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Department of Energy
National Nuclear Security Administration
Sandia Field Office
P.O. Box 5400
Albuquerque, NM 87185

NNSA National Nuclear Security Administration

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Mr. John E. Kieling
Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Dr. East, Bldg 1
Santa Fe, New Mexico 87505

NMED
Hazardous Waste Bureau

Subject: Submittal of the Chemical Waste Landfill (CWL) Updated Reference Documents Cited in the CWL Post Closure Care Permit for Sandia National Laboratories/New Mexico, Environmental Protection Agency Identification Number NM5890110518

Dear Mr. Kieling:

The Department of Energy/National Nuclear Security Administration and Sandia Corporation are submitting the enclosed updated reference documents to the New Mexico Environment Department. This submittal is required within 30 days of the effective date of the updated documents, which is October 17, 2016.

This submittal is comprised of two documents used by personnel to perform monitoring activities at the CWL. The updated reference documents are:

- AOP 95-16 Sample Management and Custody
- FOP 08-22 Soil Vapor Sampling

Revisions include updates to keep the reference documents current and to reflect ongoing modifications and improvements in industry practices.

If you have questions, please contact Karen Oden of our staff at (505) 845-5162.

Sincerely,

James W. Todd
Assistant Manager for Engineering

Enclosure
cc: See Page 2

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701827

Submittal of Updated Reference Documents Cited in the Chemical Waste Landfill Post-Closure Care Permit

Sandia National Laboratories
Albuquerque, New Mexico
EPA ID No. NM5890110518

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Michael W. Hazen, Vice President
Sandia Corporation
Albuquerque, New Mexico
Operator

31 Oct 2016
Date Signed

James W. Todd, Assistant Manager
U.S. Department of Energy
National Nuclear Security Administration
Sandia Field Office
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11/4/16
Date Signed

Enclosure A

Updated Reference Documents Cited in the Chemical Waste Landfill Post-Closure Care Permit

AOP 95-16 Sample Management and Custody
FOP 08-22 Soil Vapor Sampling

October 2016

Sandia National Laboratories
EPA ID No. NM5890110518

SANDIA NATIONAL LABORATORIES
ANALYTICAL SERVICES DEPARTMENT (4131)

SAMPLE MANAGEMENT AND CUSTODY ADMINISTRATIVE OPERATING PROCEDURE

AOP 95-16
Revision 06

Author: Don Watenpaugh — **Date:** August 2, 2016
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Reviewer: D. L. Perry — **Date:** October 3, 2016
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Reviewer: Wendy Palencia — **Date:** October 5, 2016
Wendy Palencia
SMO Project Coordinator

Approved: Corey Robert White — **Date:** 10-5-16
Corey Robert White
SMO Operations Manager

Author: How frequently does this document need to be reviewed and/or revised?	Every 3 years, or when activities change.
Manager: Does this document need to be tracked?	**Yes**

EFFECTIVE DATE: 10/17/16

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REVISION HISTORY

Revision	Effective Date	Summary of Changes
0	01/25/1995	New Document
1	04/08/1996	Administrative Updates
2	12/19/2003	Organization ownership change from Sandia ES&H to Environmental Restoration Project
3	03/28/2007	Changed revision cycle from 2 to 3 years. Organization ownership change from Sandia Environmental Restoration Project to Sandia ES&H Organization.
4	06/29/2011	Programmatic revisions include the addition of the Sample Management Analysis Request Tool (SMART) and the addition of Industrial Hygiene (IH) sampling. Other revisions are definition updates, sentence structure, grammar, and formatting. Additions include Revision History page, tracking box and footnote disclaimer
5	11/12/2013	Programmatic revisions include improvements to ARCOC processing, the addition of Bioassay sampling and changes to Industrial Hygiene (IH) sampling to include the use of the Radiological Process Knowledge Form (SF 6951-RRF). Chem101 and PKX050 were added to training requirements. The chemicals were removed from use in addition to removing the use of the fume hood. Added SMO QA Coordinator role. Other revisions include updating language to reflect current program elements and requirements.
6	10/17/2016	Removed SMO/SPF Building location. Deleted Attachment G for Holding Times and Preservation Techniques referred to Analytical Laboratory SMO-SOW. Removed SMO QA Coordinator role and added Compliance Requirement Management Staff role.

ACRONYMS AND ABBREVIATIONS

AOP	Administrative Operating Procedure
ARCOC	Analysis Request and Chain-of-Custody
COC	Chain-of-Custody
CRM	Compliance Requirement Management
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EDD	Electronic Data Deliverable
EPA	U.S. Environmental Protection Agency
IATA	International Air Transport Association
IH	Industrial Hygiene
LOP	Laboratory Operating Procedure
PHS	Primary Hazard Screening
RMA	Radioactive Materials Area
RPDP	Radiation Protection Dosimetry Program
RPSD	Radiation Protection Sample Diagnostics
SARF	Sample Analysis Request Form
SMART	Sample Management Analytical Request Tool
SMO	Sample Management Office
SMO-QAPP	Sample Management Office Quality Assurance Project Plan
SNL/NM	Sandia National Laboratories/New Mexico
SOW	Statement of Work

1.0 PURPOSE, SCOPE, AND OWNERSHIP

1.1 Purpose

This administrative operating procedure (AOP) describes the handling of samples at Sandia National Laboratories/New Mexico (SNL/NM) Sample Management Office (SMO) and delineates requirements for the selection of sample containers, required sample volumes, holding times, preservation techniques and sample custody control and documentation. This procedure also contains basic requirements for packaging and shipping environmental, industrial hygiene, bioassay and waste characterization samples. Refer to the Sample Handling, Packaging and Shipping Laboratory Operating Procedure (LOP), LOP 94-03 for more detailed sample packaging and shipping requirements. This procedure implements Section 3.3.3, Sampling Handling and Custody Requirements, of the Sample Management Office/Quality Assurance Project Plan (SMO-QAPP).

1.2 Scope

This document applies to SNL/NM sampling projects that use the services of the SMO. Projects that reference this procedure or process samples through the SMO shall comply with this procedure. Samples, forms, and data submitted to the SMO for processing shall conform to the requirements in this procedure.

1.3 Ownership

The SMO owns this document. The SMO is responsible for preparing, revising, and distributing this document as necessary.

2.0 RESPONSIBLE INDIVIDUALS AND ORGANIZATIONS

The SMO **Operations Manager** is responsible for the following:

- Providing programmatic guidance leading to the development of this AOP.
- Reviewing and approving the procedure.
- Acting as liaison to the U.S. Department of Energy (DOE) and National Nuclear Security Administration/Sandia Field Office (NNSA/SFO) regarding sample management issues.

The **SMO Project Coordinator** is responsible for the following:

- Developing and maintaining the SNL/NM SMO Contract Statement of Work for Analytical Laboratories (SMO-SOW).
- Managing contractor laboratory services including procurement, routine performance assessments and general laboratory oversight.

The **Compliance Requirement Management Staff** is responsible for the following:

- Providing project data quality assurance guidance.
- Ensuring that this procedure is distributed to the appropriate personnel for project/program use.
- Ensuring that sufficient quality checks are in place to maintain the integrity of the SMO sample information management and analytical result database.
- Documenting non-conformances and corrective actions in accordance with the applicable SMO-QAPP.

- Interfacing with the Records Management Coordinator for maintenance of project documentation and to resolve record management concerns for storage and maintenance of sampling and analysis records.

The **SMO Packaging Coordinator and SMO support staff** are responsible for receiving and packaging samples shipped through the Receiving/Mail & Material Movement Organization (10261, "Shipping and Receiving") to the contracted laboratories for analysis. SMO Packaging Coordinator(s) and Support Staff responsibilities include but are not limited to the following:

- Overseeing the day-to-day operations of the SMO Sample Packaging Facility and support personnel.
- Verifying proper sample collection documentation from field sampling personnel.
- Ensuring that sample custody is properly maintained and documented in accordance with the current SMO-QAPP.
- Ensuring all samples, with the exception of groundwater samples, dosimetry, or known non-radiological samples with a Clearance-Radiological Process Knowledge Form SF 6951-RRF (Attachment A) on file, receive a radiological survey by a Health Physics Radiation Control Technician (RCT) prior to shipment to an analytical laboratory.
- Ensuring samples are properly stored and packaged for shipment or delivery to the analytical laboratories in accordance with the SMO-QAPP, DOE, U.S. Department of Transportation (DOT) and International Air Transportation Administration (IATA) regulations. (Refer to LOP 94-03.)
- Interfacing with SNL/NM Shipping, Radiation Protection Operations and other SNL/NM on-site organizations;
- Ensuring Samples are shipped or delivered in a timely manner giving laboratories sufficient time to analyze samples within holding times.

The **SMO Customer(s)/Sampling Personnel** are responsible for sampling and initiating chain-of-custody documentation. Sampling personnel are responsible for performing the applicable activities prescribed in this procedure, including but not limited to:

- Utilizing the Sample Management Analysis Request Tool (SMART) to initiate and submit bottle orders, to produce container labels and to produce and submit the Analytical Request and Chain-of-custody (ARCOC) (Attachment B).
- Utilizing the Industrial Hygiene (IH) Sampling Analysis Request Form (SARF) chain-of-custody for industrial hygiene customers (Attachment C).
- Utilizing the Radiation Protection Dosimetry Program (RPDP) SARF chain-of-custody for RPDP customers (Attachment D).
- Providing the SMO with the Radiation Survey Documentation for samples coming out of a Radioactive Material Area (RMA).
- Working with the Radiation Protection program, and providing the SMO with a copy of the Clearance-Radiological Process Knowledge Form, SF 6951-RRF (Attachment A), for non-radiological samples. This is not mandatory, but will help expedite the process for shipping the samples.
- Labeling, using the correct containers, and preservatives for the materials to be analyzed.
- Documenting field parameters during the sampling event according to applicable sampling procedure(s).

- Collecting sufficient volumes of samples for all analyses, including quality control analyses.
- Delivering samples to the SMO Packaging Facility according to chain-of-custody requirements and in secure/safe condition according to SMO requirements as stated in the Sample Handling, Packaging and Shipping Laboratory Operating Procedure (LOP 94-03).
- Delivering samples to SMO in a timely manner and communicating with SMO staff about short holding times and/or rush analysis requests.

The **Analytical Laboratory** is responsible for following the applicable SMO-SOW.

3.0 TRAINING QUALIFICATIONS

Personnel shall be trained and qualified as necessary to perform their assigned work. The Sandia Education and Training Organization provides basic training and qualification guidance. Training requirements are presented in activity-specific operating procedures with specific requirements for the tasks performed. Personnel shall be trained according to established training cycles to maintain proficiency. Training shall be updated to meet required frequency schedules when specified. Details of corporate training are outlined in the SMO-QAPP and are referenced in the current Primary Hazard Screening (PHS) document, PHS 972834764, SMO Packaging Facility Operations and in LOP 94-03.

SMO personnel and customers are responsible for adherence to training requirements stipulated in this procedure and the current SMO-QAPP and the SMO Packaging Facility Operations PHS as it pertains to each individual.

Personnel conducting activities in this document shall complete the following:

- Read this procedure and acknowledge electronically that you have read and understand this procedure.
- On the job training is not required.

4.0 SAMPLE DOCUMENTATION AND MATERIALS

4.1 Bottle Order/Sample Request Form & Sample Containers

The Bottle Order/ Sample Request form is accessed through the SMART application. The completed and approved Bottle Order initiates the sampling process and is used to complete the ARCOC. The ARCOC may be obtained from the SMO home page, Electronic Forms link, or through the SMART application. Note that the SMART application is *not* used for the IH SARF or RPDP SARF chain-of-custody.

Recommended sample containers and chemical preservatives may be obtained by logging on to the SMO SMART application and completing the Bottle Order/Sample Request form. Most projects require that a bottle order be placed with the contract laboratory. (The IH and Bioassay projects do not utilize the SMO Bottle Order process.) It is recommended that bottle orders be submitted for approval to the SMO one to two weeks prior to sampling. The purpose of the bottle order is to:

- Initiate the sampling process.
- Notify the lab of the expected number of samples and analyses.
- Notify the lab of expected sampling dates.

- Obtain appropriate sample containers from certified suppliers with analytical method specified and chemical preservatives if required. (Containers are inspected as covered in section 5.1).

4.2 Analytical Request and Chain-of-custody (ARCOC or COC, SARF) Forms

The COC provides an accurate and defensible written and/or computerized record to trace the possession and handling of a sample from collection to completion of all required analyses. COC records provide a record of sample history and are critical for data integrity. Four different COC forms may be submitted to the SMO:

- Contract Laboratory Analysis Request and Chain-of-custody (ARCOC) (Attachment B)
- Industrial Hygiene SARF (IH SARF)(Attachment C)
- Radiation Protection Dosimetry Program Sample Analysis Request Form (RPDP SARF) (Attachment D)
- Onsite Laboratory/Radiation Protection Sample Diagnostics (RPSD) Sample Analysis Request Form (RPSD SARF) (Attachment E)

4.3 Sample Label

A SMO SNL/NM sample label must be completed with indelible ink and affixed to each sample container prior to or during sampling. The example label in Attachment F is required for all samples submitted on an ARCOC. The sample label is produced after completion of the SMART application ARCOC and using the label printer. It may also be produced using a spreadsheet and a printer. A label printer is available for customer use at the SMO Packaging Facility and at the Environmental Restoration Field Office. The Sample Label information shall match the information on the corresponding ARCOC or SARF. Each completed sample label submitted on an ARCOC includes the following:

- SMO SNL/NM Sample Identification Number (The first 5 digits of the Sample Number are controlled and obtained from the SMO. The Sample fraction designation is assigned by the sampler.)
- ARCOC Number
- Sample location
- Date and time of sample collection
- Sample matrix type
- Chemical Preservative
- Analysis
- Collector's name
- SNL/NM Thunderbird logo

Samples submitted on a SARF chain-of-custody will contain a SARF chain-of-custody number and Sample Number.

4.4 Custody Seals

Sample custody seals are used to help determine unauthorized tampering of samples following collection until the time of sample preparation and analysis. Custody seals may be obtained from an SMO Packaging Facility representative. Initialed and dated seals must be affixed to sample containers before the samples leave the custody of the sampling personnel. IH containers, Volatile Organic Compound containers and Groundwater Monitoring container(s) are placed in a sealed plastic bag and the bag, not

the container(s), is secured with the custody tape. Groundwater Monitoring containers' custody tape are not initialed.

- The custody seal is initialed and dated while the seal is affixed to the backing.
- The seal is then removed from the backing and affixed to the container in such a manner that it is necessary to break the seal in order to open the container.
- The custody seal may be removed by the person initiating or retaining custody of the sample (e.g., the sampling personnel or the analytical laboratory sample custodian).
- The integrity of the seal must be verified prior to its removal.
- A broken seal invalidates the sample and must be documented as a nonconformance.

4.5 SNL/NM "Shipper" Form and Shipper's Waybill

The SNL/NM electronic shipping form, Web Shipper, is required on all sample shipments leaving SNL/NM except for samples that are hand delivered to local analytical laboratories. The Web Shipper and the commercial shipper's waybill complete the sample custody documentation and show possession of the sample from shipment to arrival at a contract laboratory. A copy of the Web Shipper form and shipper's waybill (if applicable) under which the samples are shipped shall be retained to document shipment of the sample(s). The SMO Packaging Facility Personnel are responsible for completing all shipping documentation per the current version of LOP 94-03.

5.0 SAMPLE MANAGEMENT PROCEDURES

5.1 Sampling Kit Procedure (Bottle Orders)

Required sample containers and chemical preservatives are obtained by logging on to the SMO SMART application and completing the Bottle Order/Sample Request form. Most projects require that a bottle order be placed with the contract laboratory. IH and RPDP Bioassay programs do not require a Bottle Order.

The Bottle Order initiates the sampling process for the projects that utilize the ARCOC. The customer shall submit a Bottle Order request to the SMO utilizing the SMART application. Upon receipt, the SMO reviews the Bottle Order and submits it to the contract laboratory. The contract laboratory provides sampling kits according to the Bottle Order specifications. It is recommended that bottle orders be submitted for approval to the SMO one to two weeks prior to sampling. IH and RPDP projects do not utilize the SMART application for sampling kits.

The SMO shall provide oversight and ensure that the laboratories follow the SMO-SOW as it pertains to providing sampling kits. The laboratories shall have applicable procedures and processes in place. The SMO shall inspect sampling kits to determine that they are intact, accurate, and meet any specific written requirements associated with the SMO-SOW. Any errors or damage to sampling kits will be addressed in accordance with the SMO-SOW and procurement policies. Refer to the current version of LOP 94-03 in case of broken containers and preservative spills.

5.2 Sampling Considerations

For sampling requirements, refer to the Holding Time and Preservation Techniques matrix, in the SMO-SOW.

Sample Volume: The volume of the sample collected should be sufficient to perform all the required analyses plus any additional volume needed to meet quality control requirements or repeat analyses. The minimum sample volume required for typical analytical procedures is listed in SMO-SOW, Holding Times and Sample Preservation Techniques. After the Bottle Order/Sample Request form is complete and approved, the required sample volumes will auto fill on the ARCOC when initiated. Laboratory-specific sample volume requirements may apply.

For the IH SARF chain-of-custody, the IH customer is responsible for meeting volume requirements.

Sample Preservation: Prior to sampling, the appropriate chemical preservative(s) is added to the sample bottles by the analytical laboratory. Due to the variety of chemical tests performed on samples, it may be impractical to chemically preserve samples during actual field collection. Following collection, most samples are cooled and maintained at <6°C (i.e., stored in a cooler with ice or ice gel or in a refrigerator) to conform to temperature preservation requirements. Chemical and temperature preservation requirements are listed in SMO-SOW and will auto fill on the Bottle Order and the ARCOC forms.

For the IH SARF COC, the IH customer is responsible for meeting sample preservation requirements.

Holding Times: Holding time is the time interval between sample collection and sample preparation or analysis. Holding times are calculated in days or hours, according to the time units used in the U.S. Environmental Protection Agency (EPA) holding time requirements. That is, if the EPA-specified holding time is given in hours, then the analysis must be complete before the end of the last hour of the holding time when calculated from the sampling time. When the holding time is given in days, the analysis must be complete before the end of the day on which the holding time would expire as calculated from the sampling day. Recommended maximum holding times are listed in the SMO-SOW and should be adhered to. The SMO Packaging Facility will make every effort to ship the samples to the laboratory the same day of sampling, or as soon as practical.

SMO will make every effort to notify the laboratory when samples having less than 72 hours of the holding time remaining are to be shipped.

Sample Storage: All samples shall be stored in a secured location when not in the immediate custody of an individual. The samples should be stored under physical and environmental conditions commensurate with the preservation requirements and intended analysis. Sample integrity must be maintained during sample storage through access controls and documentation. Samples with temperature preservation requirements shall be placed in a sample storage refrigerator and allowed to equilibrate to the required temperature prior to shipment to a contract laboratory unless they are packaged for shipment immediately upon receipt.

Daily verification and documentation of storage temperature should be maintained when temperature is a preservation requirement. Additional measures must be taken to separate waste samples from non-waste samples in order to avoid cross-contamination. Trip blanks should be used as appropriate to determine sample contamination during sample storage and shipment.

5.3 Sample Custody Procedure

Custody procedures provide an accurate record of sample history and shall be followed by SMO, field (sampling) and laboratory personnel to provide an accurate record of sample history.

By definition, a sample is in custody if it is:

- In one's possession,
- In view,
- In a controlled access area, or
- In transit following proper chain-of-custody procedures.

Sampling Team Member (Customer) Custody Procedure
A Sample Team Member is responsible for the care and custody of samples collected until sample custody is properly transferred. The following procedure shall be used to ensure proper control of samples:

- For the ARCOC, a project team member must submit to the SMO a Bottle Order at least 14 days prior to the requested delivery date for containers. The Bottle Order is initiated using the SMART application found on the SMO homepage. Once the Bottle Order is submitted, it will go through an SMO approval process and will be submitted to the appropriate analytical laboratory. Upon approval, all project team members will be notified. The approved Bottle Order is used by the customer to complete the ARCOC. From the approved Bottle Order, the Sample Matrix, Container Type and Volume, Preservative, Analysis Parameter and Method will pre-fill the ARCOC. SMART application Bottle Orders are not submitted for the IH or RPDP Bioassay SARF COC or the Onsite Laboratory (RPSD) Sample Analysis Request Form (RPSD/SARF).
- For the ARCOC, the Sample Team Member documents sample collection information: *Sample-No.-Fraction, Sample ID or Sample Location Detail, Pump Depth, Date/Time Collected, Collection Method, Sample Type, Filtered/Unfiltered sample* (refer to LOP 94-03).
- For the IH SARF COC, the sample team member will provide a completely filled form to include *IH Survey ID number, Submitted by name, Submission date, Analysis Requested, IH Sample #, Col. Date, Turn-Around-Time, Matrix.* The IH SARF COC is 2 pages. The second page is the received/relinquished page. The corresponding second page must include the IH Survey ID number.
- If samples are destined for the on-sight Radiation Protection Sample Diagnostics (RPSD) laboratory for analysis (i.e., gamma spec, alpha, beta, etc.), the customer shall complete either the paper form RPSD/SARF COC (Attachment E) provided by the RPSD laboratory or submit an electronic version of the SARF through the Sample Analysis Laboratory Information (SALI) system.
- For the ARCOC, sample container labels (Attachment F) shall be affixed to sample containers, or in some cases, to the re-sealable bag, and shall match information on the associated ARCOC. Sample labels shall be legible and completed in indelible ink. (Refer to LOP 94-03). Blank Sample Labels may be obtained by contacting an SMO Packaging Facility representative or may be printed from the SMO SMART Application. (See section 4.3.)
- All samples shall be accompanied with corresponding ARCOC, IH or RPDP SARF, COC, and/or RPSD SARF documentation.
- Samples shall be delivered to the SMO Packaging Facility for review of custody documentation prior to acceptance and transfer of custody to the SMO. (Refer to LOP 94-03).
- The SMO Packaging Coordinator shall process samples as required by LOP 94-03. Samples submitted by sampling team members to the SMO Packaging coordinator or support staff shall be

clean, sealed, and intact. Sample container lids shall be secured with custody tape that has been initialed and dated. Glass containers are placed in re-sealable bubble bags and double bagged. If samples are from an area designated as a RMA, the sampling team member shall include the Radiation Survey Documentation (Attachment G) with the samples. (Refer to LOP 94-03).

- A sampling team member shall assist the SMO Packaging representative in verifying that all sample containers and request forms are correct and complete. (Refer to LOP 94-03).
- Upon complete verification, the sampling team member shall transfer custody of the samples to the SMO Packaging representative by signing, dating and noting the time on the appropriate *Relinquished By* line on the ARCOC, IH or RPDP SARF, COC, and/or RPSD SARF. The SMO Packaging representative shall then accept custody by signing, dating, and noting the time on the appropriate *Received By* line, below the *Relinquished By* signature.

Packaging Coordinator Procedure

- The SMO Packaging Coordinator shall relinquish samples to the contract laboratory by signing the *Relinquished By* line on the ARCOC, SARF, or COC. The chain-of-custody documentation is then put into a re-closable plastic bag and placed inside the shipping container/cooler. The shipping container/cooler is then closed, secured, and sealed with custody tape and delivered to SNL/NM Shipping and Receiving personnel for shipment to contract laboratories. Included with the shipping container is a completed Web Shipper. The SNL/NM Shipping and Receiving Department shall be responsible for assigning the shipment to the appropriate commercial carrier (overnight air shipment is preferred) and for final labeling of the container/cooler. Non-hazardous samples may be hand-delivered to local analytical laboratories by the SMO after meeting all other requirements for packaging and shipping. Refer to LOP 94-03 for detailed sample handling, packaging, and shipping requirements and instructions.
- The SNL/NM Shipping/Receiving Department is responsible for completing the shipping documentation, including the waybill. The SMO shall retain a copy of all sample custody documents including shipping documentation.

Analytical Laboratory Custody Procedure

Sample custody is transferred to the contract laboratory at the time of sample receipt, after which the contract laboratory is responsible for maintenance of unbroken chain-of-custody. The analytical laboratory shall maintain the sample custody records until sample analysis is complete. Sample receipt requirements for the analytical laboratory are:

- Follow the current version of the SMO-SOW

Non-conformance and Corrective Action:

Any non-conformances and corrective actions related to processes described in this procedure and associated corrective actions will be documented, approved, and implemented in accordance with the requirements of the SMO-QAPP and the responsibilities identified in this procedure (Section 4.0). Non-conformances shall be identified by any personnel (e.g., SNL/NM staff; contractor; or contract analytical laboratory).

6.0 RECORDS MANAGEMENT

The SMO shall maintain records to document activities and to provide support for possible evidential proceedings. Records that provide documentary evidence of quality shall be specified, prepared and maintained in accordance with appropriate SNL/NM record-keeping procedures. SMO records shall be transferred to the customer as well as to the Records Center for cataloging and storage in accordance with SNL/NM and DOE requirements. The following documentation required by this procedure should be submitted to the SMO Operations Manager or to the SMO Project Coordinator for review, approval, and storage in the Records Center:

- ARCOC, IH SARF COC, or RPDP SARF COC Record (hard copy to Records Center)
- Shipper form (hard copy to Records Center)
- Radiation Survey Documentation when applicable (hard copy to Records Center)
- Data package electronic file and Electronic Data Deliverable (EDD)
- Nonconformance and corrective action records
- Pertinent correspondence.

7.0 REFERENCES

International Air Transport Association (IATA) Dangerous Goods Regulations, current edition, 57th Edition (updated annually), International Air Transport Association (IATA), Montreal, Canada

Sandia National Laboratories/New Mexico Quality Assurance Project Plan for the SNL/NM Sample Management Office (SMO-QAPP), current revision, Sandia National Laboratories/New Mexico Sample Management Office, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico Sample Handling, Packaging and Shipping Laboratory Operating Procedure (LOP 94-03), current revision, Sandia National Laboratories/New Mexico Sample Management Office, Albuquerque, New Mexico.

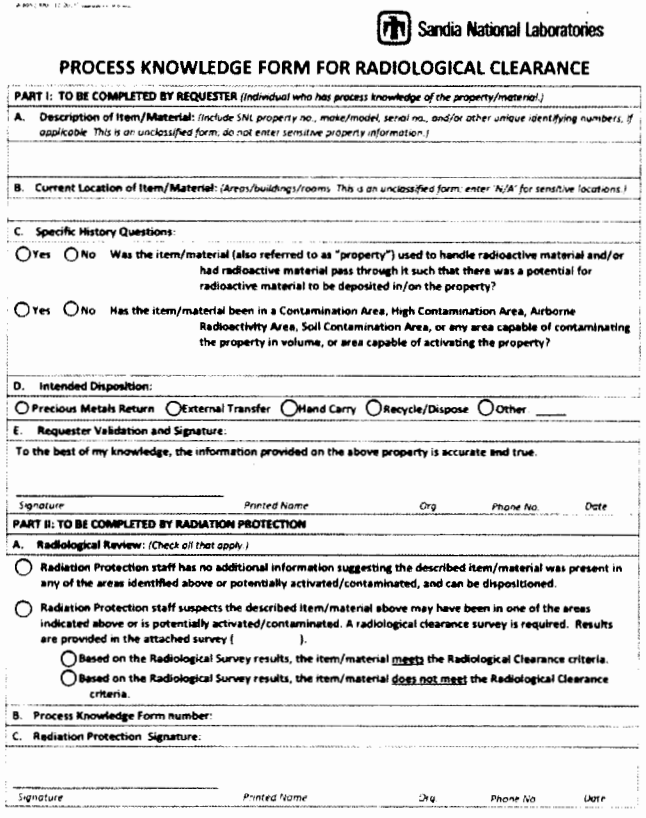
Sandia National Laboratories/New Mexico Sample Management Office Statement of Work (SMO-SOW) for Analytical Laboratories, current revision, Sandia National Laboratories/New Mexico Sample Management Office, Albuquerque, NM

U.S. Environmental Protection Agency Code of Federal Regulations (CFR), CFR Title 49, Updated Quarterly as of October 1st, U.S. Environmental Protection Agency, Washington, DC

U.S. Occupational Safety and Health Administration Code of Federal Regulations (CFR), Title 29, Section 1910.1200, Updated Quarterly as of July1st, U.S. Occupational Safety and Health Administration Government Printing Office, Washington, D.C.

ATTACHMENTS

ATTACHMENT A:
PROCESS KNOWLEDGE FORM FOR RADIOLOGICAL CLEARANCE SF 6951-RRF



Sandia National Laboratories

PROCESS KNOWLEDGE FORM FOR RADIOLOGICAL CLEARANCE

PART I: TO BE COMPLETED BY REQUESTER *(Individual who has process knowledge of the property/material.)*

A. **Description of Item/Material:** *(Include SNL property no., make/model, serial no., and/or other unique identifying numbers, if applicable. This is an unclassified form, do not enter sensitive property information.)*

B. **Current Location of Item/Material:** *(Areas/buildings/rooms. This is an unclassified form, enter 'N/A' for sensitive locations.)*

C. **Specific History Questions:**

◯ Yes ◯ No **Was the item/material (also referred to as "property") used to handle radioactive material and/or had radioactive material pass through it such that there was a potential for radioactive material to be deposited in/on the property?**

◯ Yes ◯ No **Has the item/material been in a Contamination Area, High Contamination Area, Airborne Radioactivity Area, Soil Contamination Area, or any area capable of contaminating the property in volume, or area capable of activating the property?**

D. **Intended Disposition:**

◯ Precious Metals Return ◯ External Transfer ◯ Hand Carry ◯ Recycle/Dispose ◯ Other ____

E. **Requester Validation and Signature:**

To the best of my knowledge, the information provided on the above property is accurate and true.

Signature *Printed Name* *Org.* *Phone No.* *Date*

PART II: TO BE COMPLETED BY RADIATION PROTECTION

A. **Radiological Review:** *(Check all that apply.)*

◯ **Radiation Protection staff has no additional information suggesting the described item/material was present in any of the areas identified above or potentially activated/contaminated, and can be dispositioned.**

◯ **Radiation Protection staff suspects the described item/material above may have been in one of the areas indicated above or is potentially activated/contaminated. A radiological clearance survey is required. Results are provided in the attached survey ( ).**

◯ **Based on the Radiological Survey results, the item/material meets the Radiological Clearance criteria.**

◯ **Based on the Radiological Survey results, the item/material does not meet the Radiological Clearance criteria.**

B. **Process Knowledge Form number:**

C. **Radiation Protection Signature:**

Signature *Printed Name* *Org.* *Phone No.* *Date*

This PKF is for example purposes only.

ATTACHMENT B:
CONTRACT LABORATORY ANALYSIS REQUEST AND CHAIN-OF-CUSTODY
SMO 2012-ARCOC

SMO 2012-ARCOC (4-2012)

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

AOP 95-16

Page 1 of ___

Internal Lab

Batch No.

SMO Use

AR/COC

Project Name:	Date Samples Shipped:	SMO Authorization:	Waste Characterization RMMA Released by COC No 4° Celsius
Project/Task Manager:	Carrier/Waybill No.	SMO Contact Phone:	
Project/Task Number:	Lab Contact:		
Service Order:	Lab Destination:	Send Report to SMO:	Bill to: Sandia National Laboratories (Accounts Payable)
	Contract No.:	Rita Kavanaugh/505.284.2553	P.O. Box 5800 MS-0154
Tech Area:			Albuquerque, NM 87185-0154
Building: Room:	Operational Site:		

Sample No.	Fraction	Sample Location Detail	Depth (ft)	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID

Last Chain:	Yes	Sample Tracking	SMO Use	Special Instructions/QC Requirements:		Conditions on Receipt
Validation Req'd:	Yes	Date Entered:		EDD	Yes No	
Background:	Yes	Entered by:		Turnaround Time	7 Day* 15 Day* 30 Day	
Confirmatory:	Yes	QC Inits.:		Negotiated TAT		
Sample Team Members	Name / Signature / Init. / Company/Organization/Phone/Cell			Sample Disposal	Return to Client Disposal by Lab	
				Return Samples By:		
				Comments:		Lab Use

1. Relinquished by	Org.	Date	Time	3. Relinquished by	Org.	Date	Time
1. Received by	Org.	Date	Time	3. Received by	Org.	Date	Time
2. Relinquished by	Org.	Date	Time	4. Relinquished by	Org.	Date	Time
2. Received by	Org.	Date	Time	4. Received by	Org.	Date	Time

*Prior confirmation with SMO required for 7 and 15 day TAT

This ARCOC is for example purposes only. The ARCOC currently in effect is posted on the 4100 Controlled Documents homepage (SMO 2012-ARCOC).

ATTACHMENT C:
Industrial Hygiene (IH) SARF Chain-of-custody

SANDIA
SNL NM
SARF Chain of Custody Report

IH Survey ID: S01013 Lab Log Batch ID: Lab receiving sample
Sample location TA1 897 1300

Submitted By: CASTILLO,R Submission Date:
Charge code:

Send Report To: SNL NM Attention of: CASTILLOR
Address: Email:
Phone: Fax:

Analysis requested (please be specific if possible)
CADMIUM

General comments to lab personnel
Additional Potential Hazards, Name and phone/pager of a person knowledgeable about the sample origin and hazards

IH Sample #	Lab ID	Col. Date	Turn-Around-Time	Matrix	Sample Comments
12345678901		11/17/2010	NORMAL (15 DAYS)	SWIPE	088750-001
12345678902			NORMAL (15 DAYS)	SWIPE	088750-002
12345678903			NORMAL (15 DAYS)	SWIPE	088750-003

Samples Checked For
☐ Container Integrity
☐ Sample Size
☐ Sampling Label

Condition of Sample Received
☐ Acceptable
☐ Not Acceptable

Custody Seals
☐ Present
☐ Not Present

This IH SARF is for example purposes only.

ATTACHMENT D:
RPDP SAMPLE ANALYSIS REQUEST FORM
RPDP SARF

SAMPLE ANALYSIS REQUEST FORM (SARF)
RADIATION PROTECTION DOSIMETRY PROGRAM (RPDP)

Page 1 of 1

RPDP BATCH NO: _____ RPSD LOG NO: _____

Customer Name: Goke, Sarah Hayes
Organization: 4121
MailStop: 0651
Phone: 845-DOSE / 284-5598
Email: dosimetry@sandia.gov
Prgm Name: Radiation Protection Dosimetry Program

Analytical Lab: _____
Lab Contact: _____
Contract No.: _____
Date Shipped: _____
Shipper No.: _____
RPDP Contact/Ph: Sarah Hayes Goke / 505.284.5598

Send Results to: RPDP
P.O. Box 5800, MS-0651
Albuquerque, NM 87185
Email: dosimetry@sandia.gov
FAX: 505.844.8313

Bill to: Sandia National Laboratories
Accounts Payable Department
P.O. Box 5800, MS-1383
Albuquerque, NM 87185-1383

Customer Sample ID	Lab Sample ID	Date Collected	Time Collected 0-24 HRS	TAT	Sample Matrix	Qty/Tot Volume Tare Wt	Rad Screen (cpm)	QC Set	EDD (Off-Site Labs) [ ] Yes [X] No: Parameter / Method Requested	Lab Notes

Turn Around Time (TAT) Instructions
ENTER DATE NEEDED BY: (applicable to all samples)
N - Normal, R - Rush, U - Urgent

Special Instructions/Hazards
Biological Sample - Treat With Caution
Contact: Sarah Hayes Goke, 284-5598, pager (800) 237-6849

Sample(s) Condition on Receipt
[ ] Normal
[ ] Abnormal
If abnormal, fill out the attached Sample Condition Upon receipt form and contact the customer about the sample condition before proceeding further.

	Org.	Date		Org.	Date
1. Relinquished by			1. Received by		
2. Relinquished by			2. Received by		
3. Relinquished by			3. Received by		
4. Relinquished by			4. Received by		
5. Relinquished by			5. Received by		
6. Relinquished by			6. Received by		

This RPDP SARF is for example purposes only.

ATTACHMENT E:
ONSITE LABORATORY (RPSD) SAMPLE ANALYSIS REQUEST
RPSD SARF

Sandia National Laboratories
Sample Analysis Programs

Sample Analysis Request Form
Page ____ of ____

To be completed by Customer

SHADED AREAS ARE FOR LAB USE ONLY

Customer Name: _____
Customer Email ID: _____
Organization: _____
Phone: Sample _____
Location (Bldg/Rm): _____
Date Results Needed: _____
Project/Task Number: _____

Hazards/Special Instructions:

☐ Provide EDD

Batch Log No: _____
Logged By: _____

☐ RPOP - Rad Protection Operation
☐ RPID - Dosimetry
☐ RPSD - Sample Diagnostics
☐ IH - Industrial Hygiene
☐ DND -DeconDecom
☐ EXT- External
☐ SND - Source & Device
☐ WM – Waste Management
☐ OTH - Other
☐ EM - Environment Monitoring
☐ EMAA - Ambient Air
☐ EMWW - Waste Water
☐ EMGW - Ground Water
☐ EMTS - Terrestrial surveil
☐ EMSW - Storm Water
☐ CMC – Coop Monitoring Ctr
☐ ER – Enviroment Restoration

Customer Sample ID	Sample Type	Date/Time Collected	Sample Amount or Flow Rate	Requested Analysis	or COC#	ID	Screen(CPM)	

Relinquished by _____ Date _____ Received by _____ Date_____

This RPSD SARF is for example purposes only.

ATTACHMENT F:
SAMPLE LABEL
http://info.sandia.gov/esh/smo/
https://info.sandia.gov/esh/smo_application

Sandia National Laboratories

Volume:
Type:
Container of

*Sample ID:
*COC No:
*Location:
*Date:
*Time:
*Matrix:
*Preservative:
*Analysis:
*Collector:

***Required fields**

This Sample Label is for example purposes only.

ATTACHMENT G:
Radiological Survey Form
http://www-irn.sandia.gov/esh/radpro_procedures/forms/rsf.dot

Survey Number:

RADIOLOGICAL SURVEY FORM

Page: _____ of _____

Location:	Requester/Org.:	Date:	Time:
Purpose:	Request #:	RWP#:	

Instrument and Probe Type and Serial Number		Surveyor(s) Printed Name(s)	Surveyor(s) Signature/Date

#	Item Description/Location	BETA-GAMMA ACTIVITY Counting Data Attached: ☐ YES ☐NO % Eff.: [c] _____ Radionuclide: _____				ALPHA ACTIVITY Counting Data Attached: ☐ YES ☐NO % Eff.: [c] _____ Radionuclide: _____				RADIATION SURVEY Background: _____ mrem/hr Radiation Type: Gamma	
		cpm	Bkg. cpm	dpm[a, b] / 100cm2	T/R/F[c]	cpm	Bkg. cpm	dpm[a, b] / 100cm2	T/R/F[c]	mrem/hr	Distance from Source[d]

[a] ND = No detectable activity above background [b] If other than 100 cm², indicate area or record as "dpm/probe" or "dpm/LAW" (large area wipe). [c] T/R/F = Total/Removable/Fixed [d] OC or CT = On Contact [e] %Eff-Removable/Direct

Remarks:		
	Reviewed by:	Date:

This Radiological Survey Form is for example purposes only.

SANDIA NATIONAL LABORATORIES
ANALYTICAL SERVICES DEPARTMENT (4131)

SOIL VAPOR MONITORING
FIELD OPERATING PROCEDURE

FOP 08-22
Revision 4

Author: _____ **Date:** 10/5/2016
Robert Ziock, Technologist
Environmental Compliance and Monitoring

Reviewer: _____ **Date:** 06-Oct-2016
Tim Jackson, Staff Member
Long-Term Stewardship

Reviewer: _____ **Date:** 10/5/16
Rick Dotson, Staff Member
Long-Term Stewardship

Approved: _____ **Date:** 10/13/16
Sue Collins, Program Lead
Long-Term Stewardship

Author: *How frequently does this document need to be reviewed and/or revised?*	*Every three years*
Manager: *Does this document need to be tracked?*	*Yes*

EFFECTIVE DATE: 10/17/2016

IMPORTANT NOTICE: *A printed copy of this document may not be the document currently in effect. The official version is located on the Sandia Restricted Network, 4100 Controlled Documents home page.*

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REVISION HISTORY

Revision	Effective Date	Summary of Changes
0	01/27/2009	Original Issue
1	05/27/2009	Section 6.3 – "Quality Control Sample Equipment Setup and Sampling Procedure" added.
2	06/09/2011	The rewrite makes FOP not specific to the CAMU. It now applies to soil vapor sampling at any SNL/NM site. Site-specific information for CAMU, CWL, MWL, and TA-V included in the attachments.
3	06/16/2014	Updates include methane gas monitoring and attachment for TA-III Classified Waste Landfill. On-the-Job Training, Authorized User List, and Tailgate Safety Briefing attachments removed. Table B-1 and purge time requirements removed from Attachment B. Updated Attachment C to reflect approval of the LTMMP.
4	10/17/2016	Removed all text referencing methane gas monitoring at TA-III. Added Section 1.1.3, Program Description; Section 7.0, Waste Management; 8.0, Quality Assurance; and 9.0, Data Management. Reorganized and updated Section 6. Updated Attachments A. Combined Attachments B, C, and E. Removed Attachments D, F, G, and H.

ACRONYMS and ABBREVIATIONS

ALW	activity level work
AR/COC	Analysis Request/Chain of Custody
CAMU	Corrective Action Management Unit
CWL	Chemical Waste Landfill
FOP	field operating procedure
LTMMP	Long-Term Monitoring and Maintenance Plan
MWL	Mixed Waste Landfill
NMED	New Mexico Environment Department
OJT	on-the-job training
PHS	primary hazard screening
PID	photoionization detector
Sandia	Sandia Corporation
SAP	sampling and analysis plan
SMO	Sample Management Office
SNL/NM	Sandia National Laboratories/New Mexico
TA	Technical Area
TEDS	Training and Employee Development System
THA	task hazard analysis
VOC	volatile organic compound

1.0 PURPOSE, SCOPE, AND OWNERSHIP

1.1 Purpose

The purpose of this field operating procedure (FOP) is to provide guidelines and procedures for soil vapor monitoring at various Sandia National Laboratories/New Mexico (SNL/NM) sites. Soil vapor monitoring can consist of taking *in situ* real-time measurements and/or collecting samples from the vadose zone. This procedure shall be used, as applicable, based upon the regulatory requirements for each site. Site-specific information, requirements and protocol are summarized in site-specific permits, and in attachments to this FOP.

1.2 Scope

This FOP is applicable to all Sandia Corporation (Sandia) employees and contractors who perform soil vapor monitoring activities at SNL/NM. Soil vapor monitoring is routinely performed at the Corrective Action Management Unit (CAMU) containment cell, Chemical Waste Landfill (CWL), Mixed Waste Landfill (MWL), and Technical Area (TA)-V. Site-specific information is provided in Attachments A, B, C, and D for the CAMU, CWL, MWL, and TA-V, respectively. The general guidelines in this FOP may also be applied to non-routine soil vapor monitoring locations/events (*e.g.*, Tijeras Arroyo).

1.3 Ownership

The Analytical Services Department is responsible for development, approval, distribution, revision, and control of this procedure.

1.3.1 Program Description

Soil vapor monitoring is performed as part of Long-Term Stewardship Program operations that are managed by the Analytical Services Department. The Long-Term Stewardship Program's goal is the long-term protection of human health and the environment from hazards associated with former Environmental Restoration Project sites (e.g., CAMU, CWL, MWL), and minimization of Sandia's environmental liability by ensuring environmental compliance with the requirements provided in multiple New Mexico Environment Department permits.

2.0 RESPONSIBLE INDIVIDUALS AND ORGANIZATIONS

The **Department Manager** is responsible for the following:

- Providing programmatic guidance leading to the development of this FOP.
- Review and approval of the procedure.

- Establishing and documenting field technician training in compliance with this FOP, site-specific permits (CAMU and CWL), and the MWL Long-Term Monitoring and Maintenance Plan (LTMMP).

The **Field Support Operations Project Lead** is responsible for the following:

- Coordinating with the Department Manager, Project Lead and Field Technicians regarding soil vapor sampling activities and the documentation of all required training.
- Assigning qualified Field Technicians to conduct the activities described in this procedure.
- Supervising the Field Technicians.
- On-the-job training (OJT), as necessary, for new personnel performing field activities. Document training by completing an OJT Form (EP 2009-OJT).
- Reviewing, implementing, and verifying the completion of all training required for Field Technicians.
- Providing Field Technicians with necessary equipment and supplies to conduct field work.
- Reviewing, revising, and maintaining technical work documents.

The **Project Lead** or designee is responsible for the following:

- Reviewing and concurring with this procedure and the related site-specific attachment(s).
- Providing overall coordination and management of site-specific soil vapor monitoring events.
- Providing copies of the relevant sections of the site-specific permit and sampling and analysis plan (SAP) (CAMU and CWL) and the MWL LTMMP for Field Technician review and signoff, prior to sampling.
- Reviewing field documentation and analytical results.
- Assisting with the revision of this procedure as necessary or every three years.

The **Field Technician** is responsible for the following:

- Completing all necessary and required training as specified by the Field Support Operations Project Lead. At a minimum, required training shall include the training defined in this FOP, site-specific permits (CAMU and CWL), and the MWL LTMMP.
- Maintaining requisite training status.
- Inspecting and maintaining equipment.
- Completing a program specific tailgate safety meeting form prior to each day's soil vapor monitoring activities. Program forms are available on the 4100 Controlled Documents webpage.
- Collecting and storing samples properly, when applicable.

- Delivering samples to the Sample Management Office (SMO) in a timely manner, relative to analytical holding times, when applicable.
- Completing and reviewing field documentation forms.
- Inspecting soil vapor monitoring locations during each sampling event and documenting the inspections along with any deficiencies and/or repairs, or breach of monitoring location security. Reporting deficiencies and/or breach of security to the Field Support Operations Project Lead and the Project Lead.
- Providing recommendations for revisions to this procedure (*i.e.*, process improvement feedback as appropriate).

3.0 TRAINING QUALIFICATIONS

Personnel conducting soil vapor monitoring shall complete all training required to perform work under this FOP and in accordance with site-specific permits and the MWL LTMMP:

- Field personnel shall sign an Authorized Users List (EP2009-AUL) to affirm they have read and understand this document, and agree to operate within the stated constraints.
- Read SNL/NM Corporate Policy ESH100 Environment Safety & Health.
- Required department training and training identified in the primary hazard screening (PHS) results.
- Read applicable site-specific training (*i.e.*, PHS, health and safety plan, etc.)
- Read applicable sections of site-specific permits and SAPs (CAMU and CWL), the MWL LTMMP, and comply with the related training program requirements.
- Document site-specific permit training requirements (CAMU, CWL) for a Field Technician (on file at the CAMU Administrative Trailer).
- OJT, as necessary, for new personnel performing field activities. Document training by completing an OJT Form (EP 2009-OJT).
- Complete training courses listed in Table 3-1.

Table 3-1. Training Course List

Course Code	Course Title
CHM100	Chemical Safety
CHM103	Site Specific Chemical Safety
ELC105	Basic Electrical Safety (> 50 volts)
ENV100	OSHA Health & Safety Basic Training – General Worker (40 HR)
ENV103	OSHA Health & Safety Training Refresher (8 HR)
ENV112	Hazardous Waste & Environmental Management Training
ESH100	Environment Safety& Health Awareness
MCH200	Hand and Power Tool Safety
MED102	Standard First Aid
MED104	Heartsaver CPR
OTS101	Occupational Thermal Stress
PPE106	Personal Protective Equipment Training
PRS150	Pressure Safety Orientation
PRS250	Advance Pressure Safety
RAD102	General Employee Radiological Training

4.0 HEALTH AND SAFETY

Activity level work (ALW) evaluations have been performed on the activities described in this FOP and are detailed in safety cases ALW 14-02 (CAMU) and ALW 14-11 (CWL and MWL). The evaluations were performed in conjunction with the PHS SNL05A01119 (CAMU) and PHS SNL11A00081 (CWL and MWL).

A task hazard analysis (THA) has been performed on the activities described in this FOP and is detailed in Section 4.1. The THA classifies the potential hazards and rates them based on the probability of occurrence. The THA lists control measures that will be used to mitigate the potential hazards. A site-specific PHS (see Section 9.0 for list of applicable PHSs) shall be completed prior to soil vapor monitoring activities to help identify potential hazards that can be expected when performing the work. The control measures may include exposure assessment surveys (by a SNL/NM industrial hygienist), courses, and training that are identified as part of the PHS results. This approach to identifying, rating, and controlling hazards is consistent with SNL/NM's Integrated Safety Management System initiative. Hazards classification is standard industrial hazards for activities identified in this FOP.

A tailgate safety meeting shall be conducted and documented on the program specific tailgate safety meeting form each day before the start of field activities.

In the event that work is stopped due to:

- safety related issue(s),
- an injury incurred while performing the tasks identified in this procedure, or
- as the result of an audit,

the Field Technician shall immediately notify the Field Support Operations Team Lead, the Project Lead, and the Department Manager. The Field Technician shall seek the assistance of the Field Support Operations Team Lead for the mitigation of the hazard and the completion of a Work Resumption Authorization Form (EP 2009-WRA). The Department Manager shall sign the completed form prior to the restart of work.

4.1 Task Hazard Analysis

Task Description - Soil Vapor Sampling for Volatile Organic Compounds

Soil vapor samples are collected from the vadose zone at various SNL/NM sites (*e.g.*, CAMU, CWL, MWL, TA-V) and are analyzed to determine levels of volatile organic compound (VOC) contaminants in the surrounding soil pore space. The samples are collected by connecting sample tubing on the soil vapor monitoring system directly to a sampling container (*i.e.*, SUMMA® canister). The SUMMA® canister is under a vacuum and has a valve that when opened, draws in the vapor sample. Prior to sample collection, each monitoring location (port) is purged to remove stagnant air and draw representative soil vapor from the soil pore space surrounding the sampling port in the subsurface. VOC screening with a photoionization detector (PID) or equivalent detector shall be performed prior to sample collection to provide real-time data relative to stabilization of organic soil vapor concentrations during the purging process. (Note: VOC screening with a PID or equivalent detector during the purging and sampling process is not necessary for worker health and safety purposes). A THA is provided in Table 4-1.

Table 4-1. Task Hazard Analysis
Soil Monitoring for VOCs

Level of Protection—Level D Personal Protective Equipment (safety shoes/boots, safety glasses)

Potential Hazard	Hazard Rating	Control
Chemical (various VOCs)	SIH	• There will be no contact with contaminated soils during soil vapor monitoring activities. Soil vapors can be monitored using a photoionization detector as part of the purging process for VOC sampling. Historically VOC levels have been low (parts per million). Eating, drinking and smoking will not be permitted while performing soil monitoring activities.
Physical • Heat stress • Cold stress • Sunburn • Mechanical hazards • Pinch points • Strains, and lifting hazards • Slips, trips, falls • Motor vehicle accident • Electrical • Vacuum (negative pressure)	SIH	• Soil vapor monitoring activities are not physically demanding. Workers will be trained on heat stress, cold stress, and sunburn hazards. Sunscreen will be provided. • Appropriate inspections of equipment will be performed prior to use. • Leather work gloves will be worn when handling steel cable and removing vault covers. • Proper lifting techniques will be reinforced. • Proper housekeeping will be maintained. • Holes around monitoring area will be filled or covered to eliminate slip, trip hazards. • Seat belts will be worn anytime drivers and passengers are in a moving motor vehicle. • Proper ground fault circuit interrupter devices will be used for the electric equipment and tested before each use. • A management approved pressure safety data package is in place for equipment used for soil vapor sampling.
Radiological	SIH	• There are no radiological hazards specifically related to soil vapor monitoring at the Corrective Action Management Unit, Chemical Waste Landfill, Mixed Waste Landfill, and Technical Area V.
Fire	SIH	• Fire extinguishers will be located in mobile equipment.

Notes: SIH – standard industrial hazards
VOC – volatile organic compound

5.0 EQUIPMENT AND MATERIALS

The equipment and materials required for performing VOC soil vapor sampling are as follows:

- Analysis Request/Chain-of-Custody (AR/COC) forms and sample labels.
- Logbook (if applicable).
- Field forms:
  - ➢ Soil Vapor Sampling Log Form (LTS 2015-004).
  - ➢ Inspection form (site-specific or Soil Vapor Monitoring Inspection Log Form (LTS 2015-005).

- AC power provided by ground fault circuit interrupter (GFCI) outlets.
- Vacuum pump, purge chambers, and sampling manifold assemblies.
- Flow rate meter.
- Vacuum gauge.
- PID.
- SUMMA® canister(s).
- Gas cylinder containing ultra-pure nitrogen gas.
- Key(s) to unlock padlocks.

See Attachments A (CAMU) and B (CWL, MWL, and TA-V) for site-specific equipment.

6.0 FIELD PROCEDURES

Soil vapor sampling for VOCs involves pre-sampling preparation, monitoring system and equipment inspection, equipment set up and purging/sample collection, quality assurance sample collection, and shipment of samples to the analytical laboratory. The following sections detail the overall soil vapor sampling procedure in the sequence the activities will be performed.

6.1 Pre-Sampling Preparations

The following shall be completed before soil vapor sampling can begin:

1) Obtain AR/COC and sample control numbers from the Sample Management Office Home Page. Prepare and print out AR/COC and sample labels.
2) Obtain Soil Vapor Sampling Log Form (LTS 2015-004).
3) Inspection form (site-specific or Soil Vapor Monitoring Inspection Log Form (LTS 2015-005).
4) Obtain PID from the SNL/NM Safety and Health Instrumentation Program.
5) Obtain the SUMMA® canisters from the SMO.

6.2 Equipment Setup and Sample Methodology

See Attachments A (CAMU) and B (CWL, MWL, and TA-V) for site-specific equipment setup and sample methodology.

6.3 Calculating Purge Times

The purge time is a function of the volume of the sampling tube, well casing if applicable (CAMU only), soil vapor screen that need to be purged, and the flow rate through the sampling tube. A minimum of three sampling tube, well casing if applicable (CAMU only), and soil vapor screen volumes are purged at each location before a sample is collected.

Volume calculations for cylindrical pipes and sampling tubes are as follows:
$V = \pi r^2 h$ where: V = volume
r = radius
h = height

Minimum pump running time to evacuate three sampling tube/well volumes from each sampling port is calculated as follows:

$t = (V/Q)*3$ where: t = time
V = volume
Q = flow rate

Site-specific purge volumes are based upon individual soil vapor monitoring location construction details.

6.4 Quality Assurance Equipment Setup and Sample Collection

See site-specific quality assurance requirements in Attachments A (CAMU) and B (CWL, MWL, and TA-V), and site-specific permits (CAMU and CWL) and the MWL LTMMP for collecting duplicate, split, and field and trip blank samples if applicable.

Duplicate and Split Samples

A duplicate environmental sample is collected in order to estimate the overall reproducibility of the sampling and analytical process. Collect the duplicate sample immediately after the original environmental sample or simultaneously to reduce variability caused by time and/or sampling mechanics.

Field Blank Sample

A field blank sample is submitted to assess whether contamination of an environmental sample may have resulted from ambient field conditions. The sample is prepared in the field by collecting an ultra-pure nitrogen gas sample.

Trip Blank

A trip blank of ultra-pure nitrogen gas collected at a location not affected by the possible contaminant(s) of concern, is used to identify contaminants introduced into samples during transit to the laboratory.

6.5 Inspections

Inspections of soil vapor monitoring locations and equipment shall be performed in accordance with site requirements (*i.e.*, permits, MWL LTMMP). An example of a Soil Vapor Monitoring Inspection Log Form (LTS 2015-005) is available on the 4100 Controlled Documents webpage. (Note: Inspection frequency and the format of inspection forms may vary based on site-specific requirements detailed in applicable permits or regulatory documents.) Deficiencies and repairs shall be documented per site requirements.

6.6 Shipping Samples to Laboratory

Take the SUMMA® canisters, the completed AR/COC, and a copy of the completed Soil Vapor Sampling Log Form to the SMO for shipment to the laboratory.

7.0 WASTE MANAGEMENT

Waste is managed in compliance with SNL/NM Corporate Policy ESH100 Environmental Safety & Health.

8.0 QUALITY ASSURANCE

See Section 6.4 for quality assurance equipment setup and sample collection.

9.0 DATA MANAGEMENT

After sample analysis, the laboratory will deliver the data package results electronically and/or by over-night mail delivery. The SMO will review and process the electronic data file and the hardcopy data package using the SMO-05-03, *Contract Verification Review Procedure* and the SMO 05-04, *Procedure for Electronic Data Deliverable Processing*. Data validation is performed upon the request of the Project Lead using AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data for the Sample Management Office*. The Project Lead is responsible for using professional judgment in evaluating the data quality.

10.0 RECORD

Analytical reports will be provided with acceptable quality assurance/quality control. The following records will be maintained at the Customer Funded Record Center:

- authorized user list
- sampling and analytical results
- field forms
- inspection forms
- logbooks (if applicable).

Sampling results shall be kept electronically in the Environmental Data Management System database. Copies of logbooks (if applicable), authorized user list, field and inspection forms shall be maintained at the CAMU Administrative Trailer for the CAMU, CWL, and MWL per site-specific permits (CAMU and CWL) and the MWL LTMMP. Training records shall be kept electronically in the Training and Employee Development System (TEDS) database. TEDS shall be accessible from the CAMU Administrative Trailer.

11.0 REFERENCES

AOP 00-03, "Data Validation Procedure for Chemical and Radiochemical Data for the Sample Management Office", SNL/NM, Sample Management Office, (latest edition).

New Mexico Environment Department (NMED), March 2012. "New Mexico Solid Waste Rules, Solid Waste Management Act, Article 8 and Article 9, Solid Waste Rules 20.9.2 – 20.9.10 NMAC". New Mexico Environment Department Solid Waste Bureau, Santa Fe, New Mexico.

New Mexico Environment Department (NMED), January 2015. Resource Conservation and Recovery Act Facility Operating Permit, EPA ID No. NM5890110518, to the U.S. Department of Energy/Sandia Corporation, for the Sandia National Laboratories Hazardous and Mixed Waste Treatment and Storage Units and Post-Closure Care of the Corrective Action Management Unit," New Mexico Environment Department Hazardous Waste Bureau, Santa Fe, New Mexico,

PLA 04-01, "Health and Safety Plan for the CAMU Containment Cell", SNL/NM, Environmental Programs and Assurance, (latest edition).

SMO-05-03, "Contract Verification Review Procedure", SNL/NM, Sample Management Office, (latest edition).

SMO 05-04, "Procedure for Electronic Data Deliverable Processing", Sample Management Office, (latest edition).

SNL PHS # SNL05A01119 "CAMU Containment Cell Monitoring", SNL/NM, (latest edition).

SNL PHS # SNL06A00497 "Vadose Zone Monitoring at the Mixed Waste Landfill", SNL/NM, (latest edition).

SNL PHS # SNL11A00081 "Environmental Programs Soil Vapor Well Sampling", SNL/NM (latest edition).

Attachment A

Corrective Action Management Unit

Site-Specific Information

Corrective Action Management Unit (CAMU) Introduction and Background

Soil moisture monitoring requirements for the CAMU are defined in the Resource Conservation and Recovery Act Facility Operating Permit, EPA ID No. NM5890110518, Attachment H, Section H.5 (NMED January 2015).

Prior to performing work field technicians shall complete/document all required training as indicated in Table 1 of FOP 08-22, *Soil Vapor Sampling*, PLA 04-01, *Health & Safety Plan for the Corrective Action Management Unit*, and Attachment of the F the Resource Conservation and Recovery Act Facility Operating Permit, EPA ID No. NM5890110518.

CAMU Soil Vapor Sampling Network

The CAMU uses the following two monitoring subsystems to monitor for volatile organic compounds (VOCs) as supplemental data for the CAMU Vadose Zone Monitoring System (VZMS) leak detection program:

CSS – The six Chemical Waste Landfill Sanitary Sewer (CSS) vertical monitoring well points are positioned between the CAMU containment cell and the sanitary sewer line. The monitoring well points are approximately 20 feet (ft.) deep. The bottom of each well contains a 2-foot section of galvanized steel screen to support soil vapor sampling. The remaining length is constructed of 2-inch diameter, galvanized steel pipe that protrudes 2 ft. above ground and is sealed with a threaded PVC cap with a sampling port.

VSA - The Vertical Sensor Array (VSA) consists of eleven pairs of vertically oriented monitoring locations. Five are located on both the eastern and western margins of the containment cell. The eleventh monitoring location is situated at the northern end of the cell. Each VSA location contains two soil vapor sampling screens that are 5 ft. and 15 ft. beneath the containment cell sub-liner. The soil vapor screens are 1-foot-long by 2-inch diameter and are connected to polyethylene tubing with an inner diameter of 0.25-inches. The tubing extends approximately 50 ft. and terminates at a sampling port located in an above ground enclosure.

Equipment Setup and Sampling Procedure

Figure A-1 shows a general schematic of the vacuum pump, sampling manifold, and SUMMA® canister setup for collecting an environmental sample. The vacuum pump is turned on to draw gas from the sampling tubing. The flow valve is opened to allow the gas to flow at a rate compatible with the total sampling time (purge). Record the flow rate to determine when sufficient purge gas has been removed.

The amount of gas to be drawn from the system during the purge should be more than enough to remove the resident gas (the old gas) in the system. The recommended minimum volume of gas

removal is three sampling tube, well casing if applicable (CSS only), and soil vapor screen volumes. Because minimum purge times are so small, they have been increased to a required purge times that are consistent with historical purge times (ASSOP 04-01, "*Activity Specific Standard Operating Procedure for Active Soil-Gas Sampling Using Method TO-14 at the Corrective Action Management Unit (CAMU)*", SNL/NM Environmental Restoration Project, November 2001) which meet or exceed the minimum established criteria.

Detailed procedure

Record the required information on the Soil Vapor Sampling Log Form (LTS 2015-004).

1) Connect intake tube of vacuum pump to sampling port.
2) Connect sampling manifold to vacuum pump
3) Connect sample container (*i.e.*, SUMMA® canister) to sampling manifold.
4) Close in-line valve and sampling valve.
5) Open SUMMA® canister valve and record initial vacuum displayed on the vacuum gauge. (Note: The nominal vacuum at SNL/NM, approximate elevation 5,400 feet, is 23 to 25 inches [in] mercury [Hg]).
6) Close the SUMMA® canister valve.
7) Open the in-line valve.
8) Apply vacuum to the system by turning on pump and record the start time.
9) Purge sampling tube, well casing if applicable (CSS locations only), and soil vapor screen. Use the purge volumes specific and flow rate meter values to calculate the purge times.
10) Obtain continuous photoionization detector (PID) measurements from the vacuum exhaust port.
11) Wait until the correct volume has been extracted and record the final PID measurement.
12) Close in-line valve and turn off vacuum pump. Record stop time (sampling time) and open SUMMA® canister valve until the vacuum gauge on the manifold reaches approximately minus 10 in. Hg then close the SUMMA® canister valve. Record the ending vacuum. (Note: The analytical laboratory, requests that approximately minus 10 in. Hg of vacuum remain in the SUMMA® canister at completion of sampling.)
13) Remove manifold from the SUMMA®.
14) Fill out date and sampling time on sample label and attach it to SUMMA® canister tag. Do not attach sample label to canister itself.
15) Complete Analysis Request/Chain-of-Custody.

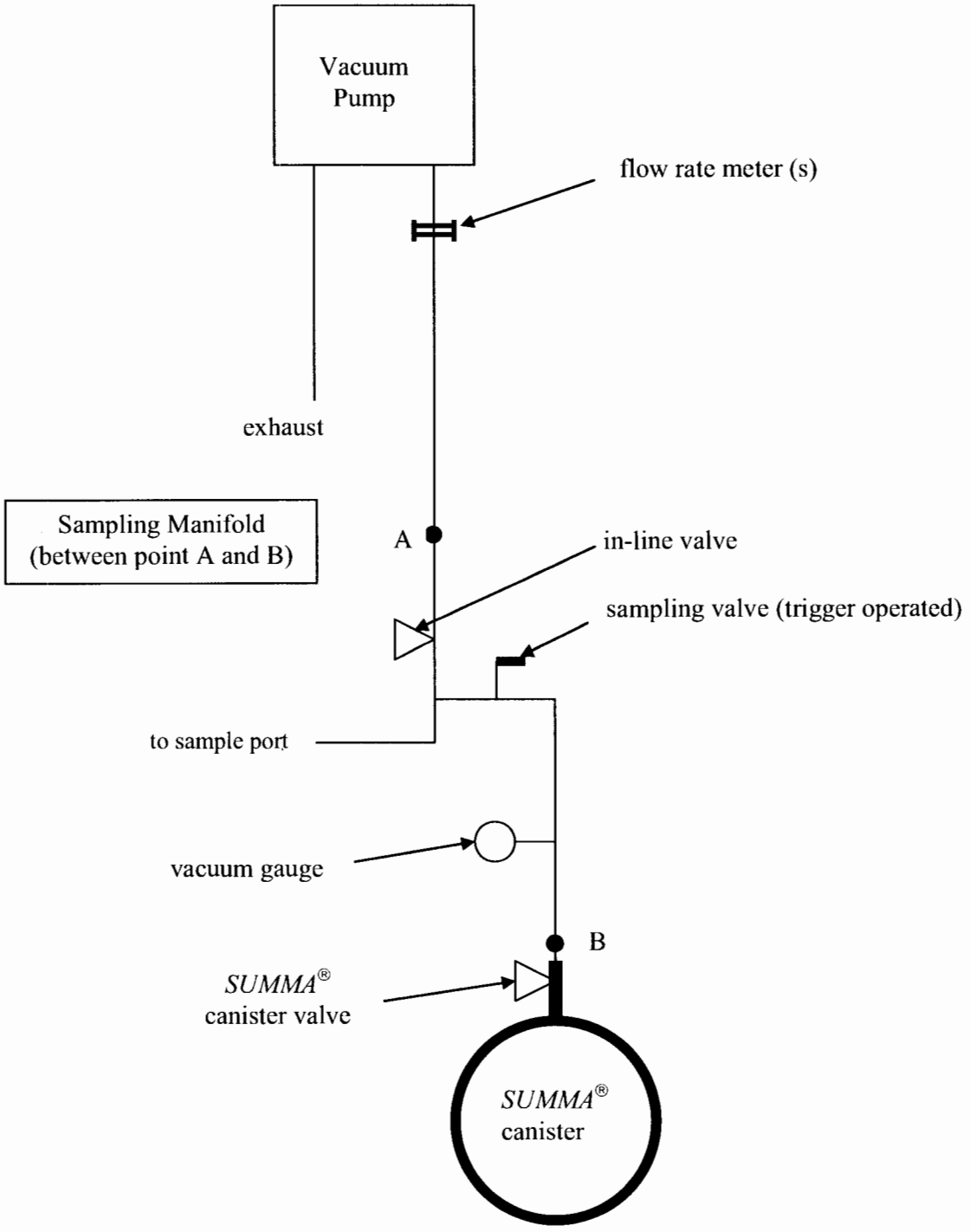

Figure A-1
Vacuum Pump, Sampling Manifold, and SUMMA® Canister Setup

Quality Assurance Samples

The following quality assurance samples shall be collected:

- One trip blank of ultra-pure nitrogen gas collected at a location not affected by the possible contaminant(s) of concern.
- One field blank of ultra-pure nitrogen gas collected at the first sampling location.
- One duplicate sample collected at a CSS location.
- One duplicate sample collected at a VSA 5-ft location.
- One duplicate sample collected at a VSA 15-ft location.

Collect quality assurance samples with an ending vacuum value of minus 10 in. Hg remaining in the SUMMA® canisters.

Field Blank and Trip Blank Equipment Setup and Sampling Process

See Figure A-2 for a general schematic of the vacuum pump, sampling manifold, and SUMMA® canister setup for collecting field blank and trip blank.

1) Close needle valve, purge valve, and regulator.
2) Connect regulator manifold assembly to SUMMA® canister and cylinder containing nitrogen gas.
3) Open nitrogen gas cylinder valve.
4) Adjust regulator to 8 pounds per square in. (psi) line pressure.
5) Adjust needle valve until compound gauge measures positive 8 psi.
6) Close nitrogen gas cylinder valve.
7) Open purge valve to purge line.
8) Close purge valve when compound gauge measures zero.
9) Repeat steps 3 through 8 a total of two times.
10) Open nitrogen gas cylinder valve.
11) Open SUMMA® canister valve.
12) Close SUMMA® canister valve when compound gauge measures approximately minus 10 in. of Hg (see site-specific attachments for ending vacuum values) .
13) Close nitrogen gas cylinder valve.
14) Open purge valve.
15) Disconnect regulator manifold assembly from SUMMA® canister and nitrogen gas cylinder.
16) Close needle valve, purge valve, and regulator.

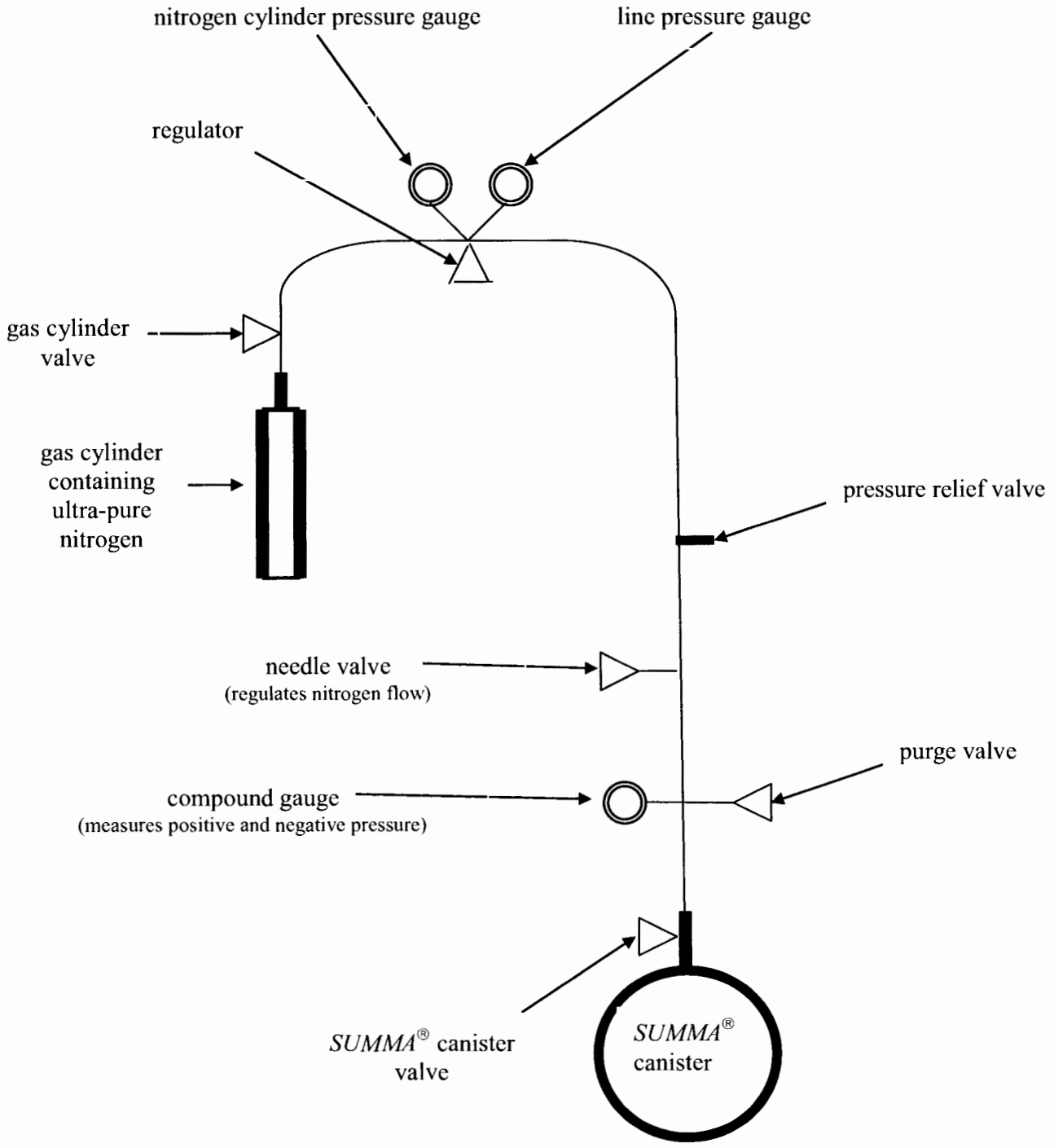

Figure A-2
Field Blank and Trip Blank Sampling Regulator Manifold and SUMMA® Canister Setup

Attachment B

Chemical Waste Landfill, Mixed Waste Landfill, and Technical Area V

Site-Specific Information

Chemical Waste Landfill (CWL) Background

Soil vapor sampling at the CWL shall be performed under the New Mexico Environment Department (NMED) approved Post-Closure Care Permit (PCCP) (NMED October 2009 and subsequent revisions), in conformance with the "Soil-Gas Sampling and Analysis Plan," Permit Attachment 3 (NMED October 2009). In all cases, the requirements of the PCCP Sampling Analysis Plan (SAP) take precedence over those of any other referenced or listed document and/or procedure, including FOP 08-22, *Soil Vapor Sampling*.

Prior to performing CWL soil vapor sampling, field technician must meet all training requirements as specified in the PCCP.

CWL Soil Vapor Sampling Network

The CWL soil vapor sampling network consists of the following five soil vapor monitoring wells: UI-1, UI-2, D-1, D-2, and D-3. The UI designation refers to "Upper Intermediate" indicating the general depth horizon that these wells are designed to sample. The D designation refers to "Deep" and is similarly indicative of the sampling depth interval. There are three soil vapor sampling ports associated with each of the UI series wells and five soil vapor sampling ports associated with each of the D series wells. One soil vapor screen at each sampling depth consists of a 2 feet (ft.) long by 0.31 inches (in.) inner diameter stainless steel screen that is attached to a 0.215 in. stainless steel tube that extends to the surface.

Mixed Waste Landfill (MWL) Background

Soil vapor sampling at the MWL shall be performed under the NMED approved LTMMP (NMED January 2014), and in conformance with the "Soil-Vapor Sampling and Analysis Plan for the Mixed Waste Landfill," LTMMP Appendix D. In all cases, the requirements of the LTMMP SAP take precedence over those of any other referenced or listed document and/or procedure, including FOP 08-22, *Soil Vapor Sampling*.

Prior to performing soil vapor sampling at the MWL, field technicians shall read the pertinent sections of the LTMMP.

MWL Soil Vapor Sampling Network

The MWL soil vapor sampling network consists of the following five soil vapor monitoring wells: MWL-SV-01, MWL-SV-02, MWL-SV-03, MWL-SV-04, and MWL-SV-05. The soil vapor implant at MWL-SV-01 and MWL-SV-02 consists of a 0.5 ft. long by 0.5 in. diameter stainless steel screen. It is attached to a nominal 0.25 in. diameter polyethylene tube that extends 41 ft. to the ground surface and a sampling port.

The soil vapor sampling systems at MWL-SV-03, MWL-SV-04, and MWL-SV-05 consists of three Flexible Liner Underground Technologies (FLUTe™) multi-port soil-vapor monitoring wells with five sampling ports per location. Each sampling port consists of FLUTe™ spacer (volume of 0.9 liters) are set at 50, 100, 200, 300, and 400 foot depths and attach to nominal 0.25 in. diameter polyethylene tubing.

Technical Area V (TA-V) Background

Soil vapor monitoring is performed under the NMED issued a Compliance Order on Consent (NMED April 2004) to the United States Department of Energy and Sandia Corporation, and supplement a Corrective Measures Evaluation for the TA-V area of groundwater contamination. In all cases, the requirements of established or approved regulatory-approved work plan requirements for soil sampling take precedence over those of any other referenced or listed document and/or procedure, including FOP 08-22, *Soil Vapor Sampling.*

TA-V Soil Vapor Sampling Network

The TA-V soil vapor sampling network consists of three soil vapor monitoring wells (TAV-SV01, TAV-SV02, and TAV-SV03), with soil vapor sampling ports at depths of approximately 50 ft., 100 ft., 150 ft., 200 ft., 250 ft., 300 ft., 350 ft., 400 ft., 450 ft., and 500 ft. below ground surface. The soil vapor screen at each location consists of a 1-ft. long by 0.5-in. diameter stainless steel screen. It is attached to 0.25 in. outside diameter stainless steel tube that extends to the ground surface and a sampling port.

Equipment Setup and Sampling Procedure

The tubing for the sampling system can be assembled by the client or purchased from a vacuum or pressure manufacturer. The geometry of the system is shown in Figure B-1. The tubing for each port is connected to the inlet of the sampling system. The vacuum pump is turned on to draw gas from the sampling tubing. The flow valve is opened to allow the gas to flow at a rate compatible with the total sampling time (purge). Record the flow rate to determine when sufficient purge gas has been removed.

The amount of gas to be drawn from the system during the purge should be more than enough to remove the resident gas (the old gas) in the system. Since the flow in the system may be laminar, it is difficult to remove all of the old gas. Turbulent flow is better in that it removes the gas along the wall more quickly; therefore, based on subject matter expert calculations, equipment shall have the capability for turbulent flow or a minimum drawdown of 0.5 bar (~7.3 psi vacuum), and assuming that laminar flow velocity at the tubing wall is zero.

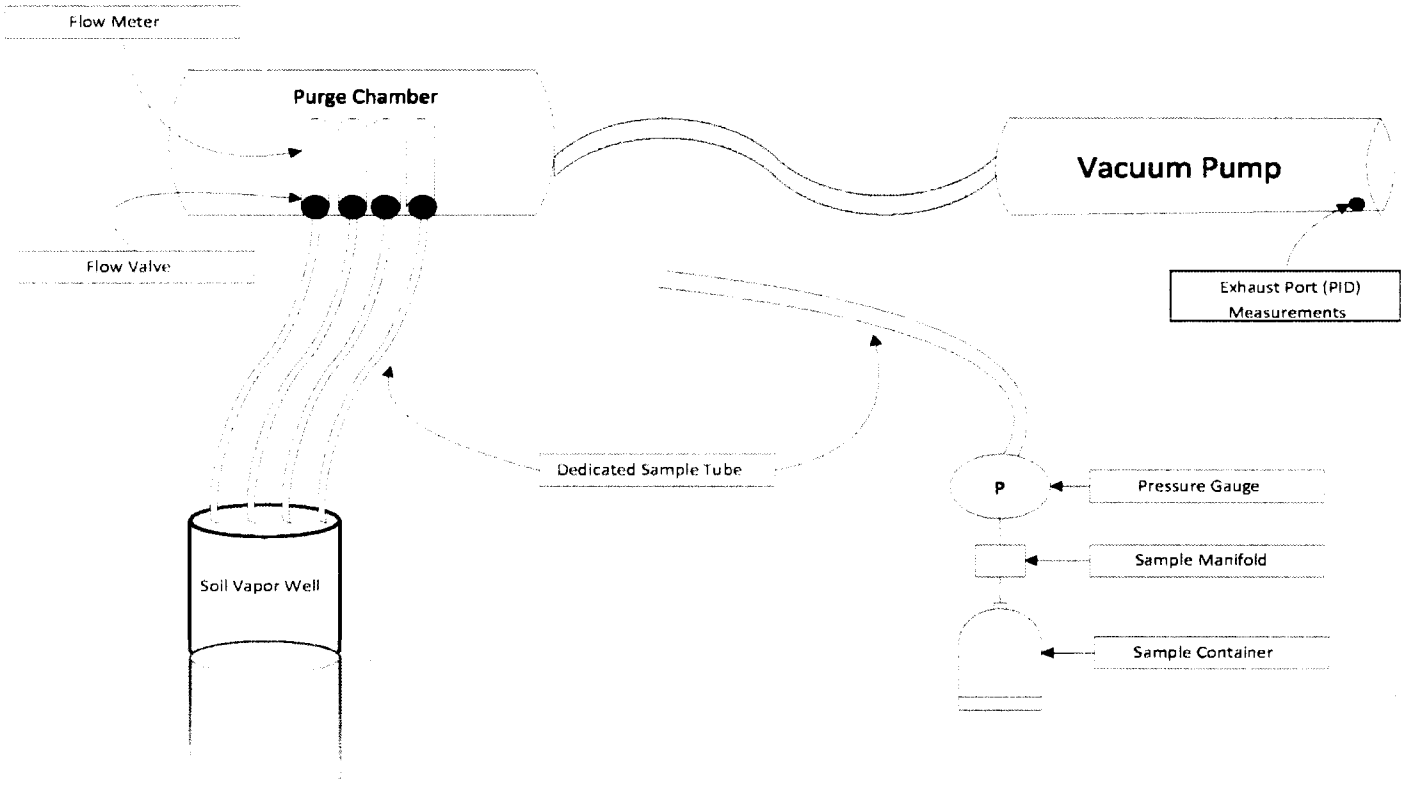

Figure B-1, Vacuum Pump, Sampling Manifold, and SUMMA® Canister

The recommended minimum volume of gas removal is three tube volumes. The more gas that is purged from the system, the more distant the origin of the gas sampled in the formation. The apparent limit is that the sampling purge volumes withdrawn should not be a significant influence on the natural flow field in the formation between sampling events.

Detailed procedure

Record the required information on the Soil Vapor Sampling Log Form (LTS 2015-004).

1. Connect purging chamber to vacuum pump.
2. Connect well or port specific sampling tube extension to the sampling system.
3. Connect sample tube to the purge chamber.
4. Apply a vacuum to the system.
5. Open the flow meter to the flow rate compatible with the volume to be extracted and record the start time.
6. Note the vacuum on the pressure gauge (the extraction pressure).
7. Obtain continuous photoionization detector measurements from the vacuum exhaust port (if required).
8. Wait until the correct volume has been extracted.
9. Close the flow valve on the flow meter and record the stop time.
10. Wait until the pressure has recovered to near ambient (optional).
11. Disconnect sample tube from purge chamber.
12. Connect sample manifold to the sample container (e.g., SUMMA® canister).
13. Connect sample tube to the sample manifold.
14. Open the sample container valve and record container pressure on the sample manifold pressure gauge.
15. Open sample manifold valve and let the collection volume fill until the pressure again returns to approximately minus 10 inches of mercury (Hg) (Note: The analytical laboratory, requests that approximately 10 in. Hg of vacuum remain in the SUMMA® canister at completion of sampling).
16. Close the valve on sample container and disconnect from sampling manifold.
17. Repeat steps 3 to 15 at each sample interval.

Additional sampling systems may be used to collect field quality samples including field blank and duplicate samples by simultaneous or in-series collection methods. It is best practice to remove gas remaining in the sample tubing or sampling manifolds any longer than necessary. Each sampling system should be equipped with valves that allow the system to be flushed with an inert gas (e.g., nitrogen gas).

The sampling systems are designed to minimize the dead end volumes in the system on the upstream side of the flow valve (e.g., the pressure gauge connection). This reduces the possible accumulation of old gas in the tubing system and allows a thorough flow of gas during the purge cycle.

Sampling Tube Volume and Purge Time Calculations

Vapor Well Volume = (V soil vapor screen, or FLUTe™ spacer, or vapor implant + V of sampling tube)
V to purge = 3 * (Vapor Well Volume)

Minimum pump run time to evacuate three volumes from each sampling port is calculated as follows:

t = V to purge / Q where: t = time
V = volume
Q = flow rate (to be determined in the field based on equipment limitations)