Pacific Northwest
NATIONAL LABORATORY

PNNL-20919-2, Rev. 1

EMP, Attachment 2

Data Management Plan

September 2024

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U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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Pacific Northwest National Laboratory
Richland, Washington 99354

Summary

Radioactive effluent monitoring and environmental surveillance for Pacific Northwest National Laboratory (PNNL) operations in Washington State are the responsibility of the PNNL Environmental Protection and Regulatory Programs division and are conducted by the Environmental Radiation Task staff. This Data Management Plan (DMP) describes the data management processes for PNNL radioactive air emissions (stack) monitoring and environmental radiological ambient air surveillance activities. In addition to PNNL-Richland and -Sequim campus monitoring and surveillance, PNNL manages radioactive air effluent monitoring data at several facilities in the 300 Area of the DOE Hanford Site. This DMP does not address sampling data acquired by other Hanford Site contractors. PNNL is a U.S. Department of Energy (DOE) Office of Science national laboratory.

This DMP is an attachment to the PNNL Environmental Radiological Air Monitoring Plan (EMP) (PNNL-20919) and addresses a discrete area of the EMP that is subject to revision independently of the main text of the EMP. This is the first revision of the DMP. Since the initial issuance in 2011, database platforms have changed, and additional ambient air particulate and external dose surveillance stations have been added at PNNL-Richland campus. In addition, external dose surveillance locations were added at PNNL-Sequim campus in 2024.

The DMP provides an overview of the type of data is captured, analyzed, validated, stored, and preserved. The roles and responsibilities of the staff associated with data management can be found in the EMP.

Revision Number	Effective Date	Description of Change
Rev 0	December 2011	Initial document.
Rev 1	September 2024	• MSL/Sequim Site is now identified as PNNL-Sequim campus. • Significant data management changes have occurred since the initial revision. The prior revision covered only ambient air sampling. This revision includes PNNL emission unit (i.e., stack) sampling. • Both ambient air sampling (particulate and dosimetry) and emission unit (particulate and gas) sampling data are now managed in a Locus EIM database. This database is described.

Acronyms and Abbreviations

ANSI/HPS	American National Standards Institute Health Physics Society
CM	configuration management
COC	chain of custody
DMP	Data Management Plan
DOE	U.S. Department of Energy
EDD	electronic data deliverable
EIM	Environmental Information Management
EM-QAP	Effluent Management Quality Assurance Plan
EMP	Environmental Radiological Air Monitoring Plan
EPRP	Environmental Protection and Regulatory Programs
ERT	Environmental Radiation Task
GED	Gaseous Effluent Database
HEIS	Hanford Environmental Information System
MAPEP	Mixed Analyte Performance Evaluation Program
PEIS	PNNL Environmental Information System
PNNL	Pacific Northwest National Laboratory
QA	quality assurance
QC	quality control
RAEL	Radioactive Air Emissions License
RaGas	Radioactive Gas Air Emissions
RMT	Radioactive Material Tracking
RPT	Radiation Protection Technologist
RS&EG	PNNL Radiochemical Science & Engineering Group
SAP	Sampling and Analysis Plan
SEM	Site Environmental Monitoring
SOW	statement of work

Contents

Figures

1.0 Introduction

Data management is a process by which data is acquired, validated, stored, protected, and processed to satisfy the needs of the data users. This plan describes the data management process for radioactive air monitoring and surveillance activities managed by the U.S. Department of Energy (DOE) Pacific Northwest National Laboratory (PNNL) (see Figure 4 of the PNNL Environmental Radiological Air Monitoring Plan [EMP]) and conducted by the Environmental Radiation Task (ERT) staff. PNNL-managed operations with radioactive air effluent occur in Richland and Sequim, Washington, with facilities at the PNNL-Richland campus, PNNL-Sequim campus, and the 300 Area of the Hanford Site (see Figure 1 of the EMP). The scope of PNNL's 300 Area facility data management responsibilities, covered in this DMP, are limited to the effluent monitoring data (i.e., stack air sampling). Ambient air surveillance data for the Hanford Site is managed by the Hanford Mission Integration Solutions and its data management is not covered herein.

Data on effluent and ambient radioactive air is generated under the control of procedures, analytical contracts/statements of work (SOWs), and chains of custody (COCs). This Data Management Plan (DMP) describes the flow of data from the point of sample scheduling through collection, evaluation, and data reporting. These activities are primarily achieved through project database(s). Implemented procedures, referenced in this DMP, will maintain the quality of the data at a high standard. Requirements for the databases and associated records are documented indicated herein and in the Effluent Management Quality Assurance Plan (EM-QAP[1]).

1.1 Environmental Information Management System

Air sampling is conducted within certain emission units prior to effluent exit to the ambient environment (see Section 2.0) and within the ambient environment (see Section 3.0). The PNNL process of planning, collecting, and tracking air samples is handled via the Locus Environmental Information Management (EIM)[2] system, which is a comprehensive subscription-based cloud platform for organizing, managing, and reporting environmental data. Figure 1 presents an overview of the EIM process. During the PNNL EIM development process, the analytical service provider's SOW defined the compatible electronic data deliverable (EDD) format for acceptance by EIM.

[1] EM-QA-01, *Current Revision. Effluent Management Quality Assurance Plan*. Pacific Northwest National Laboratory, Richland, Washington

[2] Locus EIM, provided by Locus Technologies, Mountain View, California. https://locustec.com/.

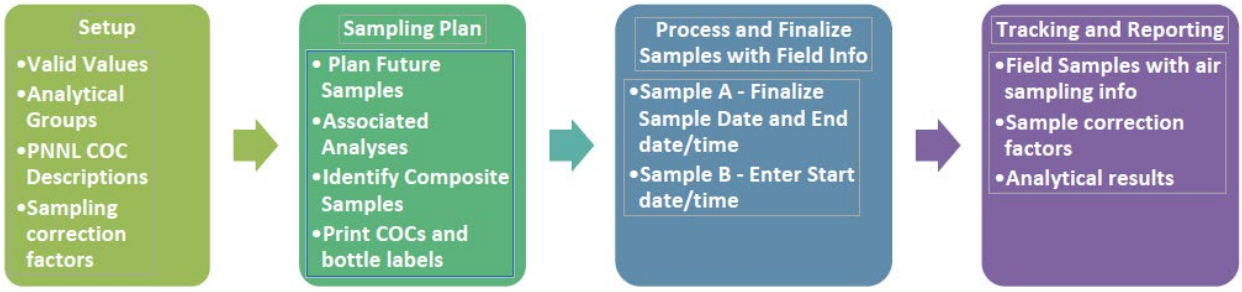

Figure 1. EIM System Process Overview

Stack sampling and ambient air sampling use similar processes for configuration management (CM), reporting, quality assurance (QA) and quality control (QC), and records management with EIM. These processes are described for both activities in Sections 6.0 and 7.0 of this DMP.

1.2 Procedures and Desk Instructions

The following ERT procedures and desk instructions, managed under Environmental Protection and Regulatory Programs (EPRP) division, are used to provide input to EIM or to use EIM output to manage air sample requirements, collection, and reporting:

- EPRP-AIR-004: *Chain of Custody Procedure*
- EPRP-AIR-010: *Hanford Stack Particulate Sampling Procedure*
- EPRP-AIR-011: *325 Building Stack Tritium Sampling Procedure*
- EPRP-AIR-015: Evaluating Rad Air Effluent Sampling Data
- EPRP-AIR-029: *Air Particulate/Dosimeter Sampling and Routine Maintenance of Environmental Monitoring Stations for the PNNL Campus*
- EPRP-AIR-032: *Environmental Surveillance Radiological Air Monitoring Data Management and Evaluation*
- DI-AIR-001: *Conducting and Documenting the Annual NESHAP Assessment*
- DI-AIR-004: *Ambient Air Dosimeters - Annual Dose Status*

2.0 Radioactive Air Emissions

PNNL radioactive material emissions to air are determined based on either sampling of air effluent or estimations based on facility radioactive material inventories, as well as administratively reported radioactive air gas emissions. Databases associated with these emissions include (1) EIM for sample analysis results, and sampling system data (e.g., flow measurements, traverse data); (2) Radioactive Material Tracking (RMT) for inventory-based calculations; and (3) Radioactive Gas Air Emissions (RaGas) for non-sampled gases.

RMT and RaGas are used to support reporting of radioactive air emissions. RMT is queried for 40 CFR 61, Appendix D, estimation of emissions that are not required to be sampled. RaGas is used for management of radioactive gas releases that are not sampled. RMT and RaGas are also used to manage future emissions and permit planning activities. The data management needs are more extensive for emissions based on sampling compared to emissions based on inventory or release records.

Only the EIM database is discussed in further detail here because RMT and RaGas do not require sample management activities. 40 CFR 61, Subpart H, compliance reporting for each calendar year combines estimated emissions from EIM, RMT, and RaGas to report total radioactive material emission from each PNNL campus.

The remainder of this section presents details on radioactive air emissions sampling of PNNL emissions units managed in EIM.

2.1 Database Overview

The EIM database is the repository for sampled radioactive air emissions at PNNL. No emission unit sampling is conducted on the PNNL-Sequim campus. The EIM software system is used for scheduling, organizing, managing, and reporting emission unit data. Sampling is not required if the regulatory or permit criteria for sampling (WAC 246-247) are not met. Access to EIM is limited to a few authorized personnel.

The purpose and scope of the EIM database support sample management activities and annual compliance reporting for stack sampling at PNNL. The database manages the activities necessary to ensure acceptable sample tracking and the integrity of the analytical data through the entire process from sample scheduling to reporting. Figure 1 presents the data flow activities conducted to obtain an acceptable data product.

The stack sampling program transitioned to the Locus EIM software system in 2020. This subscription-based cloud platform is used for organizing, managing, and reporting environmental data. The former project database (Gaseous Effluent Database [GED]) for sampling data may be used to retrieve data collected prior to 2020 but for a period not to exceed 5 years from present day.

2.1.1 Sample Scheduling

The EIM database is used to schedule sampling efforts for the designated PNNL-managed stacks. Stack air samples are scheduled for collection according to the location, frequency, and analyses identified in the Sampling and Analysis Plan (SAP; see Table 1 of EMP Attachment 1). Although the primary purpose of the database is to compile quality-assured environmental

sampling results, the ability to schedule within the database enables tracking of the scheduled stack air samples. This sampling schedule remains active until either the annual NESHAP (National Emission Standards for Hazardous Air Pollutants) Assessment (DI-AIR-001) or the operational changes leading to permit updates prompt a need for a review, at which time the schedule is revised appropriately. The sampling schedule is also subject to limited modification to respond to operational confines such as weather, equipment malfunctions, and other factors.

An ERT staff member establishes the planned sampling and analysis schedule in the project database to produce the documentation needed for sample collection.

2.1.2 Sample Collection

An ERT staff member prepares the necessary field paperwork and schedules the appropriately trained Radiation Protection Technologist (RPT) (or equivalent) for sample collection. A trained RPT (or equivalent) collects the air filters or tritium columns in accordance with applicable procedures. Generated sample paperwork is maintained as project records. In addition to collecting the sample in the field, the RPT (or equivalent) records observations, changes in sampling equipment, sampling volumes, and other data on the forms. It is critically important that the RPT (or equivalent) provide complete and accurate information, which may be key to interpreting or accounting for anomalies in the analytical data.

Samples are collected and relinquished to the service provider for analyses. Pertinent information recorded on the completed field paperwork is entered into EIM.

2.2 Analytical Laboratory Results

The stack air samples are delivered to an in-house analytical laboratory at PNNL the Radiochemical Science & Engineering group (RS&EG). RS&EG participates in national comparison studies, also called performance evaluations, such as the Mixed Analyte Performance Evaluation Program (MAPEP).

2.2.1 Tracking Analyses

The tracking of analyses occurs after the samples are collected. The sample collection date and time and other COC information are posted to EIM.

2.2.2 Analytical Results

Air samples (filters and columns) are analyzed for the requested constituents and analytical results are reported per the terms outlined in the SOW.

Stack sample analytical results are delivered via e-mail and include an Excel file and EDD. The Excel data is validated by the trained ERT staff member.

2.2.3 Evaluating and Loading Results

When air results are received, the data is evaluated in accordance with procedures (see Attachment B of EPRP-AIR-015) and any specific requirements of the EM-QAP (EM-QA-01), such as discrepancy reports and suspect data reviews. The air data is loaded to the project database using an EDD that is fully compatible with the EIM data loader format.

2.2.4 Interpreting and Verification Analytical Results

The analytical laboratory qualifies the results by reporting a qualifier code when one is needed. Typically for stack samples, the qualifier will indicate if the sample is greater or less than the critical value for the sample (L_c). If no qualifier code is reported with the analytical result, then the reported value is considered reliable without qualification. When a data review identifies suspect data, that data must be investigated to establish whether it reflects true conditions or an error.

If suspect data is identified, the investigation must be documented and maintained as stated in the EM-QAP (EM-QA-01). If a value is determined to be erroneous, the source of the error must be investigated, the correct value established if possible, and the erroneous value replaced with the correct value. If the investigation concludes that the value is suspect (possibly in error) and its status cannot be validated, the value in the database must be flagged as suspect.

To assist PNNL ERT staff in determining the value of a questionable result, the analytical laboratory may be asked to perform a data recheck, recount, or reanalysis.

3.0 Environmental Surveillance (ambient air/dosimetry)

PNNL conducts environmental surveillance activities based on criteria identified in DOE-1216-2015, *Environmental Radiological Effluent Monitoring and Environmental Surveillance* (DOE 2022), and according to requirements in the PNNL Site Radioactive Air Emissions Licenses (RAEL-005, Richland campus and RAEL-014, Sequim campus) (WDOH 2021, 2022). The EMP describes the purpose and scope of environmental surveillance of ambient air at the PNNL-Richland and PNNL-Sequim campuses.

3.1 Database Overview

The EIM database is the center of all analytical data management activities. The database manages the activities necessary to ensure acceptable sample tracking and the integrity of the analytical data through the entire process from sample scheduling to reporting.

The Environmental Surveillance program transitioned data management activities to the Locus EIM software system in 2023. Figure 1 provides an overview of the EIM process. The previous project database, referred to as PNNL SEM (Site Environmental Management) or PEIS (PNNL Environmental Information System), used the Hanford Environmental Information System (HEIS) (HEIS 1989) maintained by the Environmental Database Management organization of the Central Plateau Cleanup Company. The former project database is used as a repository for environmental surveillance data collected between 2010-2022. Access to the project database(s) is limited to a few authorized personnel.

3.1.1 Sample Scheduling

EIM is used to schedule sampling efforts for PNNL environmental surveillance air and/or dosimeter samples at the PNNL-Richland and PNNL-Sequim campuses. Although the primary purpose of the database is to compile environmental sampling results, the ability to schedule in EIM enables tracking of the scheduled ambient air samples and ambient external dosimeters. Air particulate filters and dosimeters are scheduled for collection according to the location, frequency, and analyses identified in the SAP (see EMP Attachment 1). The sampling schedule remains active until the annual design review identifies significant changes, at which time the schedule is revised. The analytes of interest for ambient air sampling are based on the radionuclides listed in RAEL-005. The sampling schedule is subject to limited modification to respond to operational confines such as weather, equipment malfunctions, and other factors that may impact scheduled sampling.

An ERT staff member establishes the planned sampling and analysis schedule in the project database to produce the documentation needed for sample collection.

3.1.2 Sample Collection

An ERT staff member prepares the necessary field paperwork and schedules the appropriately trained RPT (or equivalent) for sample collection. A trained RPT (or equivalent) collects the air filters and dosimeters in accordance with the applicable procedure (see EPRP-AIR-029). The sample paperwork generated is maintained as project records. In addition to collecting the sample in the field, the RPT (or equivalent) records observations, changes in sampling equipment, sampling volumes, and other data on the forms. It is critically important that the RPT

(or equivalent) provide complete and accurate information, which may be key to interpreting or accounting for anomalies in the analytical data.

Samples are collected and relinquished to the service provider for analyses. Pertinent information recorded on the completed field paperwork is entered into the project database.

3.2 Analytical Laboratory Results

The ambient radiological air surveillance samples are sent to an analytical laboratory service provider,[1] who is accredited through one of the bodies approved by the DOE Consolidated Audit Program-Accreditation Program (DOECAP-AP), such as the American Association for Laboratory Accreditation (A2LA). The analytical laboratory service provider is required to participate in national comparison studies, also called performance evaluations, such as MAPEP.

InLight dosimeters are procured from Landauer[2] following the external dose reporting information in the ANSI/HPS Standard N13.37-2019, *Environmental Dosimetry—Criteria for System Design and Implementation* (ANSI/HPS 2019).

3.2.1 Tracking Analyses

The tracking of analyses occurs after the samples are collected. Once the sample collection date and sample relinquish date are posted to the database, an analyses due date is determined.

3.2.2 Analytical Results

Air filter samples are analyzed for the requested constituents and analytical results are reported per the terms outlined in the analytical contract, SOW, or other mutually agreed upon conditions, with a 2-sigma overall propagated and a 2-sigma counting uncertainty.

For ambient dosimetry, data is reported per mutually agreed upon conditions. Reported dose readings indicate the measurement for the monitored period. PNNL has requested that the service provider NOT subtract the control badge value from the non-control dosimeter results; no control or background values are subtracted from the original station results reported. These actions are requested of the service provider so that results can be post-processed in accordance with ANSI/HPS N13.37.

Ambient air analytical results and ambient dosimeter readings are delivered electronically via e-mail or the vendor's secure portal and may include a portable document format (pdf) data report, comma-separated value (CSV) format, and/or an EDD.

[1] Since 2010, GEL Laboratories, LLC (Charleston, SC) has been the analytical laboratory service provider performing radiological analyses on the PNNL-Richland campus for ambient radiological air surveillance samples.
[2] Landauer, 2 Science Rd, Glenwood, IL 60425-1586. www.landauer.com.

3.2.3 Evaluating and Loading Results

When air filter and dosimeter results are received, the data is evaluated in accordance with procedures (see EPRP-AIR-032) and any specific requirements of the EM-QAP (EM-QA-01), such as discrepancy reports and suspect data reviews.

The air filter data is loaded to the project database using an EDD that is fully compatible with the EIM data loader format. Dosimeter results are received in pdf and/or CSV formats. An executable file developed by PNNL converts the dosimeter result format into a delimited file that is compatible with loading to EIM.

3.2.4 Interpreting and Verification Analytical Results

The analytical laboratory qualifies the results by reporting a valid Lab Qualifier code as needed. If no qualifier code is reported with the analytical result, the value reported is believed to be reliable without qualification. When a data review identifies suspect data, those data must be investigated to establish whether they reflect true conditions or an error. If suspect data are identified, the investigation must be documented and maintained as stated in the EM-QAP (EM-QA-01).

If a value is determined to be erroneous, the source of the error must be investigated, the correct value established if possible, and the erroneous value replaced with the correct value. If the investigation concludes that the value is suspect (possibly in error) and its status cannot be validated, the value in the database must be flagged to indicate its suspect status.

To assist PNNL ERT staff in determining the value of a questionable result, the analytical laboratory may be asked to perform a data recheck, recount, or reanalysis. If desired, following project review, a Review Qualifier and/or a Validation Qualifier code can also be added to the result record to further qualify reviewed data.

For ambient dosimetry, if the transit and control dosimeter results are within 5 mrem of each other, the station results are considered acceptable. This delta between the transit and control indicates that no additional significant external dose was received during transit (postal transit and deployment/collection transit). If the delta were greater than 5 mrem, all dosimeter results would be expected to be elevated.

4.0 Configuration Management Overview

CM is the process of (1) identifying and defining the configuration items in a system and (2) controlling the release and change of these items through the life cycle of the system to preserve and protect data. The section describes the CM for the Locus EIM.

4.1 Hardware and Software Requirements

The ERT staff migrated away from PNNL administered database systems in favor of the Locus EIM software subscription-based cloud platform. The radioactive GED, the system used to manage stack sample information previously, fully transitioned data management activities to the Locus EIM software system in 2022. The environmental surveillance task transitioned from HEIS to the Locus EIM software system in 2023. The functionality for CM is accomplished via the Locus EIM software. EIM configuration requires no special hardware to procure or up-front license fee but does require an internet connection. Locus EIM supports several desktop browsers (e.g., Microsoft Edge, Mozilla Firefox, Google Chrome) and runs on a Windows operating system.

Locus provides system implementation and configuration services, as well as technical support, for all their software applications. The Locus programs (including both software and documentation) contain proprietary information and are provided under license containing restrictions on use and disclosure and are also protected by copyright, patent, and other intellectual and industrial property laws. Programs, software, databases, and related documentation and technical data delivered to U.S. government customers are “commercial computer software” or “commercial technical data” pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations.

4.2 Access Control

Access to the project database(s) is limited to a few authorized ERT staff. Existing EIM privacy and security policies prevent unauthorized database access.

5.0 Reporting

Radioactive air effluent monitoring and environmental surveillance activities focus on materials that are actually or potentially released to the ambient air from PNNL operations. The surveillance and sampling analytical data stored in EIM are reported annually to the Washington State Department of Health, U.S. Environmental Protection Agency, and DOE as part of Radionuclide Air Emission Reports (RAER) for PNNL operations and are also reported in the Annual Site Environmental Report (ASER) for PNNL. The Hanford Site ASER acquires information on PNNL emissions from the Hanford Site RAER lead.

Sample data is typically exported from EIM and further processed in Excel spreadsheets for reporting purposes, including presentation in tables and graphs. As described in the SAP, Section 5.1.2, Reporting Requirements, ambient dosimeter results are normalized based on DI-AIR-004. Additional reporting includes monthly tritium reporting, quarterly tracking and trending (EPRP-AIR-15) for gross alpha/beta stack samples, and a periodic report to management summarizing the performance of the PNNL ERT for the calendar year. Other reporting may occur as indicated in the EMP or directed by the ERT lead.

6.0 QA/QC

QA and QC process are in place to assure the accuracy, precision, and traceability of data. The PNNL QA program and its statutory drivers are described in the QA section of the EMP. In addition to the requirements of the EM-QAP and other QAP related documents, QA and control activities are performed in accordance with procedures EPRP-AIR-004, EPRP-AIR-015, and EPRP-AIR-032 using forms, worksheets, and checklists.

Quality controls for the Locus EIM software are managed by Locus. Intermittent EIM software updates are rigorously QA-tested before being released to users to ensure they perform as expected and require no additional actions from PNNL.

7.0 Records Management

The recordkeeping requirements for the ERT data are described in the EMP. Records are required to be retained for a specific period. Project records may consist of paper (e.g., COCs, daily inspection forms) but are largely electronic documentation such as analytical data, procedures, reports, and other records. Paper records are delivered routinely to the ERT lead and scanned for e-record maintenance.

Requirements for maintaining documents and records are described in the EM-QAP. Project records are maintained in accordance with the CASE1830:08-10 e-records file plan.

8.0 References

40 CFR 61, Appendix D. “Methods for Estimating Radionuclide Emissions.” *Code of Federal Regulations*, U.S. Government Printing Office, Washington, D.C.

40 CFR 61, Subpart H. “National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities.” *Code of Federal Regulations*, U.S. Government Printing Office, Washington, D.C.

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WDOH (Washington State Department of Health). 2022. *Radioactive Air Emissions License for The Pacific Northwest National Laboratory Sequim Washington Facility.* RAEL-014, Renewal 2, January 2023-January 2028, Office of Radiation Protection, Richland, WA.

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