Dioxin Exposure Initiative
Implementation, Operation, and Maintenance of the National Dioxin Air Monitoring Network (NDAMN)

Quality Assurance Project Plan
Revision 2.0

Contract No. 68-C-00-122
Work Assignment 1-08

prepared by

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for

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EPA

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April 17, 2001

A2 TABLE OF CONTENTS
(Continued)

Page No.

A2 TABLE OF CONTENTS
(Continued)

Page No.

LIST OF FIGURES

LIST OF TABLES

A3 DISTRIBUTION LIST

David Cleverly, EPA Work Assignment Manager

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Darrell Joseph, Battelle Network Coordinator

Pam Hartford, Battelle Database Management

Patricia Holowecky, On-Site Operator Interface

Anthony Wisbith, Site Expansion Activities

Karen Tracy, Laboratory Interface

Joseph Ferrario, EPA Environmental Chemistry Laboratory, Manager

Christian Byrne, EPA Environmental Chemistry Laboratory, QA Officer

On-site Operators

A4 PROJECT ORGANIZATION

Battelle Memorial Institute (Battelle) will support the U.S. Environmental Protection Agency (EPA) in the implementation, operation, and maintenance of the National Dioxin Air Monitoring Network (NDAMN). This project is being performed under Contract No. 68-C-00-122, Work Assignment Number 1-08.

The organizational plan for this project is outlined in Figure A-1. Battelle will be responsible for all aspects of collection of field samples, transfer of the samples to the selected analytical facility, and subsequent database management. EPA will be responsible for general oversight of the laboratory analysis of field samples at an EPA laboratory. Battelle will cooperate with the EPA laboratory as necessary. A brief summary of key personnel follows.

Dr. Bruce Buxton will have overall responsibility for this work assignment as Battelle's Program Manager for the contract. He will communicate directly with Mr. Ken Reid, EPA's Project Officer, on any issues related to this work assignment. Ms. Karen Riggs will serve as Battelle's Work Assignment Leader (WAL) and will provide the technical liaison between Battelle and EPA and will directly supervise all efforts on this project. She will have overall responsibility for all technical, fiscal, and scheduling aspects of the proposed work. She will also serve as the major point-of-contact with the EPA WAM, Mr. David Cleverly. In addition, Ms. Riggs will ensure that high technical quality is obtained, that tasks adhere to the schedule, and that work is performed within budget.

Ms. Riggs will be assisted by three technical leaders: Mr. Darrell Joseph who will oversee all aspects of the NDAMN operation; Ms. Pamela Hartford who will lead database management activities and provide database inputs to NDAMN reports; and Mr. Charles Lawrie, who is Battelle's Quality Assurance (QA) Manager for this work assignment.

Working with Mr. Joseph will be Ms. Patricia Holowecky, who will be Battelle's direct interface with the NDAMN on-site operators and will assist in shipping and receiving media and samples between Battelle, the EPA laboratory, and the NDAMN stations; Ms. Karen Tracy, who will direct Battelle's dioxin laboratory staff in preparing field sampling media, and Mr. Anthony Wisbith, who will direct site expansion activities.

Ms. Pamela Hartford (the database administrator) is an Associate Manager within Battelle's Statistics and Data Analysis Systems group. Ms. Hartford will be assisted by the following staff: Darlene Wells (B.S., Statistics), a Research Scientist that will serve as a database developer/designer and data manager; Ying-Liang Chou (Master's, Statistics and Agriculture Economics), a Research Scientist that will serve as a statistician and lead database manager; Ann Herberholt (B.S, Mathematics), a Researcher and a specialist in creating database systems and managing the data within the systems; and Heather Wiseman (B.S., Mathematics Education), a Research Associate, experienced in managing and validating data for use in statistical analyses. All the Data Analysis Systems group are experienced in using Microsoft Access.

Mr. Lawrie is a Quality Assurance Manager in Battelle's Environmental Protection Sector and has responsibility for ensuring that appropriate quality planning, implementation, and assessment procedures are followed. The quality assurance function is independent of all technical work performed at Battelle, and Mr. Lawrie reports directly to Dr. Gregory A. Mack, a Vice President in the Environmental Protection Sector. Mr. Lawrie will communicate directly with the Program Manager and the WAL, but does not report to either one. These relationships are indicated by the dotted and solid lines in Figure A-1.

Mr. Lawrie will carry out the following activities:

- Review the QAPP to verify that it adequately describes the work to be performed, and addresses the relevant requirements of a QAPP
- Conduct technical system audits
- Perform audits of data quality
- Monitor situations requiring corrective actions that cannot be readily implemented by the WAL and, as necessary, discuss corrective action issues with the WAL
- Submit a QA Statement to the Battelle WAL that describes the review activities completed and any outstanding issues that could affect data quality.

A5 PROBLEM DEFINITION/BACKGROUND

On September 13, 1994, EPA released, for external review, two draft documents comprising the Scientific Reassessment of Dioxin project: Estimating Exposures to Dioxin-Like Compounds (EPA/600/6-88/005Ca-c, June, 1994), and, Health Assessment Document for 2,3,7,8-TCDD and Related Compounds (EPA/600/BP-92/001Ca-c, August, 1994). When the dioxin reassessment documents were released, the Agency also announced a program known as the EPA Dioxin Exposure Initiative (DEI). The DEI was created with the intended purpose of providing source, exposure, and environmental trends information to address the critical data gaps identified in the dioxin reassessment, as well as providing information important to the Agency's emerging Dioxin Strategy. The DEI is a cooperative effort between the Office of Prevention, Pesticides, and Toxic Substances (OPPTS) and the Office of Research and Development (ORD), and is a source of funding for a number of projects to meet the EPA's needs. The DEI identified the need for establishing National Dioxin Air Monitoring Network (NDAMN) to monitor the air concentrations of dioxin-like compounds.

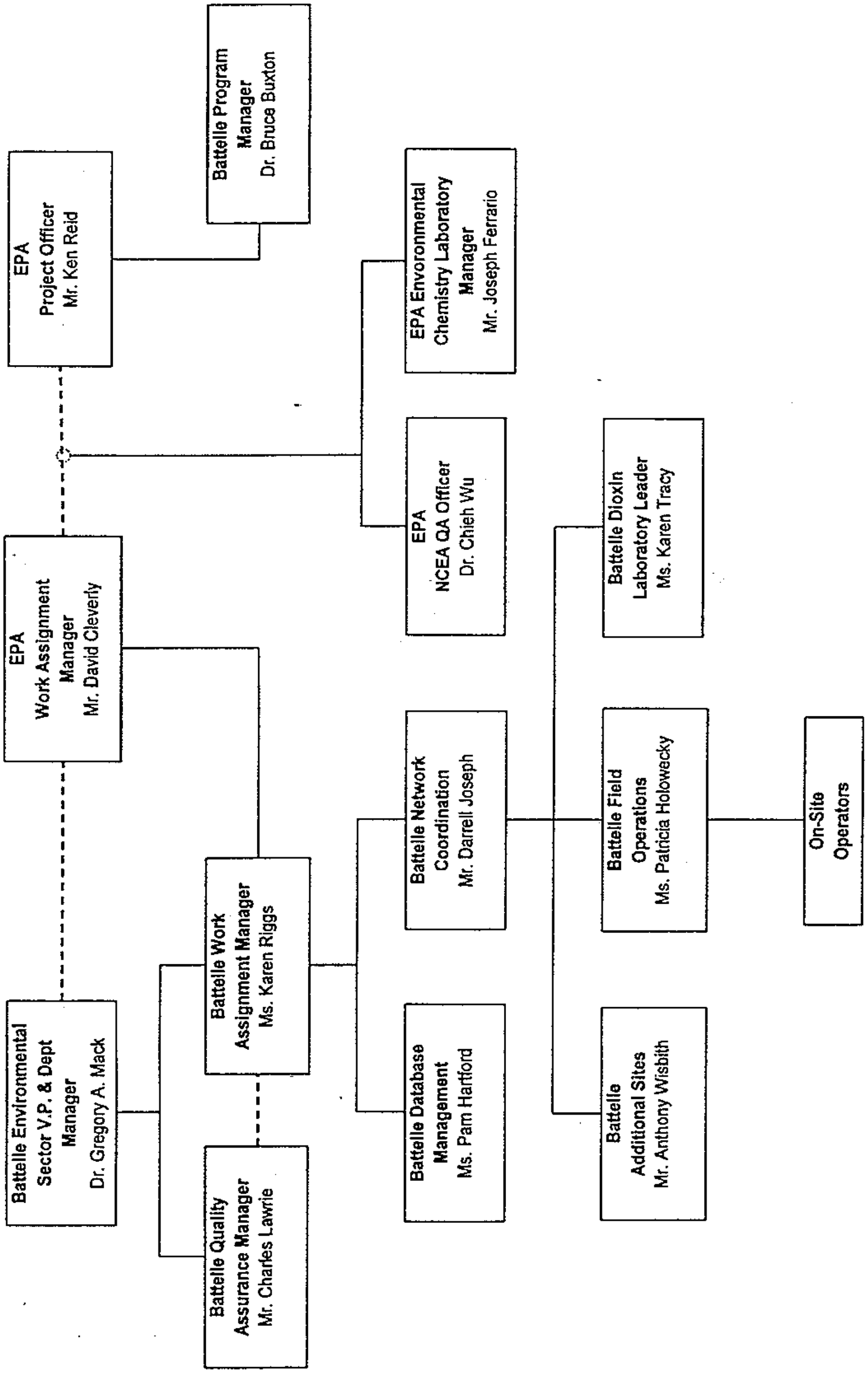
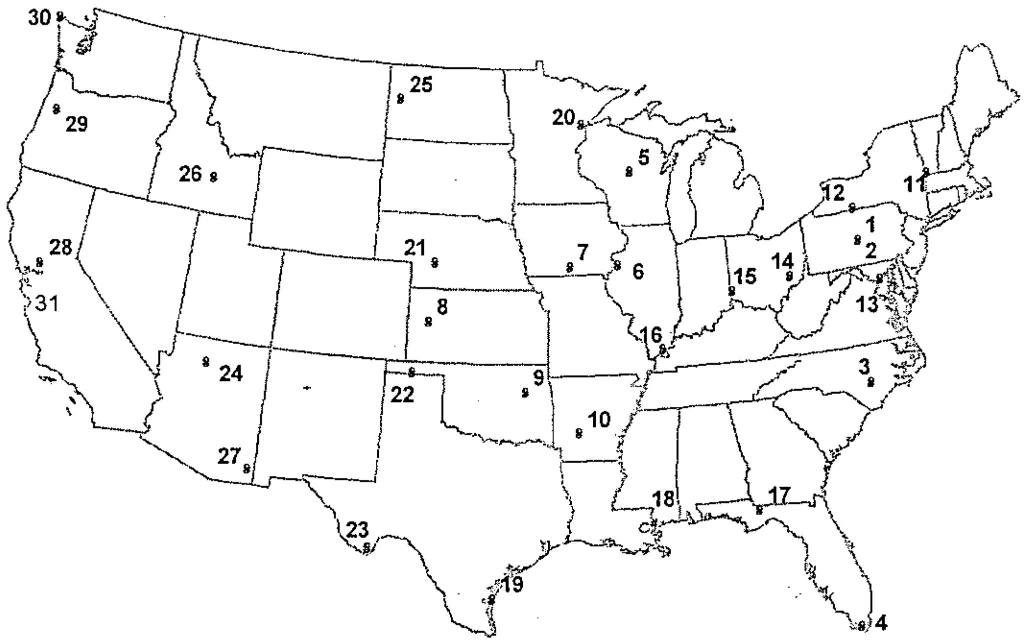


Figure A-1. Project Organization



1. Penn Nursery, Potters Mill, PA
2. Penn Nursery, Potters Mill, PA (intercomparison)
3. Clinton Crops Research Center, Clinton, NC
4. Everglades NP, Florida City, FL
5. Lake Dubay, Dancy, WI
6. NW Ill. Agric. Res. and Demo. Farm, Monmouth, IL
7. McNay Research Center, Chariton, IA
8. Lake Scott State Park, Scott City, KS
9. Bixby Water Treatment Plant, Bixby, OK
10. Arkadelphia NADP, Arkadelphia, AR
11. Bennington NADP, Bennington, VT
12. Jasper NADP, Jasper, NY
13. Natl. Agric. Research Center (USDA), Beltsville, MD
14. Caldwell NADP, Caldwell, OH
15. Oxford NADP, Oxford, OH
16. Dixon Springs Agricultural Center, Pope Co., IL
17. Quincy NADP, Gadsden Co., FL
18. John C. Stennis Space Center, Bay Saint Louis, MS
19. Padre Island NS, Kleberg Co., TX
20. Fond Du Lac NADP, Carlton Co., MN
21. North Platte Agric. Exp. Station, Lincoln Co., NE
22. Goodwell Research Station, Texas Co., OK
23. Big Bend NP, Brewster Co., TX
24. Grand Canyon NP, Coconino Co., AZ
25. Theodore Roosevelt NP, McKenzie Co., ND
26. Craters of the Moon NM, Butte Co., ID
27. Chiricahua NM, Cochise Co., AZ
28. UC Davis Dairy Research Facility, Davis, CA
29. Hyslop Farm NADP, Benton Co., OR
30. Ozette Lake, Olympic NP, Ozette, WA
31. **Fort Cronkhite, S.F., CA**

Figure A-2. Locations of NDAMN Stations (as of March 2001)

The EPA has established a National Dioxin Air Monitoring Network (NDAMN) to determine the temporal and geographical variability of atmospheric polychlorinated dibenzo-p-dioxins (CDDs), polychlorinated dibenzofurans (CDFs), and dioxin-like polychlorinated biphenyls (PCBs) at rural locations throughout the United States. Consisting of 31 sampling stations (Figure A-2), NDAMN has three primary purposes: (1) To provide measurements of background atmospheric levels of dioxin-like compounds in different geographic regions of the United States; (2) To determine the atmospheric levels of dioxin-like compounds in agricultural areas where livestock, poultry and animal feed crops are grown; and (3) To provide data to evaluate results from long-range transport and deposition air models.

In 1997, EPA developed and designed NDAMN based on the following criteria: (1) NDAMN must provide reasonable geographical coverage of the continental United States; and (2) whenever possible, NDAMN sites are to be located in rural and other non-impacted areas. To enhance cost savings, many of the sites were co-located at pre-existing air monitoring network stations located in rural areas. The EPA intends to continue to operate the NDAMN for the next several years. As data becomes available and are evaluated, the NDAMN may be extended or modified as necessary to achieve the three original purposes or future goals.

A6 PROJECT DESCRIPTION

A6.1 Implementation and Operation of the NDAMN Network

Battelle shall implement, and make fully operational the NDAMN stations sites. These station sites shall use the PS-1 high-volume sampler to collect ambient air samples according to EPA Method TO-9A[1]. Implementation involves organizing on-site operators for each NDAMN station and preparing each station for sampling moments. Operation includes scheduling sampling moments and directing on-site operators in performing the sampling moments according to the schedule and QA/QC procedures prescribed in this QAPP.

A6.1.1 NDAMN Implementation Battelle will identify and commit on-site operators for each of the 31 NDAMN stations (Appendix I). These on-site operators will work as subcontractors to Battelle, as part-time Battelle staff, or as staff of the National Park Services or other collaborating organizations. Battelle will provide each on-site operator with training as necessary for performing ambient air sampling. In addition, Battelle will provide operators with necessary documentation (QAPP, SOPs, data forms, etc.) for their assigned activities.

Preparing each NDAMN station for active sampling as per scheduled sampling moment includes the following tasks:

- Obtain QFFs and PUFs; prepare cartridge assembly at Battelle's dioxin laboratory
- Prepare cartridge for sampling (page 9A-21; section 11.3.2; EPA Method TO-9A).
- Calibrate PS-1 sampler utilizing calibrated orifice transfer standard (page 9A-16, section 11.2.2; EPA Method TO-9A).

- Simultaneously conduct sampling moments at all NDAMN stations (listed in Appendix I, illustrated in Figure A-2), and any and all future NDAMN stations that may be added to the network.

A6.1.2 NDAMN Operation Sampling moments will be conducted once each season, centered around the months of February, May, August, and November. Each sampling moment consists of station operation of 24 hours a day, 5 days per week (6 days for the February moment), for 4 weeks. Each sampling moment will be performed simultaneously at each NDAMN station. Sampling moments may be changed only by an amendment to this QAPP and approval of the EPA WAM. Battelle will work with EPA and the on-site operators to establish and communicate the dates for each sampling moment. The on-site operators will load the samplers, collect the samples, and ship the samples to Battelle, along with the field data sheets associated with the samples. On-site operators will follow this QAPP in conducting a sampling moment. If any significant problems arise during the sampling moment, the on-site operators will notify Battelle, who will work with the WAM to resolve the issues.

For each sampling moment, Battelle will receive all samples from the on-site operators, and check that samples are intact and associated documentation is complete and appropriate. Once all samples from a sampling moment are received, Battelle will repackage the samples for shipment to the EPA laboratory for analysis. Battelle shall store and ship the samples at or below < 4^0C until receipt at the EPA laboratory. Unless otherwise specified by the WAM, the EPA laboratory shall be:

EPA Environmental Chemistry Laboratory
Building 1105
Stennis Space Center, Mississippi 39529-6000
Attention: Joseph Ferrario
Phone: 228.688.3212

A6.2 Database Management

An electronic database has been established by EPA for NDAMN results. The database serves as an essential tool for archiving temporal monitoring results of measuring congener-specific dioxin-like compounds, for assessing and analyzing results, and for reporting what has been determined from NDAMN. This database includes field sampling information (i.e., sample volumes) and analytical results. Battelle will be responsible for updating the NDAMN database with data from each sampling moment.

All field sampling data sheets will be filled in by the on-site operators and provided to Battelle in hard copy along with the samples. Battelle will manually enter the appropriate field data into the database. Analytical results will be provided to Battelle by the WAM in electronic format. These analytical results will electronically transferred into the database. After each update, Battelle will provide the WAM with an electronic copy of the updated database.

A7 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Completeness is an assessment of the amount of valid data obtained compared to the amount of data expected. Percent completeness is calculated by the number of samples with acceptable data divided by the total number of samples collected and multiplied by 100. The DQO for completeness is 90 percent. Another indicator of completeness is the total amount of air sampled. A sample will only be considered useable if >2000 m^3 of air was sampled. At least 2000 m^3 of air is required to achieve the target detection limits. If the sampling period was aborted or shortened due to sampling problems, and a sufficient volume of air was not sampled, the sample will be considered unusable.

The multipoint calibration of the PS-1 ambient air samplers before and after each sampling moment is a critical control point. The resulting correlation coefficient of each calibration will be examined and must be greater than, or equal to, 0.9800.

The analytical results generated for the field blanks used at each station will be examined. Optimally, no values over the limit of detection should be encountered on the field blanks.

A8 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

Each on-site operator must have experience and/or specific training in sampling ambient air for measurements of CDDs/CDFs/PCBs. This experience and/or training should cover operation and maintenance of a PS-1 sampler, handling of PS-1 ambient air samples for CDD/CDF/PCB analysis, sample chain-of-custody, and records documentation. Battelle will ensure that any new operators receive the appropriate training. Documentation of training of new operators will be completed on training forms and maintained in project files.

A9 DOCUMENTATION AND RECORDS

All documentation and records manually generated for the NDAMN will be recorded in black or blue ink. Entries will be dated and signed by the author. Any corrections to entries will be made by a single line through the original entry, a short explanation of the correction, and the initials and date of the person making the correction. Specific documentation and records that will be generated on NDAMN are described in the following sections.

A9.1 Equipment Calibration and Maintenance Records

The PS-1 sampler will be calibrated as described in Section B7. Calibration will be documented on a Field Calibration Data Sheet (in Appendix II). The Field Calibration Data Sheet completed during a sampling moment will also be included in the sample shipment to Battelle.

In addition to calibration, routine maintenance of the PS-1 samplers will be performed (as described later in Section B6.2). This routine maintenance will be documented by entries located on the Field Calibration Data Sheet described in the preceding paragraph.

A9.2 Field Sampling Records

All field sampling activities will be documented by the on-site operators. Field record sheets will be used for this documentation. These field record sheets are included in Appendix III and include a Field Test Data Sheet (from TO-9A) and Quality Control Checklist. Both of these field record sheets will be completed four times for each sampling moment (one for each 5- or 6-day sampling period). The completed field record sheets will be included with shipment of associated samples to Battelle. Samples will not be forwarded to the EPA laboratory for analysis until these field record sheets have been received.

A9.3 Document Disposition

Equipment calibration and maintenance records, field record sheets and completed chain-of-custody records (Section B3) will be retained by Battelle in three-ring binders organized for each sampling moment.

B1 EXPERIMENTAL DESIGN

This work assignment involves the implementation and operation of the NDAMN and associated database management. The experimental design was previously developed and is briefly summarized in the next paragraph.

Each station described in Appendix I is equipped with a PS-1 sampler. A duplicate sampler (referred to as "Station 2") is currently co-located at Station 1. The sampling medium includes two components: a quartz fiber filter (QFF) to collect and retain particulate matter (≥0.1 microns); and a polyurethane foam plug (PUF) to collect and retain gaseous phase compounds. The current sampling regime engenders 4 sampling moments in a calendar year. In order to achieve a target 0.1 fg/m^3 (i.e., 1.0 E-16 g/m^3) level of detection (LOD) necessary to avoid non-detects in air, each sampling moment consists of 24 days of sampling over a 28-day period, on a weekly schedule of 5 or 6 days of continuous operation followed by one day of inactivity. Each week, on the day(s) the sampler is inactive, the QFF is harvested, yielding four QFF composite samples per sampling moment. The PUF is harvested once at the end of the sampling moment. The type, purpose, and number of sampling media for each sampling moment is summarized in Table B-1. (Field Blanks are described fully in Section B5.3.)

Table B-1. Sampling Media Used at Each NDAMN Sampling Station for Each Sampling Moment

Sampling Media	Purpose	Total Number
PUF	Collect gaseous phase compounds	1
QFF	Collect particulate (≥0.1 microns) matter	4
PUF – Field Blank	Assess contamination during field activities	1
QFF – Field Blank	Assess contamination during field activities	4

B2 SAMPLING METHOD REQUIREMENTS

EPA Method TO-9A[1] shall be employed as a general guide for the ambient air sampling of dioxin-like compounds in the NDAMN. Battelle will purchase pre-cleaned PUFs and QFFs, and pretreat the QFFs. The EPA laboratory will certify the PUFs and QFFs for use in accordance with the procedures specified in Section 10 of Method TO-9A. All PUFs will be spiked by Battelle with an isotopically labeled CDD, CDF, and/or PCB compound (i.e., PUFs to be used in active samplers, as field blanks, and as trip blanks). It is anticipated that $^{13}C_{12}$- 1,2,3,4-TCDD and $^{13}C_{12}$-PCB-81 will be spiked to the PUFs at the loading rates specified in Method TO-9A for TCDD. The spiking solution will be prepared by the EPA laboratory and provided to Battelle. On-site operators will need only to install the sample holders in the sampling heads and then return the exposed samplers to Battelle for processing.

Method TO-9A is the primary guidance in terms of standard operating procedures for this project. However, this project will involve a few deviations from the sampling portion of Method TO-9A. First, while the method allows for long-term sampling, it should be noted that the original method calls for single-day sampling only. Secondly, Method TO-9A specifies flow volumes of 325 - 400 m^3 for a single 24-hour duration sampling episode. Each sampler will be set to collect 350 m^3 of air during every 24 hours of operation. However, because the sampling period will extend over a 4-week period, total volumes of air sampled will average 6000 - 8000 m^3 of air. Actual sample volumes will be determined by the length of time each sampler operates, based on the internal run clock.

Other specific points documenting how Method TO-9A will be implemented are as follows:

1) Wherever feasible, sample intakes will be 1.2 m above ground surface and no closer than 2 m to any obstacle to flow.
2) Exhaust hoses will be used on all PS-1 samplers to minimize bias caused by recirculation. The exhaust hoses will be oriented downwind of the prevailing flow.

B3 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

Custody procedures provide safeguards against data loss and produce records that are useful in investigation of contamination and other problems encountered. Battelle will maintain standard chain-of-custody procedures for each sample as it is collected.

Chain-of-Custody documentation includes shipment information, sample identification, and receipt information. All samples will be packaged and labeled for shipment in compliance with current International Air Transport Association (IATA) dangerous goods regulations. Each container must be able to withstand a 4-foot drop onto solid concrete. Chain-of-Custody records, field data sheets, and any other documentation will accompany the shipment. Each ice chest or shipping container will be securely taped shut.

Sample custody begins at the time of shipment of the sampling media by Battelle to the on-site operators. The sampling media will be assigned a unique sample number and prepared for shipping to the on-site operators. A Chain-of-Custody Record (included in Appendix IV) will be initiated at this point. This Chain-of-Custody Record terminates when the samples are returned to Battelle from the on-site operators. Once the sampling media are sent to the on-site operators the media will be stored at 4°C or less (except during sample collection). Samples will be shipped to Battelle on frozen "blue" ice.

Once all the samples have been returned to Battelle they will be compiled and prepared for submission to the EPA laboratory. At this point a separate Chain-of-Custody Record (included in Appendix IV) will be prepared for this shipment and will terminate once the EPA laboratory has received the samples. This Chain-of-Custody Record will list the sample number for samples and blanks according to each site. Blanks and duplicates will be defined as such on the Chain-of-Custody Record. Each sample number will be written in permanent marker on the sample container. Upon receipt at the EPA laboratory, the Chain-of-Custody Record will be signed, the condition of the samples will be noted, and the record returned to Battelle.

Battelle has assumed that it will take the EPA laboratory approximately three weeks to return the glass cartridges. Undue holding times for the glass cartridges could have a significant impact on the project.

B4 ANALYTICAL METHOD REQUIREMENTS

Samples will be analyzed by the EPA laboratory according to the method described in EPA's analytical QAPP. All QA/QC requirements associated with the sample analysis will be the responsibility of the EPA and are described elsewhere. Battelle has no authority or responsibility in performing or assuring the quality of the laboratory analyses.

The NDAMN samples are currently analyzed for the compounds listed in Table B-2 which are generally referred to as 'dioxin-like' compounds.

Table B-2. Analytes Currently Measured in Ambient Air Under NDAMN

CDD Congener	CDF Congener	Coplanar PCB (IUPAC #)
2378-TCDD 12378-PeCDD 123478-HxCDD 123678-HxCDD 123789-HxCDD 1234678-HpCDD 12346789-OCDD	2378-TCDF 12378-PeCDF 23478-PeCDF 123478-HxCDF 123678-HxCDF 123789-HxCDF 234678-HxCDF 1234678-HpCDF 1234789-HpCDF 12346789-OCDF	(77) 3,3',4,4'-TCB (126)3,3',4,4',5-PeCB (169)3,3',4,4',5,5'-HxCB (105)2,3,3',4,4'-PeCB (118)2,3',4,4',5-PeCB (156)2,3,3',4,4',5-HxCB (157)2,3,3',4,4',5-HxCB.
Total TetraCDD Total PentaCDD Total HexaCDD Total HeptaCDD Total PCDD	Total TetraCDF Total PentaCDF Total HexaCDF Total HeptaCDF Total PCDF	

B5 QUALITY CONTROL REQUIREMENTS

Field quality control samples represent those quality control measures necessary to ensure that quality data are generated from the field network operations. Quality control samples that are integral to the field sampling effort include field duplicates (i.e., split samples, co-located samples), field spikes, and blanks. The quality control samples will be analyzed in the same manner as field samples and will be interspersed with the field samples.

B5.1 Field Duplicate Samples

Field duplicates provide data necessary to evaluate variability resulting from sampling procedures and from the nonhomogeneity of the sample matrix. They are collected by using two co-located samplers during the same sampling period. Battelle will operate a pair of co-located samplers at one site in each sampling moment. The site to have co-located samplers will be determined by discussion between Battelle and the WAM. Consideration will given to stations with: new operators; unusual results in a previous sampling moment; identified quality control issues; and other criteria.

B5.2 Field Spike Samples

Field recoveries will be determined by addition of a fortification solution (i.e., radio-labeled CDD/CDF/PCB) to PUF sampling media prior to sample collection to determine the recovery associated with the entire sampling and analysis process. This solution will be applied to the PUFs by Battelle prior to shipment of sampling media to on-site operators. Field recoveries will be obtained only for PUF samples.

B5.3 Blanks

Field and trip blanks provide data for evaluating contamination introduced into the samples from field activities. One field blank will be collected at each station in each sampling moment. The field blank will consist of one PUF and four QFF. The field blank will be generated by setting the PUF and QFF in the PS-1 sampling unit and handled in the same manner for the same time period as the actual sample, except that no air is pulled through the blanks. The QFFs for the field blank will be collected at the same time as the QFFs for the actual field samples. The field blank will be shipped to Battelle with the samples with which it was collected.

Trip blanks will not be collected unless authorized by the EPA WAM. A trip blank is generated by taking sampling media to the field, but not opening the container containing the media at the station. The trip blank is designed to determine whether samples may have been exposed to contamination from sample shipment. The trip blank will consist of one PUF and one QFF. The PUF and QFF will remain in their storage containers throughout the sampling moment and then returned to Battelle with the actual samples.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

B6.1 Certification of QFF and PUF Cartridge

At least one QFF and one PUF cartridge per lot (or 10 percent of the batch, or greater) shall be certified according to the procedure based on Section 10.3 of Method TO-9A[1].

B6.2 Maintenance of NDAMN Stations

Battelle shall direct on-site operators in maintaining the PS-1 samplers in accordance with the manufacturer's specifications and suggested requirements. In particular, the motors and/or motor brushes need periodic replacement-after a certain duty cycle as indicated by hours of operation (routine maintenance). The motor brushes need to be replaced for each sampling moment while the motor itself needs to replaced annually. These two events are mutually exclusive. Each routine maintenance event will be documented on the Field Calibration Data Sheet.

All other than routine operating and maintenance requirements (non-routine maintenance) completed on the PS-1 samplers will be described in detail on the comments section of the Field Test Data Sheets. Any questions by the on-site operators concerning any non-routine maintenance concerns will be directed to the Battelle Field Operator Interface. Battelle shall advise the WAM when any non-routine maintenance issues arise at any of the NDAMN stations. In consideration of these facts, the WAM may authorize extraordinary maintenance procedures.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

At the beginning and end of each sampling moment, all PS-1 samplers will undergo multi-point calibrations, consistent with specifications in Section 11.2.2 of Method TO-9A. A G40 calibration kit for the PS-1 sampler will be used. Calibration orifices will have been certified by the manufacturer. The copies of the certification forms will be kept both by Battelle and the on-site operators. A form similar to Figure 8 of Method TO-9A (provided in Appendix II) will be completed for each multipoint calibration. The resulting correlation coefficient (R) must be greater than, or equal to, 0 .9800.

B8 INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

Specification and handling procedures for the QFF and PUF cartridges are detailed in Section B6. Any other supplies and consumables will be obtained following Battelle's standard supply ordering practices.

B9 DATA ACQUISITION REQUIREMENTS FOR NONDIRECT MEASUREMENTS

Since this project involves the implementation and operation of the NDAMN and associated database management, no nondirect measurements will be acquired.

B10 DATA MANAGEMENT

B10.1 Data Validation

B10.1.1 Field Data Within two weeks of receipt of field data forms, the field data will be hand-entered into a Microsoft Access 2000® database. The data entry screens and all calculations hard-coded into the database are QC'd and validated.

Using SAS, well-checked data validation routines will be run on the data in the Access files to assess consistency of units, ranges on samples, location of the samples, and other prespecified conditions. SAS has a module which allows direct access to Microsoft Access®data thus ensuring that all validation will be performed on the current Microsoft Access®data file. Graphical validation within SAS will be used to assess whether there are potential data input errors. Any identified potential problem shall be written to an electronic problem log maintained in the same Access file and a hard copy of the list of potential problems sent to EPA for resolution.

Upon resolution of any discrepancies, Battelle will update the electronic log indicating any changes to the data files and provide a date stamp and the identity of the author of the changes.

B10.1.2 Laboratory Samples The EPA laboratory performing the analysis of the NDAMN samples will perform the data recording and provide Battelle with a Lotus 1-2-3 file containing the analytical results. The Lotus 1-2-3 files will be imported into a Microsoft Access® 2000 database. Hand-checking and validation of the data import will be performed to ensure data was imported correctly.

B.10.2 Data Transformation

After the conclusion of the data validation phase, it may be necessary that data be converted from one set of units to another. The formulas for conversion will be reversible. The conversions will be validated by hand calculations. In addition, the converted data will have a reverse calculation performed to ensure that the original value can be attained. Until the data validation phase is completed, the exact conversions cannot be determined.

B.10.3 Data Transmittal

The EPA laboratory will e-mail Lotus 1-2-3 files containing the results of the sample analysis to Battelle. Battelle will save the file on a network server in a secured directory dedicated to the NDAMN database and accessible only by personnel working on the NDAMN project.

As stated in the Data Validation section, upon receipt of the Lotus 1-2-3 file, the laboratory data will be imported into the NDAMN Microsoft Access®2000 database.

Upon the completion of a sampling moment update to the NDAMN database and the associated annual report, Battelle will date stamp the NDAMN database, copy the database to a CD, and send the CD to the WAM. At the request of the WAM a secured FTP site may be setup at Battelle. If this occurs, then the updated, validated NDAMN database will be copied to the secured FTP site by Battelle and made available for downloading by the EPA WAM.

B.10.4 Data Reduction

No irreversible data reduction is expected at this time.

B.10.5 Data Analysis

Simple statistical summaries of the data, including means, quantiles, and standard errors, will be calculated using validated routines in SAS. As mentioned above, SAS has a module which allows direct access to a database thus ensuring that all validation will be performed on the current NDAMN database, thus alleviating any potential for duplicate databases to be "floating" around. Sample sizes will be assessed for each statistical analysis to determine that all appropriate data were included in the analysis. Graphical summaries will be produced in SAS and all graphs will be validated to ensure that the correct data are being displayed. If tables of summary statistics are needed, automated WordPerfect tables will be produced directly from SAS utilizing well-validated macros. These macros eliminate human intervention and greatly reduce the potential for human error and have been utilized on several other projects where accuracy and speed were of the highest importance. The WordPerfect tables will be validated against direct output from the statistical routines.

B.10.6 Data Tracking

The data tracking at Battelle begins with the arrival of the Lotus 1-2-3 file from the EPA laboratory. The file will be e-mailed. The e-mail will be stored in the project e-mail directory on the network server directory dedicated to the NDAMN project. The data file in the e-mail will be stored in the project data directory. The e-mail will be removed from the e-mail system.

The NDAMN database will be maintained in the project data directory. All programs used to validate and transfer the data will be housed in the project program directory.

All CD's and backup tapes will be stored in a locked filing cabinet in the database administrator's office during the course of the project. At the conclusion of the project all CD's will be stored in the project file. The project directory will be copied to CD, stored in the project file, and the project directory will be removed from the database administrator's computer.

B.10.7 Data Storage and Retrieval

Prior to each update of the database, a copy of the current database will be made with a date stamp in the file name and archived to CD. Appropriate date stamps will be used to indicate when the data were added to the official NDAMN database. After the official database has been updated, the updated database will be backed-up to tape and back-ups will be made each time the NDAMN database is changed between additions of a new sampling moment.

The working NDAMN database will be housed on a secured directory on a network server. Access to the file is restricted to only the necessary project personnel. Archives and copies of the database will be maintained in a locked filing cabinet in the database administrator's office.

The NDAMN database will be maintained on the secured directory on a network server for the duration of the work assignment. Daily backups of the project directory will be made to tape. Just prior to the conclusion of the project, the database administrator will archived the official NDAMN database, all e-mail correspondences pertaining to the data files, the EPA supplied Lotus files, and the programs used in validation and production of statistical summaries to CD. All archive CD's will be put into the study file.

C1 ASSESSMENTS AND RESPONSE ACTIONS

C1.1 Technical System Audits (TSA)

A Technical Systems Audit (TSA) is a thorough and systematic onsite qualitative audit, where equipment, personnel, training, procedures, and record keeping are examined for conformance to the QAPP, Standard Operating Procedures, and associated methods. In the context of this task order, the Battelle QAM will annually conduct three TSAs. Two TSAs will be conducted during a sampling moment at a NDAMN station - two different stations. The TSAs will examine the sampling process from sampler calibration to sample transfer to the EPA laboratory. The final TSA will examine the sampling preparation and spiking procedure conducted at Battelle. The EPA WAM may participate in these TSAs.

Observations and findings of each TSA will be recorded and the resulting TSA report submitted to the responsible Task Leader for immediate corrective action (in needed). The Task Leader will then return the TSA report, documenting any corrective actions taken, to the Battelle QAM who will confirm that the corrective actions were adequate and completed. Finally the TSA report will be routed through the Battelle WAL for review. A copy of the TSA report will be sent to the EPA WAM. The Quality Assurance Manager will retain the report in permanent files.

C1.2 Audit of Data Quality (ADQ)

An Audit of Data Quality (ADQ) will be performed before submission of the data to the EPA. A 10% check of electronic data and hand-entered data will be completed by the Battelle QAM. The extent of the review assumes that a 100% quality control check of hand-entered data and suitable check of the electronic data has occurred before the data has arrived for the ADQ. If the QC check has not been completed the QAM will either return the data to the origin or greatly increase the scope of the ADQ.

The ADQ will determine that the data are in conformance with all aspects of the QAPP, Standard Operating Procedures, and associated methods. The data will then be compared to the results in the report to ensure exactitude of data reporting. The ADQ will examine how the data were handled, what judgments were made, and whether uncorrected mistakes were made. Findings of the ADQ will be handled in the same manner as the TSA.

C2 REPORTS TO MANAGEMENT

The status of the work assignment and any current or potential issues will be summarized in a Monthly Progress Report for Battelle's contract which will be provided to the EPA on or before the 15th day of each month.

D1 DATA VALIDATION AND USABILITY

Data reviews to be performed will depend upon the type of data. Field data generated by the on-site operators will be reviewed by Battelle staff upon initial receipt of these data with sample shipment. Battelle staff will ensure that field data sheets are appropriately completed and that sampling calculations are correct. If any problems with sampling or sample handling are noted on the field data sheets, Battelle staff will ensure that the description of the problem is clear and complete enough to allow an assessment of potential impact on data quality. If not, Battelle will contact the on-site operator for further explanation. Once this review is complete, the field data will be manually entered into the NDAMN database. A 10% audit of data quality (ADQ) on the database as described in Section C1.2 will be conducted to review the accuracy of this transcription.

Analytical results provided by the EPA laboratory will not be reviewed by Battelle. The data will simply be automatically transferred into the NDAMN database. The ADQ will confirm that this automatic data transfer is accurate.

Calculations made by the database will also be reviewed in the ADQ to ensure that appropriate data are used in the calculations and that formulas are proper.

Once data for a sampling moment have been entered into the database, and calculations of ambient concentrations have been made, data will be validated and verified by examination against various criteria. First, a sample will only be considered useable if >2000 m^3 of air was collected. At least 2000 m^3 of air is required to achieve the target detection limits. If the sampling period was aborted or shortened due to sampling problems, and a sufficient volume of air was not collected, the sample will be considered unusable.

Another criteria to validate and verify the data will be to compare the field blank with sample concentrations. Background levels of dioxins/furans/PCBs in the field blank must not be at a level high enough to interfere with sample results. If problematic background levels exist, the sample will be considered unusable.

Battelle will verify any anomalous results that are obtained. Anomalous results might include:

- Concentration of individual congener, total CCD/CDF/PCB concentration, or TEQ that is significantly different at one site in comparison to other sites;

- Concentration of individual congener that is unexpectedly different than other congeners within the same compound class for the same sample.

If anomalous results are found, Battelle will review field sampling data to determine if a problem had occurred with sampling or sample handling. If not, Battelle will contact the EPA laboratory to ensure that the quality of the laboratory analyses was intact. Any cause for an anomalous result that Battelle can identify will be documented to verify the anomalous results is real. If no cause is identified, Battelle will discuss with the EPA WAM.

E1 REFERENCES

1) U.S. Environmental Protection Agency. 1997. *Compendium Method TO-9A: Determination of Polychlorinated, Polybrominated and Brominated/Chlorinated Dibenzo-p-dioxins and Dibenzofurans in Ambient Air*. In: Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Cincinnati, OH: U.S. Environmental Protection Agency, Center for Environmental Research Information. EPA/625/R-96/010b.

APPENDIX I
LIST OF SAMPLING STATIONS

Listing of Current NDAMN Stations

Station 1 - Penn Nursery, PA: Located on the Penn Nursery and Woodshop Forestry Research Center operated by the Pennsylvania State University, University Park, PA.

Station 2 - Penn Nursery, PA: Duplicate sampler operated for QA/QC.

Station 3 - Clinton Crops, NC: Is located near the National Air Deposition Program/National Trends Network (NADP/NTN) monitoring station NC35, and is located on the grounds of the Clinton Crops Research Station of the North Carolina State University in Sampson County, NC. This is an Agricultural Research Station operated by the State of North Carolina. Latitude 35 Longitude 78 16 42. Elevation 41 meters.

Station 4 - Everglades National Park, FL: Is located near the NADP/NTN monitoring station FL11, and is located at the Everglades National Park operated by the U.S. National Park Service in Dade County, FL. Latitude 25 23 24 Longitude 80 40 48. Elevation 2 meters.

Station 5 - Lake Dubay, WI: Is located near the NADP/NTN monitoring station W128, and is located at Lake Dubay in Portage County, WI. The site is operated by the Wisconsin Dept. of Natural Resources. Latitude 44 39 52 Longitude 89 39 08. Elevation 338 meters.

Station 6 - Monmouth, IL: Is located near the NADM monitoring station IL78, and is located on the Agriculture Research Farm of the University of Illinois in Monmouth, IL. IL78 is maintained by the U.S. Geologic Survey (USGS) of the U.S. Dept. of Interior. Latitude 40 56 00 Longitude 90 43 23. Elevation 229 meters

Station 7 - McNay, IA: Is located near the NADP/NTN monitoring station IA23, and is located at the McNay Research Center in Lucas County, IA. IA23 is operated by the USGS and the Iowa State University. Latitude 40 57 47 Longitude 93 23 33. Elevation 320 meters

Station 8 - Lake Scott, KS: Is located near the NADP/NTN monitoring station KS32, and is located at Lake Scott State Park in Scott County, Kansas. KS32 is operated by the USGS and the State of Kansas. Latitude 38 40 18 Longitude 100 54 59. Elevation 863 meters

Station 9 - Bixby, OK: Is located near a State of Oklahoma air monitoring site located at the Bixby Water Treatment Plant in Bixby, Oklahoma. The site is operated by the State of Oklahoma EPA.

Station 10 - Arkadelphia, AR: Is located near the NADP/NTN monitoring station AR03 in near Arkadelphia in Clark County, Arkansas. Latitude 34 10 46 Longitude 93 05 55. Elevation 71 meters.

Station 11 - Bennington, VT: Is located near the NADP/NTN monitoring station VT01 in Bennington County, Vermont. Latitude 42 52 34 Longitude 73 09 48. Elevation 305 meters

Station 12 - Jasper, NY: Is located near the NADP/NTN monitoring station NY65 in Jasper, Steuben County, New York. Latitude 42 06 23 Longitude 77 32 09. Elevation 634 meters.

Station 13 - Beltsville, MD: Is located on the grounds of the Agriculture Research Station which of the U.S. Department of Agriculture in Beltsville, Maryland.

Station 14 - Caldwell, OH: Is located near the NADP/NTN monitoring station OH49 in Caldwell, Noble County, Ohio. Latitude 39 47 34 Longitude 81 31 52: Elevation 276 meters.

Station 15 - Oxford, OH: Is located near the NADP/NTN monitoring station OH09, and is located at Oxford, Butler County, Ohio. Latitude 39 31 53 Longitude 84 43 27. Elevation 284 meters.

Station 16 - Dixon Springs, IL: Is located near the NADP/NTN monitoring station IL63, and is located at the Dixon Springs Agricultural Research Center in Pope County, Illinois. Latitude 37 26 08 Longitude 88 40 19. Elevation 161 meters.

Station 17 - Quincy, FL: Is located near the NADP/NTN monitoring station FL14, and is in Quincy, Gadsden County, Florida. Latitude 30 32 53 Longitude 84 36 03. Elevation 60 meters.

Station 18 - Stennis Space Center, MS: Is located on the NASA facility at the John C. Stennis Space Center near Bay Saint Louis, Mississippi.

Station 19 - Padre Island, TX: Is located at Padre Island National Park near Corpus Christie, Texas.

Station 20 - Fond du Lac Indian Reservation, MN: Is located near the NADP/NTN monitoring station MN05, and is located at Fond du Lac Indian Reservation in Carlton County, Minnesota. Latitude 46 42 47 Longitude 92 30 39 Elevation 390 meters

Station 21 - North Platt Agricultural Experiment Station, NE: Is located near the NADP/NTN monitoring station NE99, and is located at North Platt Agricultural Experiment Station in Lincoln County, Nebraska. Latitude 41 03 33 Longitude 100 44 47. Elevation 919 meters.

Station 22 - Goodwell Research Station, OK: Is located near the NADP/NTN monitoring station OK29, and is located at the Goodwell Research Station in Texas County, Oklahoma. Latitude 36 35 27 Longitude 101 37 03. Elevation 999 meters.

Station 23 - Big Bend National Park, TX: Is located near NADP/NTN monitoring station TX04, and is located at Big Bend National Park in Brewster County, TX. Latitude 29 18 08 Longitude 103 10 38. Elevation 1056 meters.

Station 24 - Grand Canyon National Park, AR: Is located near NADP/NTN monitoring station AZ03, and is located in Grand Canyon National Park in Coconino County, Arizona. Latitude 36 04 18 Longitude 112 09 18. Elevation 2152 meters.

Station 25 - Theodore Roosevelt National Monument, ND: Is located near NADP/NTN monitoring station ND07, and is located in Theodore Roosevelt National Monument National Park, McKenzie County, North Dakota. Latitude 47 36 05 Longitude 103 15 51. Elevation 611 meters.

Station 26 - Craters of the Moon National Park, ID: Is located near NADP/NTN monitoring station ID03, and is located in the Craters of the Moon National Park in Butte County, Idaho. Latitude 43 27 41 Longitude 113 33 17. Elevation 1807 meters.

Station 27 - Chiricahua National Park, AR: Is located near NADP/NTN monitoring station AZ98, and is located at Chiricahua National Park in Chochise County, Arizona. Latitude 32 00 35 Longitude 109 23 20. Elevation 1570 meters.

Station 28 - To be determined.

Station 29 - Hyslop Farm, OR: Is located near NADP/NTN monitoring station OR97, and is located at Hyslop Farm in Benton County, Oregon. Latitude 44 38 05 Longitude 123 11 24 Elevation 69 meters.

Station 30 - Lake Ozette, WA: Is located at Lake Ozette in the Olympia National Park in the Olympian Peninsula Washington. Latitude 48 09 13 Longitude 124 40 04 Elevation 25 meters.

Station 31 - Fort Cronkhite, CA: Is located at Fort Cronkhite National Park in California. Latitude 37 50 03 Longitude 122 31 54 Elevation 30 meters.

APPENDIX II
Field Calibration Data Sheet

NDAMN FIELD CALIBRATION DATA FORM

Site Number:____________________
Site Location: ______________ Calibration Orifice ID: ________________
Slope ________________
Intercept ______________

Calibration Date: ______________ Time: ___________
Calibration Ambient Temperature: ___°F ___°C
Calibration Ambient Barometric Pressure: ___inch Hg ____mm Hg
New Brushes Installed Yes ___ No ___ Calibrator's Signature
New Motor Installed Yes ___ No ___ ____________________________

Orifice Manometer Water Column, inches			Monitor Magnehelic, inches (Y2)	Calculated Value Orifice Flow, scm (X1)
Left	Right	Total (Y1)		
			70	
			60	
			50	
			40	
			30	
			20	

Sampler Calibration:
Slope ______________
Intercept ____________
Correlation Coefficient __________________

Sampler Magnehelic Set Point _____________
at 0.24 m^3/mln

APPENDIX III
Field Sampling Records

NDAMN FIELD TEST DATA FORM

Site Location: ________________ Sampling Moment: ________
Site Number: ________________

PUF Sample Cartridge Number: __________
Date Installed: ___________

PUF Blank Cartridge Number: ________

Filter Sample Jar Number:
____

Filter Blank Jar Number:
____

Sampler Calibration:
Slope (m_2): ___________
Intercept (b_2): _________

Calculated Magnehelic Set Point:________

Sample Week: 1

Timer Set to Start at ___________ Date __________
Timer Set to Stop at ___________ Date __________

	Date	Time	Temp.	Bp	Magnehelic	Running Time
Initial Reading[a]						
Mid-Point Reading						
Final Reading						
					Average ________	Lapsed Time ________

(a) Mid-point reading is optional.

NDAMN Field Test Data Form (Continued)

Site Location: ________________ Sampling Moment: ____________

Site Number: ________________

Sample Week: 2

Timer Set to Start at ___________ Date _________

Timer Set to Stop at ___________ Date _________

	Date	Time	Temp.	Bp	Magnehelic	Running Time
Initial Reading						
Mid-Point Reading						
Final Reading						
					Average ________	Lapsed Time ________

Sample Week: 3

Timer Set to Start at ___________ Date _________

Timer Set to Stop at ___________ Date _________

	Date	Time	Temp.	Bp	Magnehelic	Running Time
Initial Reading						
Mid-Point Reading						
Final Reading						
					Average ________	Lapsed Time ________

NDAMN Field Test Data Form (Continued)

Site Location: ________________ **Sampling Moment:** _______

Site Number: ________________

Sample Week: 4

Timer Set to Start at __________ **Date** __________

Timer Set to Stop at __________ **Date** __________

	Date	Time	Temp.	Bp	Magnehelic	Running Time
Initial Reading						
Mid-Point Reading						
Final Reading						
					Average __________	**Lapsed Time** __________

Sample Recovery:

Place samples in correct sample container, complete chain-of-custody form, place in insulated container, add frozen blue ice, and ship to Battelle using supplied Federal Express label.

QUALITY CONTROL CHECKLIST FORM

Sample Site number: ______________ **Sampling moment:** _________

Site Location: ________________

Have new brushes _________ **or new motor** ________ **been installed?**

Date: ___________________ **Signature:** _____________________________

Has the presampling multiport calibration been completed? _____________

Initial Setup

______ **Gloves used to handle sample media**

______ **Glass sleeve with PUF in place**

______ **Quartz fiber filter in place**

______ **PUF blank opened**

______ **First quartz fiber filter blank in blank filter jar**

Sample Collection

Week 1	Week 2	Week 3	Week 4	
________	________	________	________	Elapsed time
________	________	________	________	-Final readings taken
________	________	________	________	Non-powdered gloves worn
________	________	________	________	QFF removed, placed in collection jar
________	________	________	________	Field blank collected
________	________	________	________	Samples returned to cooler

Sample Recovery

________ Multi-point calibration performed
________ Glass sleeves and PUFs removed and wrapped in clean foil
________ Glass sleeves packed into jars with brown paper
________ QFF jars wrapped in clean foil
________ Jars and foil labeled with sample identification (permanent marker)

Sample Shipment Activities

________ Samples packed on blue ice
________ Cooler(s) taped securely
________ All samples accounted for
________ Airbill/tracking number

APPENDIX IV
Chain-of-Custody Forms

National Dioxin Air Monitoring Network

CHAIN-OF-CUSTODY RECORD

Shipping Information: Battelle to Sampling Station

Samples Sent by (Initials/Date):	Shipping Conditions (e.g. dry ice, blue ice, etc.):

Shipping Information (Courier/Shipping #):	Received by (Initials/Date):	Blue Ice Receipt Condition (circle): Melted Frozen

Sample ID	Quantity	Remarks	Sample ID	Quantity	Remarks

Shipping Information: Sampling Station to Battelle

Samples Sent by (Initials/Date):	Shipping Conditions (e.g. dry ice, blue ice, etc.):

Shipping Information (Courier/Shipping #):	Received by (Initials/Date):	Blue Ice Receipt Condition (circle): Melted Frozen

National Dioxin Air Monitoring Network
CHAIN-OF-CUSTODY RECORD

<table>
<tr><td colspan="6">Shipping Information: Battelle to EPA Laboratory</td></tr>
<tr><td colspan="3">Samples Sent by (Initials/Date):</td><td colspan="3">Shipping Conditions (e.g. dry ice, blue ice, etc.):</td></tr>
<tr><td colspan="2">Shipping Information (Courier/Shipping #):</td><td colspan="2">Received by (Initials/Date):</td><td colspan="2">Blue Ice Receipt Condition (circle):
Melted Frozen</td></tr>
<tr><th>Site</th><th>Location</th><th>PUF Sample</th><th>PUF Blank</th><th>Filter Sample</th><th>Filter Blank</th></tr>
<tr><td>1</td><td>Penn Nursery, PA</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>Penn Nursery, PA</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>Clinton Crops, NC</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>Everglades, FL</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>Lake Dubay, WI</td><td></td><td></td><td></td><td></td></tr>
<tr><td>6</td><td>Monmouth, IL</td><td></td><td></td><td></td><td></td></tr>
<tr><td>7</td><td>McNay, IA</td><td></td><td></td><td></td><td></td></tr>
<tr><td>8</td><td>Lake Scott, KS</td><td></td><td></td><td></td><td></td></tr>
<tr><td>9</td><td>Bixby, OK</td><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>Arkadelphia, AR</td><td></td><td></td><td></td><td></td></tr>
<tr><td>11</td><td>Bennington, VT</td><td></td><td></td><td></td><td></td></tr>
<tr><td>12</td><td>Jasper, NY</td><td></td><td></td><td></td><td></td></tr>
<tr><td>13</td><td>Beltsville, MD</td><td></td><td></td><td></td><td></td></tr>
<tr><td>14</td><td>Caldwell, OH</td><td></td><td></td><td></td><td></td></tr>
</table>

Site	Location	PUF Sample	PUF Blank	Filter Sample	Filter Blank
15	Oxford, OH				
16	Dixon Springs, FL				
17	Quincy, FL				
18	Bay St. Louis, MS				
19	Padre Island, TX				
20	Fond du Lac, MN				
21	North Platte, NE				
22	Goodwell, OK				
23	Big Bend, TX				
24	Grand Canyon, AZ				
25	Theodore Roosevelt, ND				
26	Craters of the Moon, ID				
27	Chiricahua, AZ				
28	To be determined				
29	Hyslop Farm, OR				
30	Ozette Lake, WA				
31	Fort Cronkhite, CA				

21Shipping Information: Sampling Station to Battelle

Samples Sent by (Initials/Date):		Shipping Conditions (e.g. dry ice, blue ice, etc.):
Shipping Information (Courier/Shipping #):	Received by:	Blue Ice Receipt Condition (circle): Melted Frozen

APPENDIX V
Standard Operating Procedure

STANDARD OPERATING PROCEDURE (SOP) FOR AMBIENT AIR SAMPLING WITH PS-1 SAMPLER IN THE NATIONAL DIOXIN AIR MONITORING NETWORK

Originated by: ______________________ Date: ______________

Approved by: ______________________ Date: ______________
Technical Reviewer

Approved by: ______________________ Date: ______________
Management

Reviewed and Registered by QAU:

______________________ Date: ______________

Battelle
505 King Avenue
Columbus, Ohio 43201

I. Scope

This document provides standard operating procedures (SOPs) for the use of the PS-1 sampler for collecting ambient air samples of polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and polychlorinated biphenyls (PCBs).

II. Purpose

The purpose of this project-specific SOP is to provide field operators with guidance to ensure that air samples are appropriately collected, stored, and shipped. The procedures described in this document are based on the guidelines provided in the U.S. EPA Method TO-9A. Modifications, such as length of sampling time, have been made to meet National Dioxin Air Monitoring Network (NDAMN) requirements. The key activities and required documentation are highlighted in Table 1 and addressed in Section V.

Table 1. SOP for NDAMN Sampling Program

Activity	Documentation Required
Sampling Supply Receipt	Chain-of-Custody Form
Pre-Sampling Calibration	NDAMN Field Calibration Data Form
Initial Setup Sample Operation Sample Recovery	NDAMN Field Test Data Form Week 1 (Page 1) Weeks 2 and 3 (Page 2) Week 4 (Page 3)
Post-Sampling Calibration	NDAMN Field Calibration Data Form
Sample Storage and Shipment	Chain-of-Custody Form
Maintenance	Quality Control Checklist

III. References

A. U.S. Environmental Protection Agency. 1997. *Compendium Method TO-9A: Determination of Polychlorinated, Polybrominated and Brominated/Chlorinated Dibenzo-p-dioxins and Dibenzofurans in Ambient Air.* In: Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Cincinnati, OH: U.S. Environmental Protection Agency, Center for Environmental Research Information. EPA/625/R-96/010b.

IV. Definitions

The following terms and acronyms are frequently used in this document:

PCBs - polychlorinated biphenyls

PCDDs - polychlorinated dibenzo-p-dioxins

PCDFs - polychlorinated dibenzofurans

PUF - polyurethane foam

QFF - quartz fiber filter

V. Procedures

Equipment, sampling schedule, sampling operations, post-sampling calibration, sample storage and shipment, and maintenance are discussed in this section.

A. Equipment

1. **Sampler:** Samples for PCDD/PCDF/PCB analysis are collected using the Model PS-1 sampling system shown in Figure 1. The sampler consists of a sampling head, a venturi meter equipped with a magnehelic gauge to measure air flow, and a vacuum blower. Sample air flow of 250 liters per minute (lpm) is controlled by adjusting the speed of the vacuum blower using a voltage variator. The sampler is turned on and off using a seven-day timer, and the number of hours that the sampler operates is recorded with an elapsed time meter.

   The PS-1 sampling head (Figure 2) is designed to hold a 4-inch-diameter quartz-fiber filter and a 2.3-inch-diameter x 5-inch-long glass sample cartridge containing a 3-inch polyurethane foam (PUF) sorbent traps that fit snugly into the cartridge. Particulates in the sample stream are collected on the filter, while any vapors that pass through the filter are collected by the PUF sorbent. A second 3-inch PUF sorbent trap in a glass cartridge is provided as a field blank for quality assurance purposes.

2. **Other Equipment:**

   General Metals G40 calibration kit (calibration orifice and water manometer)
   Thermometer (0° to 100°C)
   Screw driver (Phillips and bladed, medium size)

B. Sampling Schedule

1. Measured PCDD/PCDF/PCB concentrations from the NDAMN program are being used to establish a national baseline and track any possible trends across the United States. Because of the importance of this program, all sites must collect data for the same time period. Prior to each sampling moment, Battelle will tell station operators what dates to start and stop sampling.

2. Although some delays may be unavoidable, every effort should be made to keep to the scheduled dates. Unless notified otherwise, sampling will start on a Tuesday evening at midnight and run until midnight of the following Monday evening. The sampler will be shut down on subsequent Tuesdays to allow the sample filter to be changed. This schedule will provide four 5- or 6-day periods for a total of 480 hours or 576 hours respectively of sampling. The length of the sampling period is required to provide sufficient quantity of sample so that the amount of PDCC/PCDF/PCB collected will be above the detection limit of the analytical method.

C. Sampling Operations

1. Sampling Supply Receipt

   a Approximately one week prior to each sampling moment, operators will receive a shipment by Federal Express containing the following supplies:

      1. One glass jar containing a glass cartridge with 1 PUF sorbent trap (sample)
      2. One glass jar containing a glass cartridge with 1 PUF sorbent trap (field blank)
      3. One aluminum foil pack containing 10 to 12 quartz fiber filters
      4. Two amber jars (one for filter samples and one for filter blanks)
      5. Four pairs of white gloves
      6. Blue ice
      7. One set of motor brushes
      8. Return Federal Express shipping label
      9. One chain-of-custody form
      10. Two NDAMN field calibration data forms
      11. One NDAMN field test data form (3 pages)
      12. One quality control checklist.

b. Upon receipt of this shipment, the shipping container should be opened and checked to assure that all listed supplies have been received and that none of the glass jars or glass cartridges have been broken. Battelle should be notified immediately if supplies are broken or missing. The blue ice should be put into a freezer as soon as possible so that it will be frozen when needed. Date and initial the **Received by** block at the top of the chain-of-custody form (Figure 3) and indicate any discrepancies in the **Remarks** column. Keep the form in a safe place for use with the return shipment.

The PUF and filter jars are labeled in a format similar to the following examples:

PUF sample		**Filter sample**
Caldwell, OH	**or**	**Caldwell, OH**
P 14-00-4-S		**F 14-00-4-S**
PUF blank	**Filter blank**	
Caldwell, OH	**or**	**Caldwell, OH**
P 14-00-4-B		**F 14-00-4-B**

The first line on each label shows the sample type. The second line gives the site name (in general, the city and state). The third line has an alphanumeric code. The first letter of the code consists of a **P** for PUF or **F** for filter. The first set of two numbers in the code is the site number. [Site numbers can be found on the contact list at the end of this document.] The second set of two numbers in the code identifies the year (i.e., 00 for 2000 or 01 for 2001). The next single number is the sampling moment for that year. This will be a **1** for samples collected in the first sampling moment of the year, **2** for samples collected in the second sampling moment, **3** for the third, and **4** for the fourth. The last letter is used to identify samples (**S**) or blanks (**B**).

2. Pre-Sampling Calibration

a. The PS-1 air sampler must be calibrated prior to the start of the sampling moment using a General Metals G40 calibration kit, consisting of a calibration orifice and a water manometer. A post-sampling calibration also must be conducted at the completion of the sampling moment. The sampling head contains an empty glass cartridge during the calibration process. If an empty glass cartridge is not available, use the glass cartridge containing the sample PUF for calibration. Make sure to note on the NDAMN field calibration data form (Figure 4) whether the sample PUF was used. Document calibration data on the NDAMN field calibration form. At the completion of the initial calibration, the sampler set point is to be calculated by the operator using the electronic spreadsheet provided. Battelle will complete the calculation for operators without this capability. The calibration orifice must be removed from the sampler after calibration is completed.

b. The PS-1 air sampler is calibrated as follows:

- Prior to the start of calibration, check the NDAMN field calibration data form (Figure 4) to verify that the site number and location are correct. Also make sure that the calibration orifice ID number and calibration orifice slope, and intercept, are on the calibration form. If not, mark them on the form. If you do not have this information, call Battelle. Mark on the form the date and start time of the calibration, along with the signature of the person doing the calibration.

- Measure the ambient temperature using the thermometer provided with the calibration kit and document it on the NDAMN field calibration data form. Also, document the barometric pressure on the form. Ambient temperature and barometric pressure during calibration can be obtained from a nearby lab or airport or from a local weather forecast, if needed.

- Indicate on the NDAMN field calibration data form if new brushes have been installed in the sampler motor or if a new motor has been installed. Note: If both answers are no, do not proceed until one or the other has been completed.

- Place an empty glass cartridge in the sampling head, making sure that there is a gasket at the top and bottom of the cartridge, as shown in Figure 2. Screw the filter holder onto the cartridge holder, making sure that the fit is snug, but do not over tighten. Install the sampling head onto the sampler vacuum blower inlet and secure it using the two ring clips at the side of the connector fitting.

- Place the calibration orifice on the sampling head (Figure 5) and secure it using the three-wing nuts. Make sure no leaks exist. **Note:** No filter should be in place at this time.

- Unwrap the manometer and hang it on the front of the air sampler housing. Open the shutoff valves on the top of the manometer. In the open position, the handles on the ports will face away from the air sampler. When the valves are open, the liquid level in the two sides of the manometer should be equal. If the liquid is not at the same level in both sides, check to make sure that the valves are open. Attach one end of the rubber tubing from the calibrator to one of the manometer valves. Blow gently into the open end of the tubing until movement of the water column can be seen. If the blockage is not cleared, repeat on the opposite valve.

- Adjust the ruler on the manometer so the "0" mark on the scale is level with the top of the liquid. This can be done by sliding the metal scale up or down. If the liquid level is low, add water to the manometer.

- Connect the tubing from one of the manometer inlet ports to the side port on the calibration orifice as shown in Figure 5.

- Turn the sampler on. With a flat blade screwdriver, adjust the sampler airflow using the voltage variator adjustment screw located to the right of the elapsed time indicator. The blower motor speed should increase when turned clockwise and decrease when turned counter-clockwise.

- Adjust the motor speed until the sampler magnehelic gauge reads 70. Allow the motor to stabilize for a few seconds. If this reading cannot be obtained when the adjustment screw is turned completely clockwise, use the highest flow rate obtained and document the new magnehelic reading by crossing out the 70 on the calibration form and writing in the new reading. Allow the system to run for approximately 1 minute at this speed. Record the difference in the inches of water from the calibrator orifice on the NDAMN field calibration data form. This is achieved by reading the liquid level on each of the two sides of the manometer and documenting them on the NDAMN field calibration data form.

- Readjust the voltage variator counter-clockwise until the sampler magnehelic reads 60, then repeat the previous step documenting the manometer readings on the NDAMN field calibration data form. This step is then repeated for magnehelic readings of 50, 40, 30, and 20. At the completion of the calibration, shut off the sampler.

- Close the shutoff valves of the manometer by turning them clockwise. Remove the manometer and calibration orifice and return them to the carrying case.

- Calculate the sampler calibration relationship and set point using the provided electronic spread sheet or call in the calibration data to Battelle. Document the sampler's calibration slope, intercept, and correlation coefficient at the bottom of the NDAMN field calibration data form.

- Record the calculated magnehelic set point that corresponds to 0.24 m^3/minute. This reading is the setting at which the sampler is to be operated.

3. Sampler Operation

   a. Sampler operation consists of an initial setup, sample collection, and sample recovery. A three-page NDAMN field test data form (Figures 6, 7, and 8) has been provided for sampling data documentation. Also provided is a one-page quality control checklist form (Figure 9). This checklist is to serve as a reminder to make sure that all sampling functions have been completed.

   b. Initial Setup

      - Prior to the start of sampling, check the first page of NDAMN field test data form (Figure 6) to verify whether the site location, site number number, and sampling moment are correct. If not, correct them on the form. If you do not have this information, call Battelle.

      - Record the following information on the first page of the NDAMN field test data form:

         - PUF sample cartridge number

- PUF blank cartridge number
- filter sample jar number
- filter blank jar number
- sampler calibration slope, intercept, and set point from the NDAMN field calibration data form.

c. Pre-Sampling Blank Collection

- While wearing disposable gloves, remove the foil-wrapped glass cartridge containing the PUF blank from the glass blank jar. The blank jar is identified by the letter B at the end of the identification number and contains one 3-inch PUF. Carefully remove the foil wrapper from the glass cartridge, placing the foil and brown cushion paper back into the jar.

- Inspect the inside of the sampling head cartridge holder to ensure that there is a gasket at the bottom. Insert the PUF blank glass cartridge into the cartridge holder. The glass cartridge is inserted so that the metal support screen is at the bottom. Place the second gasket on top of the PUF blank glass cartridge.

- Screw the filter support base onto the cartridge holder. Do not over-tighten.

- Place the Teflon gasket on top of the filter support base. With the use of forceps, carefully place one filter from the foil pack on top of the gasket and place the second gasket on top of the filter. (The filter should be placed with the patterned side down.) Place the filter-retaining ring on top of the filter and gaskets and attach it to the filter support base with the three wing nuts.

- Remove the retaining ring and top gasket.

- With the forceps remove the filter from the support base, fold it in quarters, and place it into the filter blank jar. Put the lid back onto the blank jar. NOTE: Only collect one filter for the filter blank at this time.

- Remove PUF blank glass cartridge from the cartridge holder and place the glass cartridge back into the PUF blank jar. Place the PUF blank jar on the shelf of the PS-1 sampler with the lid off. The filter blank jar with the lid on is removed from the site and stored in the same freezer/refrigerator where the samples are stored. The filter blank jar should be brought back to the sampling site each time the sample filters are to be recovered.

d. Sampling Initiation

- While wearing disposable gloves, remove the foil-wrapped glass sample cartridge containing the sample PUF from the glass sample jar. The sample jar is identified by the letter S at the end of the identification number and contains a 3-inch PUF. Carefully remove the foil wrapper from the glass cartridge, placing the foil and brown cushion paper back into the jar. Replace the lid and retain the sample jar and bubble wrap in a safe place.

- Inspect the inside of the sampling head cartridge holder to ensure that there is a gasket at the bottom. Insert the glass cartridge into the cartridge holder. The glass cartridge is inserted so that metal support screen is at the bottom. Place the second gasket on top of the glass cartridge.

- Screw the filter support base onto the cartridge holder. Do not over-tighten.

- Place the Teflon gasket on top of the filter support base. With the use of forceps, carefully place one filter from the foil pack on top of the gasket and place the second gasket on top of the filter. (The filter should be placed with the patterned side down.) Place the filter-retaining ring on the top of the filter and gaskets and attach it to the filter support base with the three wing nuts. **Caution**: If the sampling head is assembled away from the sampling site, place the metal protective cover plate on the sampling head. The cover plate must be removed prior to the start of sample collection.

- Insert the ball fitting at the base of the sampling head into the connecter fitting at the top vacuum blower. Make sure that the sampling head is seated, then secure it using the two ring clips at the side of the connecter fitting.

- Start the vacuum blower and allow the sampler to run for at least one minute. Adjust the sampler airflow to the calculated magnehelic set point using the voltage variator adjustment. Once the flow is stable, record the magnehelic reading on the NDAMN field test data form (Figure 6) as **Initial Reading**. Also document the temperature, barometric pressure, time, and date that the reading was taken. Shut the sampler off. **Note**: If you are unable to obtain the calculated set point, adjust the voltage variator to get the highest magnehelic reading. If the maximum reading is less than 80 percent of the set point, notify Battelle immediately. A new sample PUF may be required. Do **not** use the blank PUF as a sample PUF.

- Set the 7-day timer to the correct day and time by rotating the timer dial clockwise.

- Make sure timer tabs are set to turn the sampler on at midnight the first evening and off at midnight five or six days later, e.g. turn on at midnight Tuesday evening and off at midnight the following Monday evening.

- Record the time and date that the sampler is set to start and the time and date that the sampler is set to stop for the first sample week on the NDAMN field test data form.

- Record the time indicated on the running time meter on the NDAMN field test data form. (**Note**: The time is indicated in hours not minutes.)

- After the sampler setup is completed, replace the lid on the PUF blank jar. The blank PUF jar will remain on sampler shelf with the lid on throughout the duration of the entire sampling moment.

e. Sample Collection

- At the end of the first, second, and third 5- or 6-day sampling periods, the sample filter must be changed. This is done to minimize the restriction of air flow through the filter as a result of particle buildup. The blank filters and blank collection jar are to be carried to the site during each filter change.

- Record the time indicated on the running time meter on the first page of the NDAMN field test data form as **Final Reading**. The second page (Figure 7) is to be used for the second and third weeks of sampling.

- Restart the sampler motor using the on/off trip switch on the timer. Let the motor run for 1 minute, then record the magnehelic gauge reading on the data form.

- Shut off the motor and remove the exposed sample filter. Be sure to use forceps and to wear disposable gloves while handling the filter.

- Fold the sample filter in quarters with the particle side in, then place the filter into the amber glass filter sample jar.

- Remove a new clean filter from the foil pack and with forceps place it on the sampler. Make sure that both the top and bottom gaskets are in place, then replace the filter retaining ring.

- Remove a second clean filter from the foil pack, fold it in quarters, and place it into the filter blank jar.

- Start the sampler motor and let the sampler run for approximately 1 minute. Adjust the sampler motor speed so that the magnehelic reading is at the original set point. If the correct set point cannot be obtained, adjust the motor speed as close as possible to the set point and record that reading on the data form. Shut the motor off. Recheck the timer to make sure the sampler will turn on at midnight and off at midnight five or six days later.

- Return sample and blank filter jars to the refrigerator.

- Repeat the above steps for weeks 2 and 3 and document the required information on the second page of the NDAMN field test data form (Figure 7). Week 4 sample data will be documented on the third page of the data form.

f. Sample Recovery

- Record the time indicated on the running time meter on the third page of the NDAMN field test data form as **Final Reading.** Also document the temperature, barometric pressure, time, and date that the reading was taken.

- Restart the sampler motor using the on/off trip switch on the timer. Let the motor run for 1 minute, then record the magnehelic gauge reading on the field data form.

- Shut off the motor and remove the sample filter. Be sure to use forceps and to wear disposable gloves while handling the filter and PUF sample and blank.

- Fold the sample filter in quarters with the particles on the inside, then place the filter into the amber filter sample jar. Replace the sample jar lid.

- Remove a fourth clean filter from the foil pack, fold it in quarters, and place it into the filter blank jar.

- Disassemble the sampling head and remove the glass sample cartridge. Rewrap the sample cartridge with the aluminum foil previously removed. Carefully place the wrapped sample cartridge into sample jar along with the paper cushions. Position the paper cushion in the same manner as received. Replace the caps on the PUF and filter sample jars.

- Sample and blank jars must be refrigerated until shipped.

D. Post-Sampling Calibration

1. At the completion of sampling and sample recovery, a post-sampling calibration should be carried out. The calibration should be carried out following the procedures given in Section V, C, 2, b. Post-calibration data are to be documented on the NDAMN field test calibration form (Figure 4). The post-sampling calibration serves as a quality control check of the initial calibration.

E. Sample Storage and Shipment

1. All samples should be stored at 4°C (39°F) or below immediately after removal from the sampler. The use of a freezer or the freezer section of a refrigerator is preferred.

2. Complete all sampling information on the enclosed chain-of-custody form (Figure 3) before packing the samples. The shipping information at the bottom of the page must also be completed.

3. Rewrap all sample and blank jars in bubble wrap before being packed. Note: Check to make sure that the glass PUF cartridges have been rewrapped in foil and the brown paper cushions are in place before wrapping in bubble wrap.

4. Place the wrapped sample jars and frozen blue ice in the shipping container. Place the completed and signed chain-of-custody form and calibration and field test data forms into the shipping container. Seal the container with tape and affix the supplied Federal Express form to the container. To assure that samples are received cold at Battelle, do not ship samples on a Friday or the day before a holiday. Notify Battelle of shipment date and FedEx tracking ID the same day samples are shipped.

F. Maintenance

1. Remedial or Emergency Maintenance

   a. Emergency maintenance will be required if any sampler component such as running time meter, voltage variator, or motor fail to operate. Should this occur, contact Battelle immediately to request a replacement part. Should a part fail during sampling, every effort will be made to have the part delivered the next day so that the sample will not be lost.

2. Routine Maintenance

   a. Routine maintenance activities, such as sampler cleaning and motor brush replacement, must be done prior to the start of each sampling moment. Sampler cleaning consists of wiping the inside and outside of the sampler with a dry cloth or paper towel to remove any surface dirt. During summer months, be careful of spiders or wasps that might nest in the sampler.

   b. Motor brushes must be replaced before each sampling moment. Failure to do so will result in motor failure and lost sample. The following procedures should be followed in changing the motor brushes:

   Note: The armature of the motor should not be touched. When the natural oil from your hands gets on the commutator, it disrupts the smooth operation of the motor. To prevent this, wear a set of the powder-free gloves while changing the motor brushes.

   - Unplug the motor power cord and remove the motor housing from the PUF sampler assembly.

   - Remove the motor mounting cover by removing the four bolts. This will expose the flange gasket and the motor. Turn the motor over.

   - Remove ground wires from backplate and carefully lift the housing from the motor.

   - With a screwdriver, carefully remove the plastic fan cover by prying between the brush and cover until both sides pop loose.

- With a screwdriver, carefully pry the brass quick disconnect tabs away from the expanded brushes. The brass quick disconnect tabs tend to come out of the brushes easier if you squeeze across the top of the brush with a pair of pliers while gently pulling on the tab.

- With a Phillips screwdriver, remove the brush holder and release the brushes.

- With new brushes, carefully slide the quick disconnect tabs firmly into the tab slot until seated.

- Push the brush carbon against the commutator until the plastic brush stops in place.

- Replace the brush holder clamps onto brushes.

- Assemble the motor after brush replacement: snap plastic fan cover back into place, feed ground wires back through backplate, put housing back onto motor, pull cord setback to normal position, fasten groundwires to backplate, turn motor over, and tighten flange on top of housing and gasket.

Warning: Change Brushes Before Brush Shunt Touches Commutator!!

3. Motor Brush Seating

Caution: Direct application of full voltage after changing brushes will cause arcing, commutator pitting, and reduce overall life.

a. To achieve the best performance from new brushes, they must be seated on the commutator before full voltage is applied.

b. After the brush change, apply 50 percent voltage for 30 to 45 minutes to accomplish this seating.

c. Use of the flow selector on the system provides the reduced voltage for brush seating.

d. For optimal performance, apply a low voltage to the motor and slowly increase to 50 percent over a period of 45 minutes.

e. The motor will sound rough at first, but will smooth out after the brushes are properly seated.

VI. Revision History

1. Section V.A.1. Changed dimensions (length) of PUF and continued throughout SOP.

2. Section V.C.3.c . Incorporate the use of forceps with filter handling and continued throughout the SOP.

3. Section V.C.1.a. Reduced the number of PUF sample traps that will be received.

4. Section V.C.3.c. Changed the status of the PUF blank jar by leaving jar exposed during sampling setup.

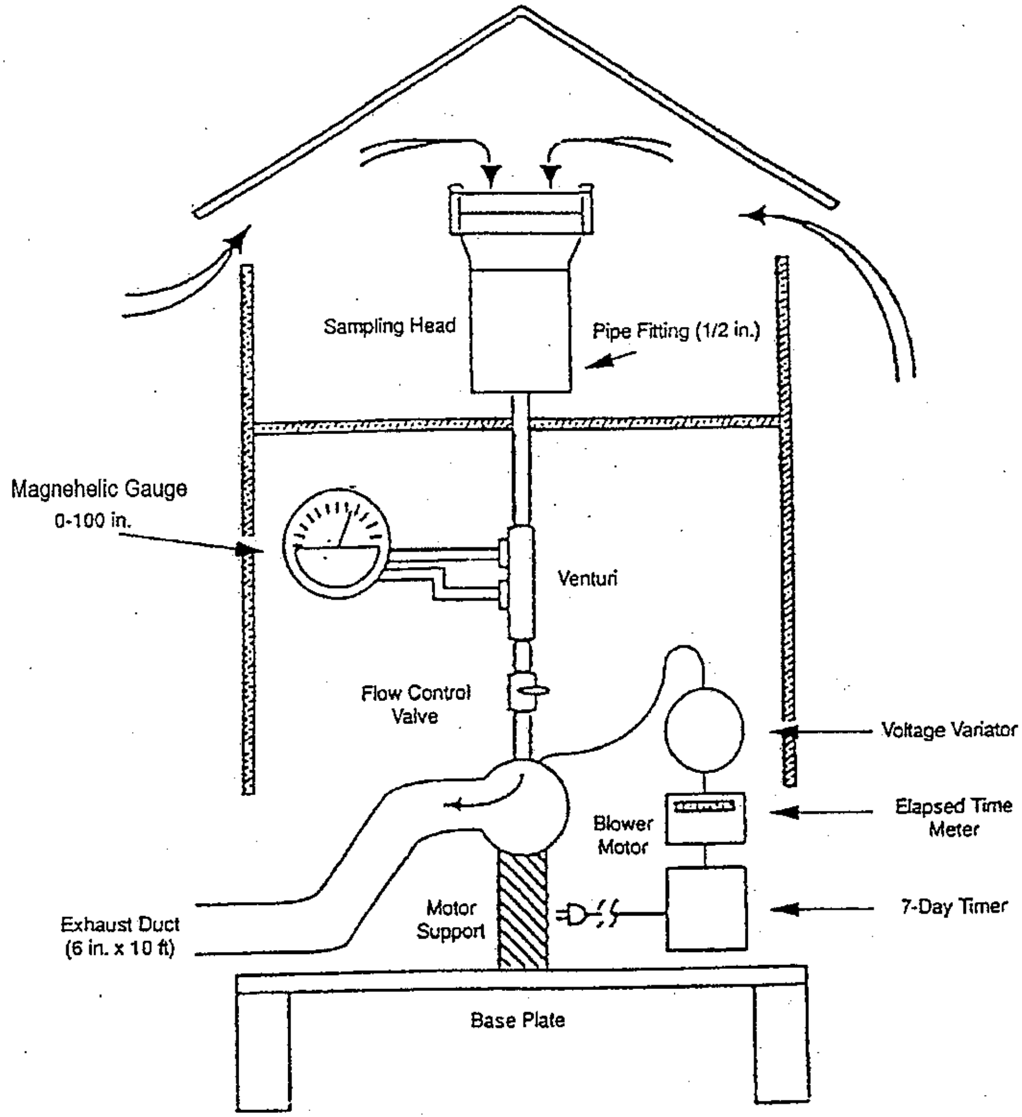


Figure 1. Schematic of PS-1 air sampler.

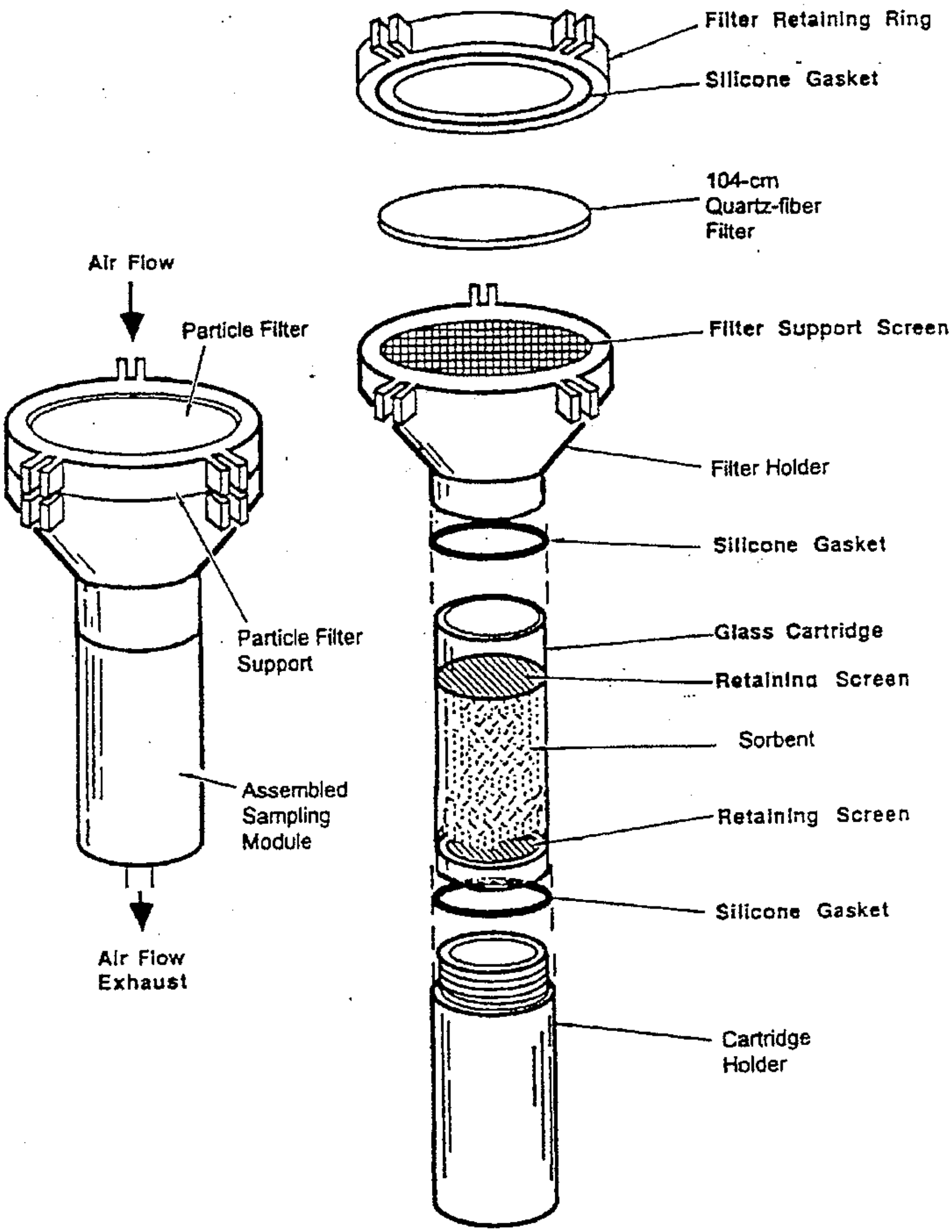


Figure 2. PS-1 sampling head.

National Dioxin Air Monitoring Network

CHAIN-OF-CUSTODY FORM

Shipping Information: Battelle to Sampling Station					
Samples Sent by (Initials/Shipping Date):			Shipping Conditions (e.g. dry ice, blue ice, etc.):		
Shipping Information (Courier/Shipping #):	Received by (Receipt Date/Initials):		Receipt Condition:		
Sample ID	**Quantity**	**Remarks (Initial/Date)**	**Sample ID**	**Quantity**	**Remarks (Initial/Date)**
Shipping Information: Sampling Station to Battelle					
Samples Sent by (Initials/ Shipping Date):			Shipping Conditions (e.g. dry ice, blue ice, etc.):		
Shipping Information (Courier/Shipping #):	Received by (Receipt Date/Initials):		Blue Ice Receipt Condition (circle): Melted Frozen		

Figure 3. Chain-of-Custody Form

NDAMN FIELD CALIBRATION DATA FORM

Site Number: ____________________

Site Location: ______________

Calibration Orifice ID: _________________

Slope ________________

Intercept _____________

Calibration Date: _____________

Time: __________

Calibration Ambient Temperature: ___°F ___°C

Calibration Ambient Barometric Pressure: ___inch Hg ____mm Hg

New Brushes Installed Yes ___ No ___

New Motor Installed Yes ___ No ___

Calibrator's Signature

____

Orifice Manometer Water Column, inches			Monitor Magnehelic, inches (Y2)	Calculated Value Orifice Flow, scm (X1)
Left	Right	Total (Y1)		
			70	
			60	
			50	
			40	
			30	
			20	

Sampler Calibration:

Slope ______________

Intercept ____________

Correlation Coefficient __________________

Sampler Magnehelic Set Point _____________

at 0.24 m^3/min

Figure 4. NDAMN Field Calibration Data Form

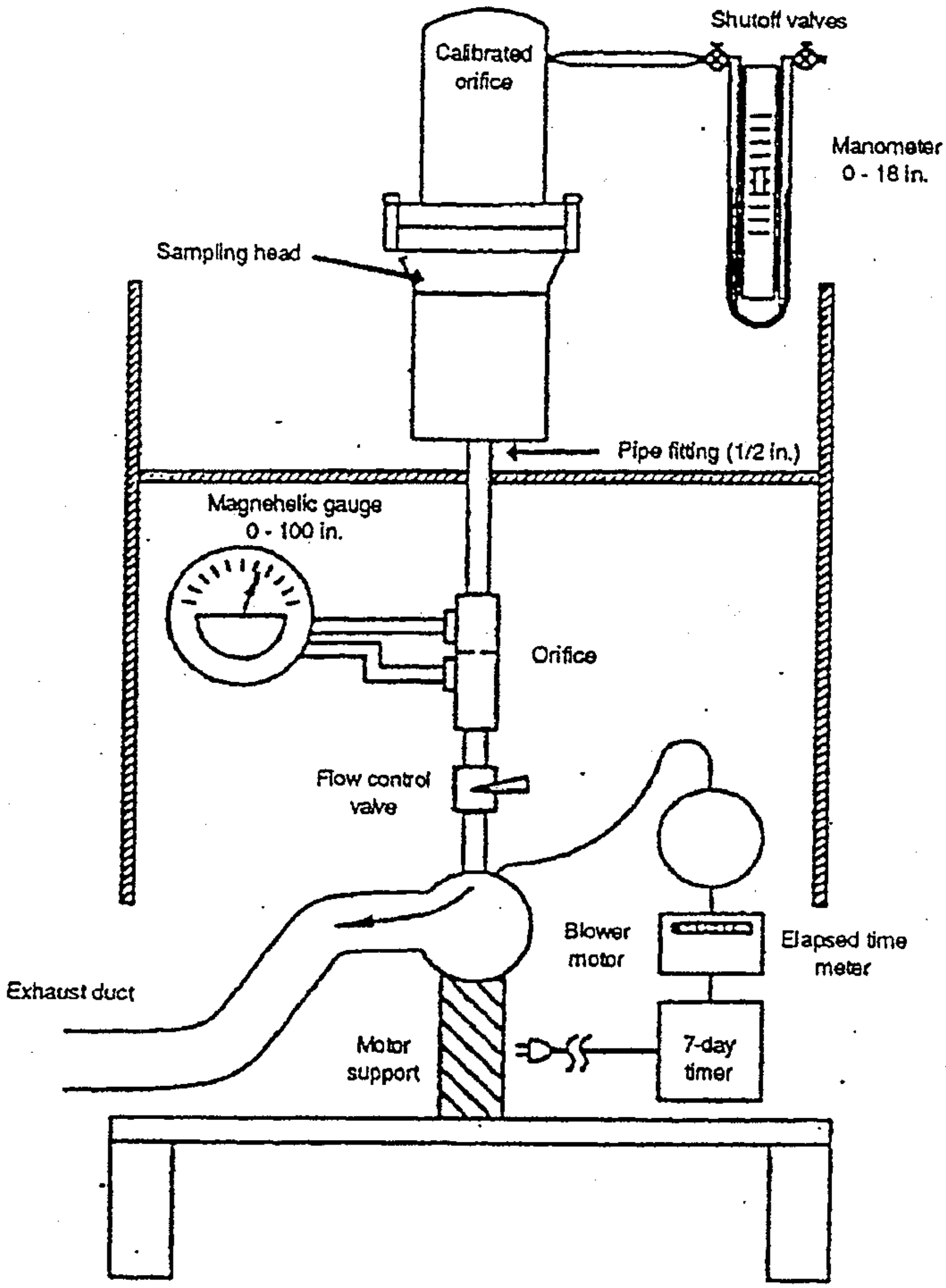


Figure 5. Field calibration configuration of the PS-1 sampler.

NDAMN FIELD TEST DATA FORM

Site Location: ________________ Sampling Moment: ________

Site Number: ________________

PUF Sample Cartridge Number: __________

Date Installed: ___________

PUF Blank Cartridge Number: ________

Filter Sample Jar Number:

____

Filter Blank Jar Number:

____

Sampler Calibration:

Slope (m_2): ___________

Intercept (b_2): _________

Calculated Magnehelic Set Point:________

Sample Week: 1

Timer Set to Start at ___________ Date __________

Timer Set to Stop at ___________ Date __________

	Date	Time	Temp.	Bp	Magnehelic	Running Time
Initial Reading[a]						
Mid-Point Reading						
Final Reading						
					Average ___________	Lapsed Time ___________

(a) Mid-point reading is optional.

Figure 6. NDAMN Field Test Data Form

Site Location: ________________ Sampling Moment: ____________

Site Number: ________________

Sample Week: 2

Timer Set to Start at __________ Date _________

Timer Set to Stop at __________ Date _________

	Date	Time	Temp.	Bp	Magnehelic	Running Time
Initial Reading						
Mid-Point Reading						
Final Reading						
					Average ________	Lapsed Time ________

Sample Week: 3

Timer Set to Start at __________ Date _________

Timer Set to Stop at __________ Date _________

	Date	Time	Temp.	Bp	Magnehelic	Running Time
Initial Reading						
Mid-Point Reading						
Final Reading						
					Average ________	Lapsed Time ________

Figure 7. NDAMN Field Test Data Form (continued)

Site Location: ________________ Sampling Moment: _______

Site Number: ________________

Sample Week: 4

Timer Set to Start at ___________ Date _________

Timer Set to Stop at ___________ Date _________

	Date	Time	Temp.	Bp	Magnehelic	Running Time
Initial Reading	-					
Mid-Point Reading						
Final Reading						
					Average __________	Lapsed Time __________

Sample Recovery:

Place samples in correct sample container, complete chain-of-custody form, place in insulated container, add frozen blue ice, and ship to Battelle using supplied Federal Express label.

Figure 8. NDAMN Field Test Data Form (continued)

QUALITY CONTROL CHECKLIST FORM

Sample Site number: ____________ **Sampling moment:** ________

Site Location: ______________

Have new brushes ________ **or new motor** _______ **been installed?**

Date: ________________ **Signature:** _________________________

Has the presampling multiport calibration been completed? ___________

Initial Setup

_____ **Gloves used to handle sample media**

_____ **Glass sleeve with PUF in place**

_____ **Quartz fiber filter in place**

_____ **PUF blank opened**

_____ **First quartz fiber filter blank in blank filter jar**

Sample Collection

Week 1	Week 2	Week 3	Week 4	
_______	_______	_______	_______	Elapsed time
_______	_______	_______	_______	Final readings taken
_______	_______	_______	_______	Non-powdered gloves worn
_______	_______	_______	_______	QFF removed, placed in collection jar
_______	_______	_______	_______	Field blank collected
_______	_______	_______	_______	Samples returned to cooler

Sample Recovery

_______ Multi-point calibration performed
_______ Glass sleeves and PUFs removed and wrapped in clean foil
_______ Glass sleeves packed into jars with brown paper
_______ QFF jars wrapped in clean foil
_______ Jars and foil labeled with sample identification (permanent marker)

Sample Shipment Activities

_______ Samples packed on blue ice
_______ Cooler(s) taped securely
_______ All samples accounted for
_______ Airbill/tracking number

Figure 9. Quality Control Checklist Form

CONTACT LIST FOR NATIONAL DIOXIN AIR MONITORING NETWORK

Site	Site Name	Site Address/Location	Mailing Address
1/2	Penn Nursery, PA	Penn Nursery The Pennsylvania State University	The Pennsylvania State University 220 Forest Resource Building University Park, PA 16802-4704
3	Clinton Crops NC	Horticultural Crops Research Station Clinton, NC	Horticulture Crops Research Station 2450 Faison Highway Clinton, NC 28328
4	Everglades, FL	Everglades, FL	Beard Center, Everglades National Park 40001 State Road 9336 Homestead, FL 33034
5	Lake Dubay, WI	Lake DuBay, Wisconsin	DNR Ranger Station 1242 River Road Wisconsin Dells, WI 53965
6	Monmouth, IL	Northwest Illinois Agricultural Research and Demonstration Center	2532 45th Street Little York, IL 61453
7	McNay, IA	McNay Research and Demonstration Farm Chariton, IA 50049	McNay R&D Farm RR 2 Box 152 Chariton, IA 50049
8	Lake Scott, KS	Lake Scott, KS State Park	2004 Arapaho Street Garden City, KS 67846
9	Bixby, OK	Bixby, Oklahoma Water Treatment Plant	16510 East 181st Street South Bixby, OK 74008
10	Arkadelphia, AR	Arkadelphia, AR	Ouachita Baptist University 410 Ouachita Street, Box 3747 Arkadelphia, AR 71998-0001
11	Bennington, VT	Bennington County, VT	Williams College 165 Bronfman Science Center Williamstown, MA 01267
12	Jasper, NY	Jasper, NY	Environmental Studies Department Alfred University Alfred, NY 14802
13	Beltsville, MD	USDA Agricultural Research Farm Beltsville, MD	USDA/ARS Environmental Chemistry Laboratory 10300 Baltimore Avenue Building 7, Rm. 029 Beltsville, MD 20705
14	Caldwell, OH	Caldwell, Ohio	8050 Corwin Road Cumberland, OH 43732
15	Oxford, OH	Oxford, Ohio	Miami University, Dept. of Geography 217 Shideler Hall Oxford, OH 45056

Site	Site Name	Site Address/Location	Mailing Address
16	Dixon Springs, IL	Dixon Springs Agricultural Center	Dixon Springs Agricultural Center Rt. 1, Box 256 Simpson, IL 62985
17	Quincy, FL	Institute of Food and Agricultural Services North Florida Research & Education Center	North Florida Research and Education Center 30 Research Road Quincy, FL 32351
18	Bay St. Louis, MS	Stennis Space Center	USEPA Env. Chem. Lab, Bldg. 1105 Stennis Space Center Stennis, MS 39529-6000
19	Padre Island, TX	Padre Island National Seashore	Padre Island National Seashore 20301 Park Road 22 Corpus Christi, TX 78418
20	Fond du Lac, MN	Fond du Lac Reservation	Environmental Program 1720 Big Lake Road Cloquet, MN 55720
21	North Platte, NE	West Central Research and Extension Center North Platte, NE	West Central Research and Extension Center RR # 4, Box 46A North Platte, NE 69101
22	Goodwell, OK	Panhandle Research and Extension Center Route 1, Box 86M Goodwell, OK 73939	Farmers Elevator 247 South Main Street Goodwell, OK 73939
23	Big Bend, TX	Big Bend National Park	1 Mesquite Street, Science Building Big Bend, TX 79834
24	Grand Canyon, AZ	Grand Canyon National Park	Grand Canyon National Park 1 Clinic Road Grand Canyon, AZ 86023
25	Theodore Roosevelt, ND	Theodore Roosevelt National Park Painted Canyon Visitor Center Medora, ND	Theodore Roosevelt National Park 315 2nd Avenue Medora, ND 58645
26	Craters of the Moon, ID	Craters of the Moon National Monument U.S. Route 20; 18 miles south of Arco, ID 83213	Craters of the Moon National Monument U.S. Route 20; 18 miles south of Arco, ID 83213
27	Chiricahua, AZ	Chiricahua National Monument Willcox, AZ 85643	Chiricahua National Monument HCR#2, Box 6500 Willcox, AZ 85643
28	To be determined	To be determined	
29	Hyslop Farm, OR	Hyslop Farm 3455 NE Granger Road Corvallis, OR 97330	36192 Marval Road Blodgett, OR 97326
30	Ozette Lake, WA	Ozette Lake Ranger Station	Olympic National Park 21261 Hoko Ozette Road Clallam Bay, WA 98326
31	Fort Cronkhite, CA	San Francisco, CA	939 Ellis Street San Francisco, CA 94109