environmental Scientist Supervisors, Assessment Division**
  AD GC Field and Network Operation Supervisors are responsible for reporting problems and issuing appropriate response/corrective action reports. They are responsible for assigning specific personnel to address response/corrective action reports and assuring that the work is completed and that the corrections are effective. They are also responsible for assuring that the staff under their supervision maintains their documentation files as defined in the network design. Supervisors are responsible for disseminating information appearing in audit reports and other quality-related documents to operations personnel.

- **Environmental Scientists, Assessment Division**
  They do not normally write reports to management. However, they participate in the process by generating control charts, identifying the need for response/corrective action reports, and maintaining other quality-related information used to prepare QA reports.

- **Project Officer, Assessment Division**
  The project officer is responsible for the final data review and validation and ensuring the data is suitable for the intended use. The project officer is also responsible for data analysis and the generation of annual reports.

D DATA VALIDATION AND USABILITY

D1 Data Review, Verification and Validation

This section will describe how LDEQ will verify and validate the data collection associated with the PAMS and Air Toxics monitoring network. Validation can be defined as confirmation by examination and provision of objective evidence that the particular requirements for a specific *intended use* are fulfilled. In addition, the major objective of the PAMS network is to determine the extent of the effect ozone precursor compounds have on the formation of ozone, with this being identified as the intended use. This section will describe the verification and validation activities that occur at a number of the important data collection phases.

D1.1 Sampling Design Verification

Section B1 describes the sampling design for the PAMS and air toxics sampling networks established by LDEQ. It covers the number of sites required, their locations, and the frequency of data collection. The objective of the sampling design is to represent the population of interest at adequate levels of spatial and temporal resolution. Most of these requirements have been described in the Code of Federal Regulations. However, it is the responsibility of LDEQ to ensure that the intent of the regulations is properly administered and carried out.

Verification of the sampling design will occur through three processes:

Network Design Plan Confirmation -- The Network Design Plan that discusses the initial deployment of the network has been submitted, reviewed and approved by EPA before implementation. This process verifies the initial sampling design.

Internal Network Reviews -- Once a year, LDEQ will perform a network review to determine whether the network objectives, as described in the Network Design Plan, are still being met, and that the sites are meeting the siting criteria.

External Network Reviews -- Every three years the EPA Regional Office must conduct a network review to determine whether the network objectives, as described in the Network Design Plan, are still being met, and that the sites are meeting the CFR siting criteria.

D1.2 Sampling Design Validation

The data derived from the sites will be used to validate the sampling design. LDEQ will use each year's collected data to validate that the monitors are properly sited and that the sampling design will meet the objectives of the network. This

information will be included in network review documentation and appropriately communicated to the EPA Regional Office. In addition, the processes described in Section B1 will be used to confirm the network design.

D1.3 Sample Collection Verification

Sample collection procedures are described in detail in Section B2 and are developed to ensure proper sampling and to maintain sample integrity.

D1.4 Sample Collection Validation

Monitoring is just one phase of the measurement process. The use of QC procedures has been placed throughout the measurement process to help validate the activities occurring at each phase of monitoring. The review of QC data such as the replicate sampling data, zero/span checks, and precision checks are being used to validate the data collection activities. Any data that indicates unacceptable levels of bias or precision or a tendency (trend on a control chart) must be flagged and investigated. This investigation could lead to a discovery of inappropriate sampling activities.

D1.5 Sample Handling Verification and Validation

Sections B2, B3 and B4 give the sample-handling requirements for both continuous and non-continuous parameters. The preservation methods used are included to ensure that they are appropriate to the nature of the sample and the type of data generated from the sample. Sample handling is one of the phases where inappropriate techniques can have a significant effect on sample integrity and data quality.

Similar to the validation of sampling activities, the review of data from replicate sampling, precision checks, zero/span checks and performance audits are used to validate the sample handling activities. Acceptable precision and bias in these samples would verify that the sample handling activities are adequate. Any data that indicates unacceptable levels of bias or precision or a tendency (trend on a control chart) will be flagged and investigated. This investigation could lead to a discovery of inappropriate activities that require corrective action.

D1.6 Sample Analysis Verification and Validation

Section B4 details the monitoring and analytical methods used by LDEQ and the appropriate analytical requirements and specifications. This section includes the acceptance criteria for important components of the procedures.

Similar to the validation of sampling activities, the review of data from lab blanks, calibration checks, laboratory duplicates and other laboratory QC used for VOC

analysis by the laboratory can be used to validate the analytical procedures. Acceptable precision and bias in these samples would lead one to believe that the analytical procedures are adequate. Any data that indicates unacceptable levels of accuracy, bias or precision or a tendency (trend on a control chart) will be flagged and investigated. All flagged data will be “re-verified” that the values are entered correctly. This investigation could lead to a discovery of errors, requiring corrective action. The data qualifiers or flags can be found in the laboratory quality manual.

D1.7 Verification and Validation of Quality Control Procedures

Section B4 and B7 of this QAPP specify the QC checks that are to be performed during sample collecting and handling. Laboratory SOPs will specify the quality control checks for each analytical batch to be used in laboratory analysis. These checks provide indications of the quality of data being produced by specified components of the measurement process. For each specified QC check, the procedure, acceptance criteria, and corrective action are specified in the SOP.

Validation activities of many of the other data collection phases mentioned in this subsection use the quality control data to validate the proper and adequate implementation of that phase. Therefore, validation of QC procedures will require a review of the documentation of the corrective actions that were taken when QC checks failed to meet the acceptance criteria, and the potential effect of the corrective actions on the validity of the routine data. Section B5 describes the techniques used to document QC review/corrective action activities.

D1.8 Verification and Validation of Calibration Procedures

Section B7, as well as the field (Section B2) and the analytical sections (Section B4) detail the calibration activities and requirements for the critical pieces of equipment for the PAMS and air toxics sampling networks.

Similar to the validation of sampling activities, the review of calibration data that is described in Sections B5 and B7 can be used to validate calibration procedures. Calibration data within the acceptance requirements would lead one to believe that the monitoring equipment, samplers, and analyzers are operating properly. Any data that indicates unacceptable levels of bias or precision or a tendency (trend on a control chart) must be flagged and investigated as described in Section B5 or B7. Validation would include the review of the documentation to ensure corrective action was taken as prescribed.

D1.9 Verification and Validation of Data Reduction and Processing

As part of the audits of data quality, discussed in Section C1, a number of sample IDs, chosen at random will be identified. All raw data files, including the following will be selected:

- Pre-sampling activity (VOC canister)
- Sampling (both continuous and non-continuous parameters)
- Data reduction
- Sample handling/custody (canisters, strip charts)
- Post-sampling activity (canisters)
- Corrective action
- Calibration – the calibration information represented from that sampling period.

These raw data must be reviewed and final concentrations calculated by hand to determine if the raw data values are comparable to the final values submitted to AQS. The data must also be reviewed to ensure that appropriate corrective actions were taken for the appropriate data associated with flags or any other qualifiers.

D2 Verification and Validation Methods

The purpose of data validation is to detect and then verify any data values that may not represent actual air quality conditions at the sampling station. All data shall be validated and reviewed to insure the overall quality of the measurement before inclusion in the AQS database. Many of the processes for verifying and validating the measurement phases of the PAMS data collection operation have been discussed in Section D1. 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 PAMS and air toxics sampling DQOs. However, exceptional events may occur, and monitoring/sampling activities may negatively affect the integrity of data. In addition, it is expected that some of the QC checks will fail to meet the acceptance criteria. Information on problems that affect the integrity of data is identified in the form of flags. It is important to determine how these failures affect the routine data. The review of this routine data and their associated QC data will be verified and validated for each continuous monitor and on a sample basis for VOC analysis. If measurement uncertainty can be controlled within acceptance criteria, then the overall measurement uncertainty will be maintained within the precision and bias DQOs.

A thorough review of the ambient air monitoring and the PAMS data will be conducted for completeness and data entry accuracy. All raw data that are hand entered from data sheets or strip charts will be double-checked before entry in the database. The entries are compared to reduce the possibility of entry and transcription errors. Once the data are entered into the database, the system will review the data for routine data outliers and data outside of acceptance criteria. These data will be flagged/annotated appropriately. All flagged data will be “re-verified” that the values were entered correctly.

Validation of measurement data will require four stages:

- During the level “0” data validation, routine checks are made during the initial data processing and generation of data, including proper data file identification, review of unusual events, review of field data sheets and result reports, instrument performance checks and QC performance. Computer file entries are checked against data sheets. Samples are flagged/annotated when significant deviations from measurement assumptions have occurred, or instrument malfunctions have occurred. Measurements biased by quantifiable calibration errors or interferences are adjusted appropriately & all changes are documented in the database. The Laboratory Manager usually conducts this validation & verification level.
- During the level “1” data validation, tests for internal consistency are conducted to identify values in the data which appear atypical when compared to values of the entire data set. This may include comparison of time series plots to expected diurnal patterns. The relationship between various VOC species may be investigated using scatter plots. This validation level may be conducted by the Laboratory Manager or by the AD Project officer.
- During the level “2” data validation a comparison of the current data set with historical data is conducted to verify consistency over time. This level can be considered a part of the data interpretation or analysis process. This investigation will include examining abundant species (fingerprints) & noting what changes have occurred over time. The spatial and temporal characteristics of the data are investigated. This validation level is conducted by the AD Project officer or other person designated by the AD administrator.
- During the level “3” Data Validation tests for parallel consistency with data sets from the same population (i.e., region, period of time, air mass, etc.) are conducted to identify systematic bias. This level can also be considered a part of the data interpretation or analysis process. VOC speciation and concentration among sites is compared using special studies data, etc. Determinations are made to explain differences by meteorology, photochemistry, contamination, analytical differences, etc. This validation level is conducted by the AD Project officer or other person designated by the AD administrator.

Data validations levels 1, 2 & 3 shall be used to determine if the data is suitable for the intended use. Any data found to be flawed or unsuitable shall be appropriately flagged/annotated and may be removed from the reporting dataset.

Records of all invalid samples will be filed for 5 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 LIMS since all samples that were analyzed will be recorded. At least one flag will be associated with an invalid sample or when no analysis result is reported. Additional flags will usually be used to describe the reason for these flags, as well as free form notes or comments from the field operator or laboratory.

If the amount of data being invalidated is relatively small, the department will report them every month to EPA Region 6. If however, more than 5 values from one site appear to require invalidation, EPA Region 6 will be notified immediately and the issue described.

D3 Reconciliation with User Requirements

D3.1 Purpose

The DQOs for the PAMS and air toxics sampling networks were developed in Section A7. This section of the QAPP will explain the procedures that LDEQ will follow to determine whether the data being produced complies with the DQOs and the actions taken as a result of the assessment process. Such an assessment is termed a Data Quality Assessment (DQA) and is described in *EPA QA/G-9: Guidance for Data Quality Assessment*. Assessments must be made at the individual sampler as well as at the network level.

D3.2 Reconciling Results with DQOs

Section A7 of this QAPP contains the details for development of the DQOs including defining the primary objective of the PAMS Network, translating the objective into a statistical hypothesis, and developing limits on decision errors.

Section B1 of this QAPP contains the details for the network design, including the rationale for design assumptions and the monitoring locations and frequency. If any deviations from the network design have occurred, these will be indicated and their potential effect carefully considered throughout the DQA process.

A preliminary data review will be performed to uncover potential limitations to using the data, reveal outliers, and generally explore the basic structure of the data. Particular attention will be directed to looking for anomalies in the 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.

LDEQ will submit to EPA in AQS format valid precision and accuracy data for each continuous monitor each calendar quarter. LDEQ will calculate quarterly integrated estimates of precision and accuracy applicable to the data submitted as prescribed in 40 CFR Part 58.

LDEQ will calculate the properly weighted probability limits for precision and accuracy for the calendar year from the data submitted each calendar quarter. These calculations result from the formulas specified in 40 CFR Part 58, Section 5.

The limits calculated will be associated with the data submitted by LDEQ in the annual report on monitoring activities. For precision data, for each monitor, standard deviation and 95 percent probability limits are calculated. For accuracy data of continuous monitors an integrated probability interval for all analyzers audited is calculated for each pollutant and separate probability limits are calculated for each audit concentration level. Also calculated are the percentage difference for each audit concentration, the individual percentage difference for all analyzers, the standard deviation of the percentage difference for all analyzers audited and 95 percent probability limits for each audit concentration level.

If any of the data from the precision and accuracy data submitted violates the statistical limits, LDEQ will investigate for the cause of the violation and take corrective action to alleviate the problem. In order to determine the level of corrective action to be taken, LDEQ will need to determine if the problem is unique to one or two sites, unique to LDEQ or caused by a broader problem, like a particular type of monitor/sampler demonstrating poor QA on a national level. LDEQ understands that AQS will generate QA reports summarizing accuracy and precision statistics at the national and reporting organization levels, and by method designation. These reports will assist LDEQ in determining the appropriate level at which the DQO's are being violated. The procedure for determining the level of violation is,

- Review national reports for which LDEQ's DQA process indicated a violation. If large bias or imprecision is seen at the national level, LDEQ will request assistance from the EPA Region 6 Office and OAQPS. If no problem is seen at national level, LDEQ will proceed looking at the QA reports specific to its neighboring reporting organizations.
- Review neighboring reporting organizations' precision and bias reports for the method designations for which LDEQ's DQA process indicated a violation. If large bias or imprecision is seen in the neighboring organizations, LDEQ will request assistance from the EPA Region 6 Office. If no problem is seen in the neighboring reporting organizations, LDEQ will proceed looking at the QA reports specific to LDEQ.
- Within LDEQ, if the violations occur for only one method designation, performance evaluation data for that method from NPAP will be reviewed for confirmation. The performance evaluation data may show that one of the monitors has a problem and must be repaired or replaced. LDEQ will also use the national performance evaluation summaries to see if LDEQ is unique or like the national network. If LDEQ is similar to the national picture, then assistance will be requested from the EPA Region 6 Office and OAQPS. The results from the neighboring reporting organizations will also be reviewed. If the violations seem unique to LDEQ, then an investigation will continue on all the pieces that comprise the data.

- Communication with Regional Office. If a violation of the accuracy and precision DQOs is found, LDEQ will remain in close contact with the EPA Region 6 Office both for assistance and for communication.

Appendix Reference Documents

All Field Sampling Standard operating procedures are maintained on the LDEQ intranet site at the following location. http://intranet/sop/soplist.asp . The contract lab's SOPs are maintained in LDEQ's Electronic Document Management System (EDMS). The document ID is 45970081. The SOPs that are used in the PAM/Air Toxics Program are as follows.

Automated Gas Chromatograph Determination of Total Non-Methane Organic Carbons AD SOP#: 1065

Sampling of Volatile Organic Compounds in Ambient Air Collected in Specially-prepared Canisters (Xontech Samplers), AD SOP#: 1099

Meteorological Parameters, AD SOP#: 1350

Methane--Non-Methane Analyzer Coupled with NMHC Ttriggered Sampling of Volatile Organic Compounds in Ambient Air, AD SOP#: 1746

Procedure for Cleaning Summa Canisters for PAMS and TO-15 for Louisiana Department of Environmental Quality, the Contract lab SOP#: SPL/HE/Air –M5.01.

Determination of Target Toxic Compounds in Ambient Air by GC/MS Based On EPA Compendium Method TO-15 for Louisiana Department of Environmental Quality, the contract SOP#: SPL/HE/Air-M7.01

Determination of Ozone Precursors in Ambient Air by Gas Chromatography/Flame ionization Detector For Louisiana Department of Environmental Quality, the contract SOP#: SPL/HE/Air-M6.01