NAREL Quality Assurance Project Plan

Deployment of Air Monitors to the WIPP Site

Effective Date April 5, 2014

WIPP/QAPP-1

National Analytical Radiation Environmental Laboratory
Office of Radiation and Indoor Air
540 S. Morris Avenue
Montgomery, Alabama 36115

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This Quality Assurance Project Plan has been prepared in accordance with requirements described in EPA QA/R-5, “EPA Requirements for Quality Assurance Project Plans,” United States Environmental Protection Agency, Office of Environmental Information, Washington, D.C., March 2001, re-issued May 2006.

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Quality Assurance Project Plan – Deployment of Air Monitors to the WIPP Site

WIPP /QAPP-1
Revision 0
April 5, 2014

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A PROJECT MANAGEMENT

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A.4 Project Organization

A.4.1 National Analytical Radiation Environmental Laboratory (NAREL)

NAREL will deploy personnel and equipment to the site for the purpose of collecting air samples from three areas around the WIPP site, co-locating their monitors with monitors currently being used by DOE and contractor staff at the WIPP site.

The deployed field team will collect filters from the monitors, count the samples with hand-held instruments, and then package and ship the filters to the fixed lab at NAREL by UPS. These samples will consist of 2" glass fiber particulate filters.

NAREL will receive the air samples that have been collected. At NAREL, the samples will be individually processed for isotopic analysis for ^{241}Am, ^{238}Pu, and $^{239/240}$Pu.

The members of the (initial) deployment team are:

Sam Poppell (NAREL)	RERT Commander
Christopher Royce (NAREL)	Health Physicist
Scott Faller (NCRFO)	RERT Team Member

The key NAREL personnel responsible for implementation of this QAPP are:

John G. Griggs, Ph.D.	Laboratory Director
Michael Clark	Deputy Director
Mary Wisdom	Quality Assurance Manager
Sam Poppell	RERT Commander
Christopher Royce	Deputy RERT Commander
Cindy White	Center Director, CERLS
Keith McCroan	Quality Assurance Officer, CERLS

NAREL's organizational structure is described in its Quality Management Plan.

A.4.2 WIPP Sample Analysis and Data Comparison Team (RPD and NAREL)

The WIPP Sample Analysis and Data Comparison Team will receive analytical results from filter analyses from NAREL, as a product of this deployment, and will also receive analytical results from the WIPP laboratory. The WIPP laboratory

results will be analytical data from analysis of filters from previously established DOE monitors. NAREL will co-locate its portable monitors with three established DOE sites around the WIPP location.

The Data Comparison Team will compare the laboratory analytical results from the two laboratories for each monitor location, using statistical tests and professional judgement.

The goal is to determine whether EPA, with similar methods and site locations, corroborates the analytical results that DOE obtains from its monitors.

The members of the Data Comparison Team are:

David Pawel	Statistician, RPD
Jonathan Walsh	WIPP Inspection Team Lead
Keith McCroan, Ph.D.	Quality Assurance Officer, NAREL

A.5 Problem Definition

A.5.1 History and Background

On February 14, 2014, a continuous air monitor (CAM) in the underground mine facility at the Waste Isolation Pilot Plant (WIPP), approximately 2150 feet below the surface of the ground, alarmed. A CAM detects airborne radioactivity. The underground CAM was located in the vicinity of where waste was being placed. When the CAM alarmed, bypass dampers automatically closed in the exhaust ducts.

The following day, an above ground exhaust air monitor on the WIPP site detected very low levels of airborne radioactive contamination.

On March 25, U.S. Senators Tom Udall and Martin Heinrich of New Mexico requested that EPA deploy mobile environmental monitoring units to the WIPP, in order to conduct independent tests and help respond to questions that have arisen from the local community about safety following the February radiation leak at WIPP.

EPA is a key public health agency responsible for setting standards for acceptable levels of public exposure to both natural and man-made sources of radiation in air, water, and soil. It is also the Federal environmental regulator of WIPP and has authority over external radiation releases. EPA has assisted in a similar way in the past, including deploying radiation monitors to the Los Alamos area during fires in 2000 and 2011.

A.5.3 Decisions to be Made

The purpose of the deployment is to co-locate air monitors at three sites where DOE has established air monitors. DOE contractors and EPA sampling teams will begin and end their sampling at the same time during this project, and filters will be collected from all the designated monitors. Filters from the WIPP monitors will be sent to the WIPP laboratory as usual, for analysis for isotopes of plutonium and americium. Filters from the EPA monitors will be shipped by UPS to the fixed laboratory, NAREL, in Montgomery, Alabama, for similar analysis for plutonium and americium.

NAREL laboratory and field staff have consulted with DOE, RPD, and contractor staff so that NAREL is able to closely mimic the sample collection and laboratory

analytical processes used by the WIPP site sample collectors and the WIPP laboratory.

Once analytical results from the analysis of the filters are available from both laboratories, data will be sent to the WIPP Sample Analysis and Data Comparison Team. Using statistical tests and professional judgment, the team will compare matched pairs of data, i.e., a numerical result for an isotope taken from the DOE monitor and the co-located EPA monitor at the same time, to determine if the results are comparable.

A.6 Project/Task Description and Schedule

A.6.1 Purpose

NAREL will deploy two RERT team members and a number of F & J DL-28B Low Volume Air Samplers to the WIPP site located 33 miles southeast of Carlsbad, New Mexico. NCRFO will deploy one RERT team member to join the NAREL team. The EPA monitors will be co-located with at least three sites of established DOE monitors that routinely monitor air around the WIPP site for radiation. Air samples will be collected and shipped to the fixed laboratory, NAREL, in Montgomery, Alabama, for analysis.

EPA will co-locate one pair of EPA monitors at the WFF monitor location in order to directly compare data from two different monitors of the same type, as well as comparing data from the DOE monitor.

The air samplers will be in place in anticipation of the re-opening of the tunnel which has been closed since the February incident.

A.6.2 Schedule

The schedule for deployment is fluid. At the time of this initial QAPP, the intended schedule is that the personnel and equipment from NAREL will deploy from Montgomery on Saturday, April 5, 2014. NAREL RERT members will drive to the WIPP site bringing with them the portable air sampling monitors and all other equipment and consumables needed for the incident deployment.

The RERT Team member from the ORIA Las Vegas, Nevada, office, NCRFO, will arrive at the site at approximately the same time. The team expects to be at the site by Monday, April 7.

The team will position the air samplers and begin collecting background samples. The monitors will continue to run as long as possible before the day of the re-opening of the shaft. The team will remove the background filters and prepare them for shipping to NAREL. Both DOE and EPA monitors will begin sampling shortly before the re-opening of the shaft, to monitor for any possible radioactive particulate matter escaping from the shaft.

Once the monitoring begins, the air samplers will run for seven days collecting the sample. At the end of that time, the filters will be removed from the EPA monitors and prepared for shipment to NAREL for isotopic analysis. The filters from the DOE monitors will be removed at the same time and processed as usual in the WIPP laboratory.

At this time, it is uncertain whether or not a second round of samples will be taken the following week by the EPA sampling team. There is the potential for allowing the air samplers to remain at the site for an additional week or two, but

having the weekly filter changes made by staff from EPA Region VI or the State of New Mexico.

A.6.3 Deployment Locations

EPA will locate its air samplers at three established sites around the WIPP:

Sampling Location	Latitude	Longitude
WIPP Far Field (WFF)	32.377633	-103.798817
WIPP East (WEE)	32.3717	-103.787983
WIPP South (WSS)	32.3677	-103.79255

See Appendix 1 for a map of the sampling locations.

EPA will co-locate two of its DL-28B samplers at the WFF sampling sites so that a direct comparison can be made of the variabilities between samplers of the same type.

A.6.4 Samples and Measurements

The work schedule is directly related to the re-entry schedules being established to enter the underground portions of the WIPP.

Air samples will be collected using 2” glass fiber particulate filters.

The initial round of samples for background will be collected and counted for as many hours as possible before the filters must be prepared for the timing of the re-opening of the shaft.

The first sampling round will begin shortly before the re-opening and re-entry process begins, and will run for seven days.

A.6.5 Field Data

EPA will not collect electronic data in the field.

The sampler operator will screen each filter in the field once it is removed from the sampler. The operator will count the filters for alpha-beta using an iSolo. Results of the field screening will be documented on the sample control forms. Screening is performed as a precaution, both for health and safety reasons and to ensure the filters can be shipped to NAREL without requiring any special labeling or handling.

A.6.6 Laboratory Analysis

The fixed laboratory at NAREL will receive the filters from the EPA monitors along with a Chain of Custody form and all relevant information about each sample.

The laboratory will wet ash each filter and analyze for ^{241}Am, ^{238}Pu, and $^{239/240}$Pu using a method essentially similar to the method used at the WIPP laboratory.

Each prepared sample will be counted by alpha spectrometry for 1000 minutes or longer, in order to obtain MDAs similar to those obtained at the WIPP laboratory.

A.7 Quality Objectives and Criteria for Measurement Data

A.7.1 Field Measurements

Field measurements, i.e., screening for gross alpha-beta, are made only for purposes of health and safety and to ensure that samples can be safely shipped by common carrier. No objective criteria are required for the screening measurements.

A.7.2 Laboratory Data

This QAPP covers a very limited deployment of a small number of air samplers. The purpose of the deployment is to sample the air in the same manner used by DOE, and to analyze the samples in the laboratory in a manner closely similar to that used by the WIPP lab. Data from DOE and EPA co-located monitors will be compared using statistical tests and professional judgment. While there are no objective criteria for these limited measurements and comparisons, the quality objective is to evaluate the comparability between DOE and EPA data (see Appendix 2 as a possible process to be used.) A written report of this comparison will be generated and provided to the ORIA Office Director.

Data quality objectives for the laboratory analysis of project samples are the normal analytical procedures and quality control acceptance criteria routinely followed by NAREL.

NAREL reports each quantitative result of a laboratory radiochemical analysis with a numerical value, unit of measurement, and associated uncertainty of measurement. The reference date and time for the result, usually a decay-corrected result, is also reported.

NAREL follows the *Guide to the Expression of Uncertainty in Measurement* (commonly known as the GUM) when evaluating and expressing measurement uncertainty.

NAREL routinely reports an expanded uncertainty U with each measured value y. By default, the expanded uncertainty U is calculated as the product of the combined standard uncertainty $u_c(y)$ and the coverage factor $k = 2$. The reported coverage interval $[y - U, y + U]$ should have a coverage probability of approximately 95 %.

NAREL reports sample-specific MDCs. The sample-specific MDC may be used to judge whether NAREL has met the client's expectation or requirements for detection capability. The MDC is decay-corrected in the same manner as the measurement result and is expressed in the same unit of measurement. The MDC should not be used to make decisions about the presence or absence of an analyte in a sample. The critical value, or decision level, is the appropriate threshold for such decisions.

A.8 Special Training Requirements/Qualifications

A.8.1 Sampling Team Members

Each sampler operator must be familiar with the DL-28B air sampler and be competent in its use. Each operator will have a copy of *FMM/SOP-13, NAREL Standard Operating Procedure for the Operation of the F & J DL-28B Air*

Sampler, which contains specific information for calibration, maintenance, and operation of the sampler.

Sampling team members are also expected to have:

- Radiation Safety (RW2) training
- 40-hour HAZWOPER training
- Required WIPP site-specific HazCon training

A.8.2 Laboratory Analysts

NAREL fixed laboratory staff are knowledgeable, well-trained, and experienced. Laboratory staff routinely performs radiochemical analysis and data evaluation. Laboratory analysts must be trained and certified for the analytical procedures they conduct.

Each analyst at NAREL must be certified to perform each analysis according to the requirements of the *NAREL Standard Operating Procedure for Training and Certification of Laboratory Personnel* (QA/SOP-9). This process requires study, familiarity with the analytical SOP, on-the-job training with a mentor, demonstration of acceptable technique, passing of a written exam on the procedure, and successfully analyzing a series of spiked samples as a practical exam. Each analyst must analyze performance samples at least twice a year.

A.8.3 Data Reviewers

Each person who reviews data at any step must be qualified by training and experience in that particular area of laboratory operations. Final reviews of laboratory data are conducted by the analytical branch Quality Assurance Officer and by the NAREL Quality Assurance Manager.

A.9 Documents and Records

A.9.1 Field Records

Original COC forms and SCFs are kept with the samples and are ultimately stored with related information at NAREL.

The operator maintains the Field Monitoring Log and copies of COC forms and SCFs for his or her records.

Each operator is given an uncontrolled copy of the *SOP for the Operation of the F & J DL-28B Low Volume Air Sampler.*

All records of calibrations, maintenance, and repairs to equipment are maintained at NAREL. Physical copies of evidence of calibration are kept with the equipment. Physical and electronic copies of calibrations are maintained at NAREL.

A.9.2 Laboratory Documents and Records

All documents such as sample acceptance forms, chains of custody, logbooks, instrument printouts, copies of reports, and review forms are retained in files at NAREL.

Analytical results for the samples are stored in the NAREL LIMS and are never deleted.

The original signed copy of each SOP is maintained by the NAREL Quality Assurance Manager. The current revision of each SOP is available electronically in the NAREL Document Control System.

A.9.3 Maintenance and Archiving of Documents and Records

NAREL policy states that all hard copies of analytical data and supporting data are maintained at NAREL for at least five years.

Data and information in the LIMS are never deleted. The LIMS system and other electronic data systems are backed up every night. Once a week, they are backed up on tape which is stored off-site by a commercial firm.

B Measurement/Data Acquisition

B.1 Sampling Process Design

EPA has a narrow focus for this deployment. Joint discussions between DOE and EPA resulted in an agreement that NAREL and NCRFO deploy a total of three RERT team members and a limited number of portable air samplers to the WIPP site.

The current plan is that EPA will collect four background samples before the date of the tunnel re-entry. At the time of the re-entry, EPA will begin collecting an additional four samples. Those samples will be collected over a period of seven days. It is possible that EPA may leave the monitors in place for a third sampling period, but allow them to be operated by staff from either EPA Region VI or the State of New Mexico.

DOE and EPA have chosen three of the existing DOE monitoring sites for placement of EPA air samplers. EPA will co-locate two of its monitors at one of the WIPP monitors.

B.2 Sampling Method

EPA will set up a total of four F & J DL-28B Low Volume Air Samplers at three existing DOE monitoring sites, co-locating with existing DOE samplers. The DL-28B is capable of maintaining a nearly constant sample flow rate from 0.5 to 4.3 cubic feet per minute at standard temperature and pressure (SCFM). The DL-28B model low volume air sampler utilizes a 2” glass fiber filter that may be followed by a 30 x 50 Mesh TEDA charcoal or a 50 x 80 Mesh silver zeolite cartridge depending on the application.

Samples (filters) will be collected in accordance with the *NAREL Standard Operating Procedure for Use of the F & J DL-28B Low Volume Air Sampler*. The filters will be collected, screened for gross alpha-beta, and prepared for shipment to NAREL where they will be processed for isotopic analysis.

The sample collector is instructed to assume the sampler head is contaminated after removing each filter, and treat it accordingly. The operator must replace the sample holder with a clean one and decontaminate the previous sampler head. The operator will then screen the sampler head using swipes and appropriate instruments for detecting Gross Alpha/Beta/Gamma. No sampler head will be reused if the screen indicates it contains greater than 20 dpm/100cm^2 Alpha contamination or 1000 dpm/100cm^2 Beta Gamma contamination.

If any contamination is detected above background and a clean sampler head cannot be used for the next sample, the operator must document contamination levels present on the new sample SCF.

B.3 Sample Handling and Custody

There are no holding times for analysis of plutonium and americium isotopes. Filters and all sample information should be shipped to NAREL as soon as feasible.

At the end of a sampling period, the operator will remove the filter from the sampler using the procedure in the SOP. He will visually inspect the filter for damage and record any damage on the SCF. The operator will record information for the air sampler:

- Start and Stop Dates and Times
- Any power outages that occurred during the sampling period
- Total Volume and Average Flow Rate
- High and Low flow rates, if space is available on the SCF
- High and Low temperatures, if space is available on the SCF

The operator will wait at least 30 minutes after the filter is removed, and then count each filter in the Canberra iSolo instrument for gross alpha-beta activity. If the count is above background level, the operator will wait until four hours have elapsed, in order to eliminate the contribution of radon progeny to the count. The filter will then be re-counted using the iSolo. Field screening information is documented on the SCF.

Each filter will be placed into a clean glassine envelope and the top folded to prevent loss of any loose sample material. The glassine envelope will be labeled with the number of the corresponding Sample Control Form as a sample ID. The operator will place the labeled glassine envelope into a sealable plastic bag which will be labeled with the same SCF number. The original SCF is placed into the plastic bag with the sample.

The operator will complete the chain-of-custody forms, documenting all samples and analysis requests.

Samples are to be shipped using UPS overnight or two-day shipping, as requested by NAREL.

B.4 Analytical Methods

Upon receipt at NAREL, sample shipment containers are screened for radiation and then unpacked. Samples are checked against accompanying documentation such as a chain of custody, and any discrepancies are resolved. Sample information is double- entered into the LIMS (Laboratory Information Management System) which is used to track samples, to assign samples to delivery and QC batches, to store analytical results, and to report results to clients. All documents such as sample acceptance forms, chains of custody, instrument printouts, copies of reports, and review forms are retained in files at NAREL.

All routine procedures at NAREL are conducted according to the *NAREL Quality Management Plan* (QA/QMP-1), the *NAREL Radiochemistry Quality Assurance Manual* (QA/QAM-1), and specific Standard Operating Procedures. The following SOPs are to be used for this project:

- Use of the F & J DL-28B Low Volume Air Sampler
- Preparing and Validating Radiochemical Tracers, Spiking Solutions, and Calibration Solutions (QA/SOP-4)
- Training and Certification of Laboratory Personnel (QA/SOP-9

- Use of Laboratory Logbooks (DR/SOP-1)
- Sample Tracking (SRP/SOP-1
- Receipt, Log-in, and Storage of Environmental Samples (SRP/SOP-2
- Maintenance and Use of Balances (SE/SOP-1
- Cleaning of Laboratory Glassware and Planchets (SE/SOP-2)
- Calibration, Maintenance, and Use of Pipets (Se/SOP-4)
- Actinides in Environmental Matrices by Extraction Chromatography (AM/SOP-1)
- Preparation of Environmental Samples for Radiochemical Analysis (SRP/SOP-3)
- Review of Radiochemistry Data (DR/SOP-2)
- Production, Review, and Shipping of Radioanalytical Data Packages (DR/SOP-3)
- Calibration and Use of Alpha Spectrometers Using AlphaVision (NC/SOP-8)
- Quality System Corrective Action (QA/SOP-5)

All NAREL analytical method SOPs contain method performance data for that analysis. NAREL SOPs are available as uncontrolled documents in a PDF format.

Problems that occur during sample handling, analysis, or review require initiation of a Corrective Action Report using an electronic system which allows tracking of investigation steps and corrective actions taken. CARs are tracked and monitored by the Center Quality Assurance Officer and the NAREL Quality Assurance Manager.

Air filters received as a result of the WIPP deployment will essentially be handled in the same manner as routine air samples at NAREL. They will be prepared and analyzed for ^{241}Am, ^{238}Pu, and $^{239/240}$Pu. Samples will be counted by alpha spectrometry for 1000 minutes minimum.

There may be two deviations from NAREL's standard process for actinides analysis. NAREL will add tracer solutions for plutonium and americium to the filters before they are digested, to mimic the procedure used at the WIPP laboratory. In addition, in order to meet the MDAs obtained by the WIPP laboratory, it may be necessary to count the samples for longer than 1000 minutes.

There will be a third deviation from standard practice in the preparation of the sample aliquant. Generally, when NAREL analyzes a filter, the analyst wet ashes the filter, brings it to a volume, and uses only a portion of that volume as the sample for analysis. This allows saving the additional material in case of analytical problems that necessitates reanalyzing the sample. The WIPP laboratory uses the entire volume from the whole filter for its analysis. In order to mimic the WIPP laboratory procedure, NAREL will also use the entire filter as a sample.

Any such deviation from the SOP will be documented in a formal memo from the QA Manager to staff and for the project file.

B.5 Quality Control

A QC batch consists of up to 20 field samples plus any related QC samples. For a batch of ashed filter samples to be analyzed for plutonium and americium, the analyst prepares a method blank, an LCS, and a duplicate (second aliquant of the sample) as QC samples. Results of QC samples are evaluated against QC criteria.

Analysts are required to control chart results from blanks and laboratory control samples, and to observe the control charts for indicators of possible problems in the measurement system. LIMS software allows the analyst to input data points and to view and print the control charts.

See the *NAREL Radiochemistry Quality Assurance Manual* for acceptance criteria for QC samples and equations for calculating values for quality indicators.

B.6 Instrument/Equipment Testing, Inspection, and Maintenance

B.6.1 Field Equipment

The F & J air samplers are maintained at NAREL and are inspected routinely. Maintenance is limited to replacement of gaskets when needed, and at least annually, and routine annual calibrations.

For this deployment, extra air samplers will be carried to the site in order to provide spare parts in the event there are problems with the deployed monitors.

B.6.2 Laboratory Instruments and Equipment

Laboratory instruments and equipment at the laboratory are used, calibrated, and maintained according to accepted good laboratory practices, the laboratory's written policies, and the laboratory's SOPs.

Regular efficiency checks are performed on every detector in use at the laboratory according to standard operating procedures and written policies. Criteria and corrective actions are in place which dictate procedures when checks fail.

Regular background measurements are required for all detectors Backgrounds are measured daily for proportional counters, twice a month for alpha spectrometers, monthly for germanium detectors, and immediately before a sample is counted on a scintillation counter. Weekly background counts are performed for the alpha and gamma detectors.

B.7 Instrument/Equipment Calibration and Frequency

B.7.1 Field Equipment

The DL-28B is calibrated annually. Calibration is performed at NAREL using the calibration procedure in Appendix 18.6 of the SOP for Use of the F & J DL-28B Low Volume Air Sampler.

If repair or maintenance is required on the DL-28B or the sampler cannot be calibrated at NAREL, the sampler is sent to the manufacturer for repair and calibration.

B.7.2 Laboratory Instruments

Laboratory instruments are routinely calibrated and operated, and procedures fully documented, in accordance with SOPs specific to each type of instrument. SOPs are available for calibration, maintenance, and use of each type of nuclear counting instrument in use at the fixed laboratory as well as for review and reporting of analytical data.

B.8 Inspection/Acceptance for Supplies and Consumables

B.8.1 Field Supplies

For this deployment to the WIPP, critical supplies for the field team include:

- 2” glass fiber filters
- Glassine envelopes
- Ziplock bags
- Sample Control Forms
- Chain-of-Custody Forms
- Field Monitoring Logs
- Pens
- GPS Units
- Gas
- Gloves

Christopher Royce and Sam Poppell will be responsible for the supplies during the deployment. Spencer Hamil (CEM/NAREL) is able to ship additional equipment to the site if required.

B.8.2 Laboratory Supplies

Laboratory supplies are handled as a matter of routine. Generally, each individual analyst and technician maintains a limited inventory of needed supplies. NAREL procurement policy defines responsibility of each person purchasing supplies and equipment to inspect purchases on their arrival at NAREL and to assure that the items received meet expectations and requirements.

B.9 Non-Direct Measurements

For this limited project, there is no anticipated use of non-direct measurements from any source.

B.10 Data Management

Data from the field and laboratory will be handled for the WIPP deployment according to procedures documented in the NAREL Radiochemistry Quality Assurance Manual and relevant Standard Operating Procedures.

All documentation produced in the field, including SCFs, FMLs, and COCs, will be sent to the laboratory with the samples.

Samples will be logged into the NAREL LIMS and given a unique NAREL Sample ID. All sample information will be tracked using the unique ID. All forms, logbook pages, instrument printouts, and reports reference the NAREL ID. All records associated with the sample are filed together in a project-specific file.

Analytical results are stored in the LIMS and are never deleted. Information in LIMS includes location of the sample, air volume, time and date of collection, and other relevant information for each sample.

Samples are prepared and analyzed in QC batches of up to 20 samples plus associated QC samples.

All steps in the receipt, handling, tracking, preparation, analysis, review, and reporting of analytical results are detailed in specific SOPs. See Section B.4 of this QAPP for a list of SOPs pertinent to this WIPP deployment project.

All sample data in LIMS can be accessed by NAREL staff authorized to do so. No data can be changed or deleted. The LIMS is backed up nightly, and backed up to tape weekly for off-site storage.

After NAREL has analyzed the samples from the WIPP deployment, and the WIPP laboratory has completed analysis of corresponding samples from the DOE monitors, all data will be sent to the Sample Analysis and Data Comparison Team. The team will use statistical tests and professional judgement in reviewing the data for comparability between the paired monitors.

A suggested method for comparing the pairs of data is included in this QAPP as Appendix 2.

All software and hardware are subject to evaluation according to their use and purpose. New software or revisions to current software requires a formal, documented software testing process. This includes a testing plan, which must be approved by several key people at NAREL, followed by a defined test process and period, which must be documented. After the testing has been successfully completed, there is a formal documentation of the software's acceptability before it is available for use by analysts or others.

NAREL operates under a formal document control system, described in the *NAREL SOP for Document Control,* which presents the policies and procedures for the production, review, revision, storage, and distribution of documents. Document control policies apply to all printed internal documents that are maintained by or for NAREL personnel on a continuing basis for a period longer than one year. Controlled documents include, but are not limited to, the *NAREL Quality Management Plan* (QMP), Quality Assurance Manuals (QAMs), Quality Assurance Project Plans (QAPPs), SOPs, technical documentation, and forms.

The Document Control Officer maintains the NAREL Document Control System, maintains current copies of all controlled documents in hard copy and electronic forms, approves any new or revised documents in the system, and has primary responsibility for the *NAREL SOP for Document Control.*

C Assessment/Oversight

C.1 Assessments and Response Actions

EPA does not expect to conduct field assessments of the filters during this deployment.

All laboratory operations undergo an annual internal Quality Assurance audit. Parts of that audit may incidentally occur during the process of this deployment, but are not intentionally scheduled for that time period.

C.2 Reports to Management

ORIA EPA and representatives of the WIPP site will continue to have daily briefings either by conference call or email updates. These will be led by the WIPP Inspection Team Lead, Tom Peake, or his designee, Jonathan Walsh, and will include significant input from the sampling team lead, Sam Poppell, and the NAREL laboratory staff.

EPA ORIA will provide a written report on the results and findings of the deployment and filter analyses. EPA also expects to brief ORIA senior leadership on the findings, along with staff from the Office of Congressional and Intergovernmental Relations, and the Office of Air and Radiation leadership team.

Once data collection and analysis activities are complete, EPA ORIA will post the data onto the EPA radiation website with appropriate communications. The Center for Radiation Information and Outreach (CRIO) in RPD will take the lead on the website and Region VI public affairs office. CRIO will also take the lead in developing appropriate communication materials on the study findings for delivery to the Office of Congressional and Intergovernmental Relations.

D. Data Validation and Usability

D.1 Data Review, Verification, and Validation

This QAPP covers a very limited time period and will result in analysis of a very few samples, probably only eight, and possibly a total of 12. NAREL will use its routine procedures for data review and will apply usual procedures in order to flag or reject data. These are detailed in the NAREL Radiochemistry Quality Assurance Manual, the SOP for Radiochemistry Data Review, and the individual instrument and analytical method SOPs. See Section B.4 for a list of NAREL SOPs used for this project.

D.2 Validation and Verification Methods

NAREL does not validate its own analytical data. There is no formal verification and validation process anticipated for the limited data set that NAREL will provide from this deployment.

D.3 Reconciliation with User Requirements

EPA ORIA, and particularly the WIPP Oversight Team, have asked NAREL to provide a limited data set as a result of this deployment. NAREL and DOE will provide analytical results for use in comparing corresponding pairs of analytical result.

Appendices

1 Map of Active and Proposed Air Sampling Sites at the WIPP

2 Possible Process for Comparing Data Pairs

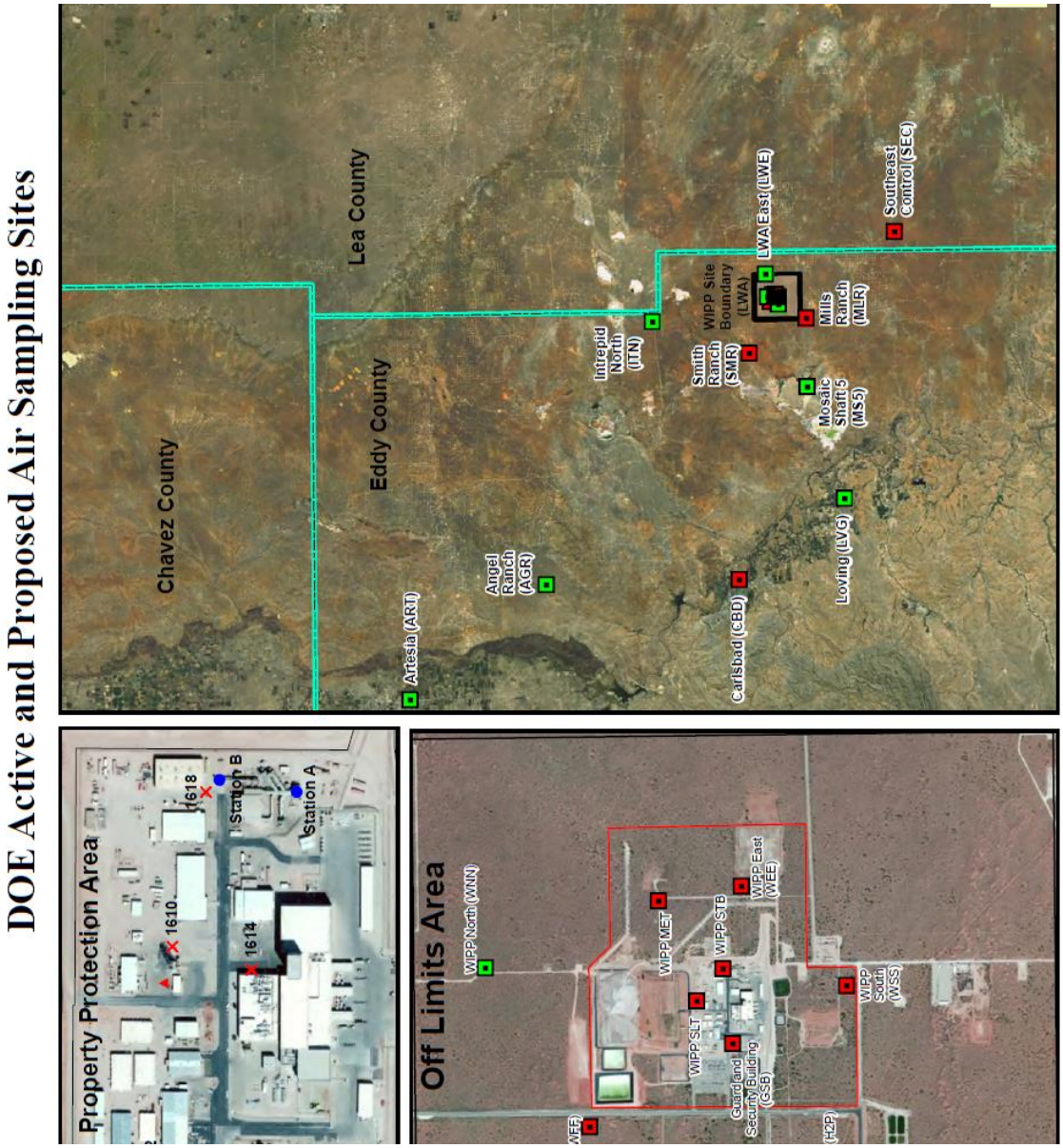
3 References

4 Glossary

5 Acronyms

APPENDIX 1

Map of Current and Proposed Air Sampling Sites at WIPP



APPENDIX 2

Possible Process for Comparing Data Pairs

Evaluate paired measurements (X_{EPA},X_{DOE}), where X_{EPA} is EPA's measurement result and X_{DOE} is DOE's measurement result, to determine whether DOE's result is significantly different from EPA's result. The null hypothesis for this test will be that there is no difference, or DOE ≡ EPA. The alternative hypothesis will be that DOE ≢ EPA. We set the type I error probability for each test at approximately 5 %, which means that if there is no real difference between the measurements, the false rejection rate should be approximately 5 %.

To make the determination for a pair (X_{EPA},X_{DOE}), calculate the normalized difference Z as shown below:

$$Z = \frac{X_{\mathrm{EPA}} - X_{\mathrm{DOE}}}{\sqrt{u^2(X_{\mathrm{EPA}}) + u^2(X_{\mathrm{DOE}})}}$$

where

X_{EPA} is EPA's measured result,
X_{DOE} is DOE's measured result,
$u(X_{EPA})$ is the standard uncertainty of X_{EPA} (measurement uncertainty), and
$u(X_{DOE})$ is the standard uncertainty of X_{DOE} (measurement uncertainty).

If the absolute value of Z exceeds 2.0, conclude that a significant difference exists.

> Note that if there is no real difference between the measurements, about 2.5 % of the normalized differences will be greater than +2.0 and about 2.5 % will be less than −2.0.

Also identify for follow-up investigation any pair of measurements (X_{EPA}, X_{DOE}) for which $u(X_{DOE})$ is more than 150 % of $u(X_{EPA})$—that is, where the uncertainty of the DOE measurement is much greater than the uncertainty of the EPA measurement.

When all the data have been collected, apply a one-sided t test to all the normalized differences for each analysis type to decide whether the DOE results are significantly less than the corresponding EPA results. Set the type I error rate for this test at 5 %. Evaluate the ^{241}Am results separately from the plutonium results.

APPENDIX 3

References for this QAPP

NAREL Standard Operating Procedure for the Use of the F & J DL-28B Low Volume Air Sampler (FMM/SOP-13)

NAREL Standard Operating Procedure for Preparing and Validating Radiochemical Tracers, Spiking Solutions, and Calibration Solutions (QA/SOP-4)

NAREL Standard Operating Procedure for Training and Certification of Laboratory Personnel (QA/SOP-9

NAREL Standard Operating Procedure for Use of Laboratory Logbooks (DR/SOP-1)

NAREL Standard Operating Procedure for Sample Tracking (SRP/SOP-1

NAREL Standard Operating Procedure for Receipt, Log-in, and Storage of Environmental Samples (SRP/SOP-2

NAREL Standard Operating Procedure for Maintenance and Use of Balances (SE/SOP-1

NAREL Standard Operating Procedure for Cleaning of Laboratory Glassware and Planchets (SE/SOP-2)

NAREL Standard Operating Procedure for Calibration, Maintenance, and Use of Pipets (Se/SOP-4)

NAREL Standard Operating Procedure for Actinides in Environmental Matrices by Extraction Chromatography (AM/SOP-1)

NAREL Standard Operating Procedure for Preparation of Environmental Samples for Radiochemical Analysis (SRP/SOP-3)

NAREL Standard Operating Procedure for Review of Radiochemistry Data (DR/SOP-2)

NAREL Standard Operating Procedure for Production, Review, and Shipping of Radioanalytical Data Packages (DR/SOP-3)

NAREL Standard Operating Procedure for Calibration and Use of Alpha Spectrometers Using AlphaVision (NC/SOP-8)

NAREL Standard Operating Procedure for Quality System Corrective Action (QA/SOP-5)

Technical Manual, Portable Digital Low Volume Air Sampler Model DL-28B and DL-28BE Series, F&J Specialty Products, Inc.

APPENDIX 4

Glossary

accuracy – the closeness of agreement between a measured value and the true value of the measurand – affected by random and systematic measurement as well as spurious errors.

action level – the numerical value that causes the decision maker to choose one of the alternative decisions (e.g,, conformity or nonconformity). This may be a regulatory threshold standard, such as a maximum contaminant level; a risk-based concentration level; a technology limitation; or a reference-based standard.

activity (radioactivity) – the rate of decay of radioactive material expressed as the number of atoms breaking down per unit time.

analysis – the identification and/or quantification of the constituent compounds, elements, or isotopes of a material.

audit – a planned and documented investigative evaluation of an item or process to determine the adequacy and effectiveness as well as compliance with established procedures, instructions, QAPPs, and/or other applicable documents.

background radiation – ionizing radiation from natural sources, such as terrestrial radiation due to radionuclides in the soil or cosmic radiation originating in outer space.

batch – the collection of samples of the same groups which is to be analyzed in one test run or inspected together within specified time limit and traceable as a unit; also a set of data or jobs to be processed in one computer run.

calibration – a comparison of a measurement standard, instrument, or item with one having higher accuracy to detect, quantify, and record any inaccuracy or variation; the process by which an instrument setting is adjusted based on response to a standard to eliminate the inaccuracy. The comparison of a measurement instrument or system of unverified accuracy to a measurement instrument or system of known accuracy to detect any variation from the required performance specification.

CEM – Center for Environmental Monitoring – the Center at NAREL responsible for maintaining the RadNet monitoring program and emergency response capabilities.

CERLS – Center for Environmental Radioanalytical Laboratory Science, formerly the Monitoring and Analytical Services Branch (MASB) – a Center at NAREL responsible for analyzing samples for radioactive constituents and hazardous chemicals.

corrective action – measures taken to rectify conditions adverse to quality and, where necessary, to preclude their reoccurrence.

decay products (or daughter products) – isotopes formed during radioactive decay.

detection level – the lowest “measureable” analyte concentration by a specific method.

efficiency – relationship between measurements recorded by a radiation detector and the actual radiation emissions received by the detector.

environmental data – any measurements or information that describe natural processes, locations, or conditions; ecological or health effects and consequences; or the performance of technology dealing with natural process; and, for EPA, information collected directly from measurements, produced from models, and compiled from other sources such as mathematical repositories or the literature.

environmental monitoring – the process of measuring or collecting information on natural surroundings.

laboratory control sample (LCS) – an artificial sample generated by the analyst in the laboratory and spiked with a known amount of one or more analytes. After being spiked, the LCS is prepared and analyzed in the same manner as a normal sample.

LIMS – Laboratory Information Management System - a database and software system used to manage radioanalytical data, monitor work processes, and produce reports.

method – a procedure, technique, or tool for performing a scientific activity.

method blank – an artificial sample generated by the analyst in the laboratory, which is as free as possible of the analyte of interest. The method blank is prepared and analyzed in the same manner as a normal sample.

NAREL – National Analytical Radiation Environmental Laboratory

NIST – National Institute of Standards and Technology, formerly the National Bureau of Standards (NBS), which is the national standards body for the United States and a member organization of the International Organization for Standardization (ISO).

nuclide – a general term applicable to all isotopes or atomic forms of an element.

proficiency testing sample (PT) – a test specimen that mimics an actual specimen in all possible aspects, except that its composition is unknown to the laboratory at the time of analysis, which is used to assess the laboratory's capability to produce results within acceptable criteria.

quality assurance (QA) – an integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the customer.

quality control (QC) – the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer.

quality indicators – measurable attributes of the attainment of the necessary quality for a particular environmental decision. Indicators of quality include precision, bias, completeness, representativeness, reproducibility, comparability, and statistical confidence.

record – a completed document that provides evidence of an item or process, e.g., photographs, drawing, magnetic tape, and other data recording media.

sample – a single item or specimen selected from a larger population, such as any subset of a population of any medium used to characterize or make inferences regarding that population.

standard operating procedure (SOP) – a written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps, and that is officially approved as the method for performing certain routine or repetitive tasks.

source – material for generating a known amount of radiation at known concentrations during instrument calibrations.

standard uncertainty – uncertainty of the result of a measurement expressed as a standard deviation (sometimes informally called the "one-sigma" uncertainty)

APPENDIX 5

Acronyms

CAM – Continuous Air Monitor

CZT – Cadmium Zinc Telluride

DEM – Digital Electronic Module

DOE – Department of Energy

DQO – Data Quality Objective

EPA – Environmental Protection Agency

GPS – Global Positioning System

LIMS – Laboratory Information Management System

CERLS – Monitoring & Analytical Services Branch

NAREL – National Analytical Radiation Environmental Laboratory

NCRFO – National Center for Radiation Field Operations

OAR – Office of Air & Radiation

ORIA – Office of Radiation & Indoor Air

PAGs – Protective Action Guidelines

PDA – Personal Digital Assistant

PIC – Pressurized Ionization Chamber

QA – Quality Assurance

QAM – Quality Assurance Manual

QAPP – Quality Assurance Project Plan

QC – Quality Control

QMP – Quality Management Plan

QS – Quality System

RERT – Radiological Emergency Response Team

ROI – Regions of Interest

SCF – Standard Cubic Feet

SCFM – Standard Cubic Feet Per Minute

SOP – Standard Operating Procedure

STP - Standard Temperature & Pressure

UTC - Coordinated Universal Time