Environment, Health, and Safety
BERKELEY LAB
ENVIRONMENTAL SERVICES

Guidance for the Excavation and Removal of Known and Potentially Contaminated Underground Piping

Prepared by:
Environment, Health, and Safety Division
Environmental Services Group
Lawrence Berkeley National Laboratory

Revision: 1

July 2026

Review and Approval

Prepared By:

Date: 07 / 10 / 2026

David Baskin
Certified Engineering Geologist
Environmental Services Group
Environment, Health, and Safety Division

Reviewed By:

Date: 07 / 13 / 2026

Kara Quan-Montgomery
Professional Geologist
Environmental Services Group
Environment, Health, and Safety Division

Cummings, John A

Date: 07 / 13 / 2026

John A. Cummings III
Sr. Environmental Health Physicist
Environmental Services Group
Environment, Health, and Safety Division

Approved By:

Jim Buehler

Date: 07 / 13 / 2026

Jim Buehler
Group Leader
Environmental Services Group
Environment, Health, and Safety Division

Contents

Review and Approval ii
Abbreviations iv
1 Introduction 1
1.1 Purpose and Scope 1
1.2 Applicability 1
1.3 Associated Berkeley Lab Requirements 2
1.4 Project-Specific Requirements 2
1.5 Responsibilities 3
1.6 Potential Environmental Hazards 4
1.7 Environmental Training and Certification Requirements 5
2 Excavating and Removing Piping 7
2.1 Assessment of Potential Contaminants 7
2.2 Exposing of Piping 8
2.3 Assessing Piping for Potential Releases 9
2.4 Documenting Sample Locations 10
2.5 Removal of Piping 11
2.6 Disposal 12
2.7 Record Keeping 12
3 References 14
Attachment 1 – Procedure for Headspace Screening 15

Abbreviations

ACM	asbestos-containing material
Berkeley Lab	Lawrence Berkeley National Laboratory
DOECAP	Department of Energy Consolidated Audit Program
EHS	Environment, Health, and Safety Division
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
ESG	Environmental Services Group
EWRP	Environment, Waste & Radiation Protection Department
LBNL	Lawrence Berkeley National Laboratory
MARSAME	Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
PCBs	polychlorinated biphenyls
PID	photo-ionization detector
RadSMP	Radiological Soil Management Plan
RPG	Radiation Protection Group
SMP	Soil Management Plan
SWPPP	Stormwater Pollution Prevention Plan
VOCs	volatile organic compounds
WMG	Waste Management Group
WMP	Waste Management Plan

1 Introduction

1.1 Purpose and Scope

This document provides guidance for the following activities associated with the removal, repair, or replacement of potentially or known contaminated underground piping at Lawrence Berkeley National Laboratory (Berkeley Lab, LBNL):

- Removing or repairing the piping in a manner that prevents the release to the environment of any liquid or sediment that might be contained in the piping
- Inspecting the piping to identify any defects that could have been locations of release of contaminants to the environment
- Screening and sampling soil to assess whether a release of contaminants occurred and to determine the nature of the release if identified
- Characterizing removed piping and contents for waste management and disposition purposes

This guidance document provides the recommended approach for conducting the work in a manner that is protective of human health and the environment and complies with regulations and Berkeley Lab policies. The required process to be followed when conducting the work must be specified in contractor-prepared Work Packages or other contract-required documents. Contractors are free to propose alternative methods in those documents; however, those methods must be protective of human health and the environment, comply with regulations and Berkeley Lab policies, and be reviewed and approved by Berkeley Lab's Environmental Services Group (ESG) prior to execution.

Although this document includes general requirements related to waste management, it is not intended to be a guidance document for waste management practices related to underground pipe removal. Waste management requirements – including but not limited to record keeping; storing, labeling, and tracking waste and waste containers; characterizing and classifying waste for disposal; scheduling, manifesting, packaging, and transporting waste for off-site disposal; and waste generator training requirements – must be specified in a project-specific Waste Management Plan (WMP) or similar contractor required document approved by the Berkeley Lab Waste Management Group (WMG).

1.2 Applicability

This guidance document applies to all projects at LBNL that remove, replace, or repair potentially or known contaminated underground piping, or that encounter potentially or known contaminated underground piping during excavation work. Potentially contaminated underground piping includes primarily sanitary sewer lines, but other underground piping that may have carried chemical, radiological, or biological constituents such as process lines, storm drain lines, and unknown abandoned lines are also subject to this document.

1.3 Associated Berkeley Lab Requirements

Activities conducted in association with this document must comply with the requirements of the following Berkeley Lab Environmental Specifications:

- Environmental Specification – Soils
- Hazardous, Mixed, and Radioactive Waste Management Specification
- Radiation Protection Specification (when appropriate)

In addition, all soil excavation activities at LBNL must be managed in accordance with the requirements in the following Berkeley Lab documents:

- Soil Management Plan (SMP) (Berkeley Lab, 2024)
- *Radiological Soil Management Plan* (RadSMP) (Berkeley Lab, 2026)
- The Stormwater Pollution Prevention Plan (SWPPP) (Berkeley Lab, 2025)

The SMP and RadSMP establish Berkeley Lab's policies and procedures to ensure that excavated and disturbed soils are handled, stored, reused on-site, or disposed of off-site in accordance with applicable laws, regulations, and regulatory agency requirements. The SWPPP provides erosion control requirements that are designed to prevent soil from being transported in stormwater runoff into storm drains and eventually discharged into creeks that carry runoff from LBNL.

The SMP, RadSMP, and SWPPP as well as the specifications listed above are available at https://sites.google.com/lbl.gov/esg-project-resources/project-resources.

1.4 Project-Specific Requirements

Project-specific requirements for the type of work covered in this guidance document beyond those that have been established in Berkeley Lab institutional plans and procedures must be specified in supplemental project document(s) prepared by the contractor and approved by LBNL. Those documents may include but are not limited to the following:

- Project Work Packages for excavating, removing, or repairing underground piping approved by ESG
- Sampling and Analysis Plans approved by ESG
- A radiological work authorization, radiological hazard review, radiological protection program plan, and all associated training records or technical documentation approved by the Berkeley Lab Radiation Protection Group (RPG), when appropriate.
- MARSSIM/MARSAME Work Plans and Instruction Packages approved by EWRP (generally personnel from RPG and ESG)

1.5 Responsibilities

This section lists the primary responsibilities for the Berkeley Lab Environment, Waste & Radiation Protection Department (EWRP), which consists of ESG, WMG, and RPG and project personnel. Depending on contractual requirements, certain activities listed below may be the responsibility of either the project or EWRP. For those activities that are the responsibility of the project but fall under EWRP authority, EWRP has oversight and assurance responsibilities. The EWRP Project Advisor is responsible for coordinating EWRP and project activities.

ESG is responsible for the following:

- Approving soil testing and management requirements including screening methods for potential contamination
- Setting up sample collection information in the ESG database and coordinating soil sampling and laboratory analysis with project personnel
- Determining whether additional soil sampling is required to characterize detected contamination
- Verifying that soil analytical results demonstrate that soil is acceptable for on-site reuse/replacement or must be disposed of off-site
- Evaluating soil radionuclide results for “indistinguishable from background” criteria and radionuclide air emissions potential to emit, if applicable
- Determining the controls and/or processes required to be implemented in order to mitigate radionuclide air emissions, if applicable
- Notifying the appropriate regulatory agency(s) if a historical release is identified that poses a potential risk to human health or the environment
- Notifying the appropriate regulatory agency if a contaminant spill occurs to the environment during work activities and notification is required by regulation
- Overseeing all environmental-associated activities including compliance with SMP, RadSMP, and SWPPP requirements
- Reviewing and approving documents prepared by the project team that are associated with environmental activities

WMG is responsible for the following:

- Evaluating analytical requirements and results for compliance with landfill acceptance criteria and hazardous waste criteria
- Facilitating compliant staging of excavated piping and soil
- Arranging for landfill acceptance of excavated soil and disposition of removed piping
- Overseeing waste management–associated activities
- Reviewing and approving documents prepared by the project team that are associated with waste management activities

RPG is responsible for the following:

- Identifying and evaluating the sources of influent to underground piping to assess the potential for radiological contamination
- Determining whether occupational radiological controls are required
- Conducting radiological screening or overseeing radiological screening if performed by the project
- Determining whether radiological training is required
- Reviewing and approving all radiological training, experience, and certifications
- Overseeing all radiological-associated activities
- Reviewing and approving documents prepared by the project team that are associated with radiological activities

Project personnel are responsible for the following:

- Project oversight and execution of the work
- Preparing Project Work Packages or other contract-required documents associated with the work covered in this document
- Submitting the documents to EWRP for review and approval, and revising those documents in accordance with EWRP comments
- Performing the work in accordance with the requirements of those documents
- Performing the work in accordance with Berkeley Lab, regulatory agency, and project-specific safety requirements
- Notifying EWRP if conditions that pose a known or potential threat to human health or the environment are encountered

1.6 Potential Environmental Hazards

Potential environmental hazards associated with underground piping include the following:

- Toxic or hazardous materials/waste (e.g., metals, volatile organic compounds [VOCs], petroleum products, polychlorinated biphenyls [PCBs])
- Mercury (liquid or vapors)
- Acids
- Radioactive materials
- Biohazards

These materials, if present, are likely to accumulate at sags, joints, bends, and traps in the piping. If the piping is not carefully removed, the pipe contents could be released to the environment, creating an environmental hazard that could require reporting to a regulatory agency and cleanup. In addition, if cracks, holes, or other defects are present in the piping, the pipe contents could have leaked and contaminated the soil surrounding the piping.

If radiological contamination (external material present within, on, or around the piping) has been determined to be present (or is likely to be present based on historical knowledge), additional radiological controls and postings may be required. These may include, but are not limited to, requiring a radiological work authorization prior to work being conducted, radiological training, presence of radiological coverage (radiological control technicians), and releasing/clearing samples prior to being shipped off-site for analysis, as to be determined by RPG.

Additional potential hazards include lead and asbestos associated with lead and oakum bell and spigot joints commonly found in older cast-iron sanitary sewer and process piping as well as asbestos-cement (Transite) piping. These materials may be classified as asbestos-containing materials (ACMs) depending on their asbestos content.

Cutting, drilling, crushing, removing, or otherwise disturbing asbestos-cement piping or asbestos-containing packing materials may release asbestos fibers into the air. Appropriate material handling procedures, worker protection measures, and disposal requirements must be implemented. Specific requirements for the removal and disposal of these materials should be specified in the Project Work Package and WMP.

Potential hazards, mitigations, and controls for the potential environmental hazards associated with the work must be specified in Berkeley Lab–required documents prepared by the contractor, including the Job Hazards Analysis and Site Specific Safety Plan.

1.7 Environmental Training and Certification Requirements

Personnel involved in the excavation, removal, screening, or sampling of potentially or known contaminated underground piping who may be potentially exposed to contaminated material must have completed 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training in compliance with federal regulations (29 CFR 1910.120). They must also have completed an 8-hour refresher course within the previous 12 months if the 40-hour training course was completed more than one year before and have received, or are receiving during the course of the work, three days of field training by a safety supervisor with 8-hour HAZWOPER supervisor training. In addition, 40-hour-trained field personnel must work under the oversight of a safety supervisor who has completed an 8-hour supervisor training course in addition to having the equivalent training of the field personnel or must be supervisor trained.

All soil characterization work except for radiological soil screening must be conducted either by or under the supervision of a California-licensed Professional Geologist or Professional Civil Engineer, with training and experience in environmental investigations.

In addition, the personnel directly involved in the excavation and removal of potentially contaminated underground piping are required to complete Radiological Worker 2 training (or equivalent) if radionuclide concentrations greater than 10 CFR 835 Appendix D are suspected or known to be present. Personnel performing radiological screening must have current qualification as a U.S. Department of

Energy, U.S. Nuclear Regulatory Commission American National Standards Institute/American Nuclear Society Standard 3.1, U.S. Department of Defense, or equivalent Radiological Control Technician, Health Physics Technician, U.S. Navy Engineering Laboratory Technician, or equivalent certification approved by RPG.

2 Excavating and Removing Piping

2.1 Assessment of Potential Contaminants

Prior to the removal, repair, or replacement of potentially or known contaminated underground piping, assess the piping to determine the types of material it might have carried and potentially released to the environment. This assessment should include a review of Berkeley Lab underground utility maps to obtain the following piping information, if available:

- Location and depth
- Diameter and construction material
- Use (e.g., sanitary sewer, storm drain)
- Status (active or abandoned)

Identify and evaluate building operations that are, or have been, the source of influent to determine known and potential contaminants that could have been discharged to the piping. Potential sources of information may include:

- Historical Site Assessments
- Facility Radiological Impact Sheets
- Historical and current building plans
- Radiological authorizations, permits, and/or surveys
- Chemical inventories and/or databases
- Waste inventories and storage and disposal records
- Decontamination records
- Occurrence reports
- Spill or leak reports and other incident reports

The EWRP Project Advisor is responsible for requesting an assessment of the availability of the source information from the appropriate Berkeley Lab Environment, Health, and Safety Division (EHS) group; obtaining the information on the sources, if available; and providing the information to the project.

Conduct a building site walk and contact current and former building occupants and EHS personnel to provide information on potential contaminants. The EWRP Project Advisor would also help coordinate this activity.

If no information on potential pipe contents is available or unless eliminated as a potential hazard by EHS, assume worst-case conditions (i.e., potential chemical and radiological contamination).

If pipe openings such as floor drains, cleanouts, or manholes are available, chemically and radiologically screen the openings and any liquid or sediment in the openings with a photo-ionization detector (PID) to detect VOCs, mercury vapor analyzer to detect mercury, and the appropriate radiological survey

instrument, if radionuclides are a potential concern. Also sample any accessible sediment and liquids for potential contaminants. If radionuclide contamination is detected above pre-determined project thresholds, STOP WORK and notify the EWRP Project Advisor. Do not resume work until RPG has determined whether additional radiological controls are required and, if required, have been implemented.

2.2 Exposing of Piping

Apply for a Penetration Permit at least 10 days before starting any excavation work (https://sites.google.com/lbl.gov/penetrationpermit) and do not start work until the Permit has been approved.

Prior to the removal of piping located beneath hardscape or foundation slabs (e.g., concrete, asphalt), determine the order of removal for the hardscape, slab, and the piping. Factors to consider when determining the sequencing include the following:

- Type of buried piping (e.g., sanitary sewer, storm drain)
- Diameter of the piping
- Known/anticipated hazards
- Depth of piping
- Number of floor drains and traps
- Potential electrical or mechanical (pressurized) hazards
- Location of piping

Ensure controls specified in any applicable permit (e.g., penetration permit), radiological authorization, Work Planning and Control requirements, and Project Work Packages are in place. Expose the piping as follows:

1. For piping under hardscape or foundation slabs, saw cut around existing cleanouts, floor drains, and valve boxes, and along the length of piping to isolate those sections from the rest of the slab or hardscape. This will prevent damage to the piping and possible release of contaminants when the hardscape/foundation slab is removed. Saw cutting along the piping is not necessary if piping is sufficiently below the slab or hardscape (e.g., more than 2½ feet) so that it would not be damaged when the slab or hardscape is removed. In accordance with Penetration Permit requirements, destructive methods such as using a jackhammer or hoe-ram cannot be used within 30 inches of an underground utility.
2. Expose the top and sides of the piping using non-destructive techniques. Soil excavation within a 30-inch radius of the piping must be completed using non-destructive methods such as an air knife, flat-end shovel, vacuum, chipping gun with a spade bit, breaker bar, or high-pressure water excavation.
3. Clear soil from the immediate area (top, bottom, and sides) of the piping such that it is completely visible. Place the soil onto visqueen/plastic sheeting or into bins/drums, and manage the soil in

accordance with the requirements of the SMP and RadSMP if the soil is potentially radioactive. Clearing soil from all sides of piping that is not planned for removal is not required unless there is an indication that the piping has been a potential source of release.

Manage excavated soil stockpiles in accordance with the requirements of the SWPPP, including preventing runoff from entering storm drains or other open conduits during rain events. Also manage the waste (piping and excavated soil) in accordance with the WMP.

2.3 Assessing Piping for Potential Releases

The guidance in this section also applies to unknown piping discovered during excavation work. "All LBNL employees, subcontractor employees have the authority and obligation to stop the work when unexpected utilities are encountered or any hazards are observed" (LBNL Facilities Division, 2013). Excavation work should not resume until approved by the Utilities Coordinator.

2.3.1 Pipe and Soil Screening

Inspect soil surrounding the exposed piping for discoloration, unusual smells, liquids, or other evidence of potential contamination. Inspect the piping for holes, breaks, dislocations, or any other obvious damage that could be a source of environmental release. Screen the inside of the piping, if accessible, and areas of potential soil contamination with instruments appropriate for the potential contamination, such as a PID and/or a mercury vapor analyzer. Screening of soil samples with the PID should be completed using the headspace sampling method, which is described in Attachment 1. If the piping is a sanitary sewer line or other line with a potential for radiological contamination, screen the soil using a radiological survey instrument appropriate for the anticipated radioisotope of concern, such as Ludlum handheld instruments, using a 43-89 probe (alpha & beta) and sodium/iodide (NaI) probe (gamma), or in situ gamma spectroscopy. If projects do not have the appropriate resources to conduct the recommended screening, request support from the EHS Operations Support Team for nonradiological screening and the EWRP Project Advisor, who will coordinate radiological screening with RPG.

If an indication of potential contamination is identified, notify the EWRP Project Advisor. If radionuclide contamination is detected, STOP WORK and notify the EWRP Project Advisor. Do not resume work until RPG determines whether additional radiological controls are required (and, if required, have been implemented) and resumption of work is approved by the Berkeley Lab Project Construction Manager or Project Manager with concurrence from the EWRP Project Advisor.

2.3.2 Soil Sampling

Collect a minimum of one soil sample at each location where visual observation and/or field screening indicate potential soil contamination and at locations where defects in piping that could be a source of release to the environment are observed. Samples should be collected from approximately 3 to 9 inches below the excavated soil surface. Collect and analyze the soil samples in accordance with the requirements listed in Table 1. Confirm with ESG that samples will be collected for the appropriate analyses and a sufficient number of samples are collected at the appropriate locations. The analytical

laboratory must be Department of Energy Consolidated Audit Program (DOECAP) certified and also State Water Resources Control Board Environmental Laboratory Accreditation Program (ELAP) certified for nonradiological analyses.

Table 1. Required Soil Sampling Methods Summary[a]

Measurement	Required?	Method	Berkeley Lab Analysis Code	Container[b] / Required Volume	Preservation
VOCs	Yes	EPA 5035 & 8260	E8260:DRY	3 × 40 mL TerraCore or equivalent	Cold to <6°C
Metals Total	Yes	EPA 6010/7471	TTLCLBNL:DRY	8 oz. glass or stainless steel sleeve/50 grams	Cold to <6°C
TPH: Oil/Diesel	Yes	EPA Modified 8015B	E8015:D&O:DRY	8 oz. glass or stainless steel sleeve/50 grams	Cold to <6°C
PCBs	Yes	EPA 8082	E8082:DRY	8 oz. glass or stainless steel sleeve/50 grams	Cold to <6°C
Tritium (H^3)	Potentially[c]	EPA 906	E906EPSM	1 L polyethylene/ 1,000–3,000 grams	None
Gamma Isotopes	For sanitary sewer lines, yes For other piping, potentially[c]	Gamma Spectroscopy	Gamma_Spec-ESG	1 L polyethylene/ 200 grams	None
Gross alpha/beta	For sanitary sewer lines, yes For other piping, potentially[c]	EPA 900	E900	1 L. polyethylene / 100 grams	None
Alpha Isotopes	Potentially[c]	Alpha Spec	Alpha_Spec-ESG	1 L polyethylene / 100 grams	None
Plutonium Isotopes	Potentially[c]	Alpha Spec	PUISO+PU242:OT	1 L polyethylene / 100 grams	None
Uranium Isotopes	Potentially[c]	Alpha Spec	UISO:OT	1 L polyethylene / 100 grams	None

[a] Contact ESG to determine whether there are additional analytical requirements.
[b] Alternative containers may be acceptable. Check with the analytical laboratory to confirm specific container requirements.
[c] Contact ESG to determine whether this analysis is required.
PCB = polychlorinated biphenyl; TPH = total petroleum hydrocarbons; VOCs = volatile organic compounds

2.4 Documenting Sample Locations

Document the initial sampling locations' on-site plan sketches in both plan view and cross-section. The plan view should show the extent of the excavation and the location of samples along the pipe length relative to a fixed reference location. The reference location must remain fixed at least until the sample results are received and evaluated. The cross-section should show the ground surface, the top and bottom of the piping, the top of the soil surface beneath the piping, and the depth where the sample was collected. As an alternative to the cross-section, the required information can be recorded in a field logbook or other form specified in the Project Work Package.

If contamination is detected and not removed, document the x, y coordinates of the sample location within 3 feet horizontally. Horizontal coordinates should be expressed as northings and eastings in

U.S. Survey Feet in the California State Plane, Zone III coordinate system using the North American Datum 1983 (NAD83). Also document the depth of the sample location below a known datum (e.g., ground surface), and if surveyed, record the feet above mean sea level according to the North American Vertical Datum 1988 (NAVD88). Acceptable methods to document the sample location include the following:

1. Surveying by a California-licensed land surveyor
2. Using tape and compass oriented to true north to measure to positions whose coordinates are known or can be determined
3. Using a GPS system with the required accuracy

2.5 Removal of Piping

Unless underground piping is carefully removed, contaminated liquids or materials contained in the piping could spill, releasing contaminants to the environment and requiring subsequent release reporting and cleanup. The piping must therefore be excavated and removed using a process that prevents the release of potentially contaminated liquids or sediment to the surrounding soil. To accomplish this objective, use the following process when removing potentially or known contaminated underground piping:

1. Establish a lay-down area to stage the piping system components prior to handling or transfer off-site for disposal. The lay-down area must be controlled to mitigate the spread of contamination and liquids (e.g., covering the lay-down area with plastic sheeting and berming the edges).
2. Establish a controlled work area around the piping excavation to prevent the migration of potential contaminants from the work site into the soil or storm drains (additional controls may be needed if rain is expected). Ensure absorbent pads and a mercury spill kit are available.
3. Place plastic sheeting or other containment under the pipe section to be exposed such that it will collect any residue that may accidentally spill from the pipe as it is cut, unbolted, repaired, removed, or capped.
4. Cut or snap (for cast iron pipes) the pipe, remove the pipe sections, and immediately drain the pipe. Pour any liquids in the pipe into appropriate containers for collection and subsequent sampling. Then bag and/or place the pipe section within the lay-down area. Old (sewer) piping often contained lead rings with packed hemp oakum-type rope to seal the pipe sections together. Some rope seals may contain asbestos. If only lead rings are present, remove and package the rings separately. If lead is present with packed asbestos rope, the asbestos must be removed by asbestos-trained workers. Note that no electrical conduit that may contain live or dead conductors may be cut without an approved SAF-001 permit in place. In general, conductors must be de-energized and pulled out prior to cutting or air gapping.
5. Screen the pipe ends and any sediment/liquid remaining in the pipes with a PID, mercury vapor analyzer, and radiological survey instrument if radiation is a potential concern. If radiation is

detected, notify the EWRP Project Advisor. Rope off and post the work area in accordance with RPG requirements.

6. Cap the ends of potentially contaminated pipe with lead-free fittings or cover and seal the ends with plastic sheeting/bags or equivalent. Alternatively, place the pipe in a plastic or polyethylene tubular encasement sleeve, and tie off and seal each end with tape.
7. Label each section of bagged piping in accordance with the requirements of the Project Work Package.
8. If radiological contamination is detected above background thresholds, secure, move, and containerize the pipe in accordance with the requirements of the Project Work Package.

2.6 Disposal

Leave sediment in the removed pipe section until any required radionuclide analyses have been completed and the results evaluated. If sediment or liquid is present in the pipe section, collect a sample of each media. Also, collect a sample of any liquid that had been containerized and any soil that had been containerized or stockpiled. Analyze the samples in accordance with WMP requirements and confirm with WMG that appropriate and sufficient samples have been collected for disposal purposes. If excavated soil is planned for Berkeley Lab site reuse or replacement in the excavation, sample the soil in accordance with SMP and RadSMP requirements.

If radionuclides are detected in the soil/sediment at concentrations above Berkeley Lab background, remove the material from the pipe section, unless there is only a small amount that is tightly adhered to the walls of the pipe. If the contaminated material is removed, manage both the pipe as low-level radioactive waste and the removed material as low-level or mixed waste, depending on the results of other testing. If radionuclides in the soil/sediment are indistinguishable from Berkeley Lab background, keep the pipe/sediment together and manage as nonhazardous or hazardous waste, depending on chemical testing of the sediment and its relative mass in relation to the total mass of sediment and pipe.

2.7 Record Keeping

If contamination is detected, the following records must be maintained by the project and provided to EWRP:

- Sample location depth below ground surface, elevations if surveyed, and x, y coordinates
- Maps, site plans, cross-sections, and/or text describing the sample locations and depths including location relative to the piping
- Analytical results
- Tables providing field-screening results including the types of instruments and text or figures showing the screening locations

- Photo documentation (photographs and dates) of the area including, but not limited to, the area of pipe defects including the pipe itself, discolored soil, and the area where the samples were collected
- Radiological survey records
- Waste disposal records

3 References

Berkeley Lab, 2024. *Soil Management Plan for Lawrence Berkeley National Laboratory*, Lawrence Berkeley National Laboratory, Environment, Health, and Safety Division, Environmental Services Group, Revision 02, September.

Berkeley Lab, 2025. *Stormwater Pollution Prevention Plan for Industrial Activities*, WDID #2 01I002421, Lawrence Berkeley National Laboratory, Environment, Health, and Safety Division, Environmental Services Group, Revision 6, November.

Berkeley Lab, 2026. *Radiological Soil Management Plan*, Document No. PP-5006, Revision 6, Lawrence Berkeley National Laboratory, Environmental Services Group, May 19.

LBNL Facilities Division, 2013. *ADMN-053-Rev 6, LBNL Surface Penetration Procedures* (https://sites.google.com/lbl.gov/penetrationpermit).

Attachment 1 – Procedure for Headspace Screening

1. Half-fill either a glass jar or a ziplock plastic bag with the soil to be tested. When using glass jars, use 16 oz. jars if available. If not, 8 oz. jars are acceptable.
2. Seal each jar with one sheet of aluminum foil with the screw cap applied to secure the aluminum foil. When using ziplock plastic bags, zip to close.
3. If the day is sunny, expose the jar or bag to the sun for at least 10 minutes.
4. Vigorously shake the sample jars or bags for at least 30 seconds once or twice in a 10–15-minute period to allow for headspace development.
5. Quickly insert the PID sampling probe through the aluminum foil. If plastic bags are used, unzip the corner of the bag approximately 1 to 2 inches and insert the probe, or insert the probe through the plastic.
6. Record the maximum meter response. Erratic responses should be discounted as a result of high organic vapor concentrations or conditions of elevated headspace moisture.
7. Repeat Steps 5 and 6 for the mercury vapor analyzer.

PID instruments must be operated and calibrated to yield “total organic vapors” in parts per million as benzene. PID instruments should be calibrated with isobutylene and operated with a 10.2 eV lamp source. Calibration must be checked/adjusted daily before the start of work. In addition, all manufacturers’ requirements for instrument calibration must be followed.

If sample jars are to be reused in the field, jars must be cleaned according to field decontamination procedures. In addition, headspace readings must be taken to ensure no residual organic vapors exist in the cleaned sample jars. Plastic bags may not be reused.

Any deviation(s) from these procedures must be noted and a basis stated for the deviation.