



Lawrence Berkeley
National Laboratory

Soil Management Plan

Old Town Demolition Project

Phase One

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

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1. Purpose

The purpose of this Soil Management Plan (SMP) is to specify the procedures required to manage soil associated with project demolition activities conducted by the Old Town Demolition Project Phase One (Project), at Lawrence Berkeley National Laboratory (LBNL). The objective is to help assure that there is no adverse impact to human health or the environment from soil management activities and that soils are handled, used, and stored in accordance with applicable laws, regulations, and LBNL policies.

Waste characterization, packaging, and disposing of waste soil are specified in the *Waste Management Plan for Phase One of Old Town Demolition (WMP)*. Soil stockpile management requirements including erosion and sediment control are provided in the *Stormwater Pollution Prevention Plan Old Town Demolition Project (SWPPP)*.

2. Scope

The Project includes demolition of LBNL Buildings 5, 16, 16A and the foundation slabs for previously demolished Buildings 40, 41, 52, and 52A. Figure 1 shows the Project work areas. This SMP provides soil management requirements associated with the following Project activities:

- Demolishing and removing buildings, foundations, sumps, retaining walls, and pavement;
- Potholing to locate subsurface utilities;
- Cutting, capping, removing, and/or relocating underground utilities;
- Backfilling excavations;
- Sampling and analyses of soils to determine the appropriate disposition (i.e. onsite reuse or offsite disposal);
- Importing, stockpiling, and handling clean soil, including engineered fill;
- Stabilizing the site, including grading and constructing retaining walls; and
- Excavating and managing incidental soil removed as a result of the above listed activities.

3. Schedule

The Project is tentatively scheduled for October 2014 through November 2015.

4. Roles and Responsibilities

Following are the general roles and responsibilities of the parties involved in soil management activities.

- a. LBNL's Facilities Division is responsible for oversight of demolition activities, including soil management activities performed by the demolition subcontractor and ensuring work is completed in accordance with requirements of this SMP. The LBNL Project Manager or designee is the point of contact.

b. LBNL's demolition subcontractor is responsible for completing the following activities:

- Preparing an LBNL approved excavation plan showing the vertical and lateral extent of excavation required to comply with the demolition activities work scope identified in Section 2 above including, but not limited to, the removal of building foundations, underground utilities, retaining walls, sumps, and pavement; site grading; and excavation of soil associated with these activities (i.e. incidental soil);
- Preparing an LBNL approved Sampling and Analysis Plan (SAP), including quality assurance requirements, for all chemical and radiological testing of excavated and in place soil including testing for polychlorinated biphenyls (PCBs);
- Preparing an LBNL approved SAP for testing of excavated and in place soil for PCBs only;
- Sampling soil in areas identified as having potential contamination including beneath breaks in underground utilities and Project areas where there may be a potential risk to human health or the environment based on the findings of LBNL's pre-demolition investigation;
- Sampling *in situ* soil in areas where contaminated soil is excavated, to document residual concentrations remaining in place;
- Maintaining quarantine controls over each soil storage location to ensure no mixing of soil from different areas occurs while waiting for analytical results and a determination of disposition;
- Sampling soil to provide data to document acceptability for onsite reuse;
- Submitting all samples where chemical testing is required to a California Department of Public Health (CDPH) accredited laboratory;
- Submitting all samples where radiological testing is required and/or all samples from areas suspected of radiological contamination to a DOE/CAP qualified laboratory;
- Stockpiling soil for onsite reuse at LBNL approved staging location(s);
- Complying with all requirements of the Project SWPPP, including daily covering of stockpiles/bins, dust control, and runoff management;
- Field screening and visual monitoring of soil while excavating for evidence of potential chemical or radioactive contamination;
- Stopping work and notifying LBNL if indications of potential contamination, are observed (see Section 7);
- Importing, placing, and compacting LBNL approved clean soils;
- Disposing waste soils (i.e. excavated soils not reused on site) in accordance with requirements of the WMP;

- Maintaining records of excavation locations/depths, utility locations, sampling locations etc. by surveying x, y, and z coordinates or other LBNL approved method(s);
 - Preparing LBNL approved *Soil Management Reports* (The first will be prepared for all soil management activities including PCBs. The Second will be prepared for PCBs only. Requirements for the *Soil Management Reports* are provided in Section 10 of this document);
 - Providing LBNL with hard copies and Electronic Data Deliverables (EDDs) of all analytical records; and
 - Maintaining and transferring all applicable soil management records to LBNL.
- c. LBNL's Environment, Health and Safety Division (EHS) Environmental Services Group (ESG) is responsible for the following supporting services, as needed:
- Modifying this SMP, as necessary, to meet changed conditions or requirements;
 - Assisting in evaluating onsite excavation, soil testing, and soil management strategies and practices;
 - Providing soil removal guidance to the subcontractor;
 - Evaluating analytical results and other criteria for onsite soil reuse.
- d. LBNL's EHS Waste Management Group (WMG) is responsible for providing oversight of Project waste soil management and disposal activities in accordance with the WMP.
- e. LBNL's EHS Radiation Protection Group (RPG) is responsible for the following supporting services, as needed:
- Providing guidance on sanitary sewers lines or process lines that are designated as radiological waste or suspected of radiological contamination;
 - Assisting in determining when radiological soil scanning/testing is required;
 - Developing Radiological Work Authorizations (RWA) to establish radiological controls for safely excavating, handling, and disposing of radionuclide-impacted soils;
 - Establishing radiological controls and protocols in the RWA to protect human health and the environment, while adhering to regulatory and LBNL requirements; and
 - Providing oversight and issuing criterion in achieving final site conditions per the *Multi-Agency Radiation Survey & Site Investigation Manual (MARSSIM)*.
- f. LBNL's Construction & Maintenance Field Support Team will assist in determining industrial safety, health, and hygiene requirements associated with activities specified under this Plan.

5. Activities that Generate Soils

Work activities that are anticipated to generate soil that will require management under this SMP include:

- Demolishing and removing of structures, foundations, retaining walls, sumps, process systems, utilities, and pavement;
- Potholing for locating utilities;
- Cutting, capping, removing, and /or relocating underground utilities;
- Importing clean materials, including engineered fill;
- Excavating chemically and radionuclide-impacted soils; and
- Stabilizing the site, including grading and constructing retaining walls.

6. Soil Management

During activities covered by this SMP, the demolition subcontractor must employ the following controls:

- Continuously observe and monitor excavation areas and in-situ soils as they are removed for signs of potential chemical or radiological contamination (see Section 7). The LBNL Project Manager will visit the site as often as necessary to confirm these observations are taking place.
- Monitor areas of suspected volatile organic compound (VOC) contamination (e.g. discoloration or other indications of a spill) with a photoionization detector (PID), at a minimum. For excavations at underground piping comply with monitoring requirements specified in *General Process for the Excavation and Removal of Potentially Contaminated Underground Piping*.
- Place soils onto plastic sheeting (visqueen) or similar impermeable material or in plastic-lined bins or similar containers that can be sealed. Cover the stockpiled/binned soil completely when not in active use and at the end of each workday. Weigh down the cover to prevent wind-blown dust from being generated. Wet the soil, as needed to minimize dust generation. Any wetting of soil must be kept to a minimum to avoid runoff. Refer to the SWPPP for additional requirements.
- Store PCB contaminated soils in accordance with Toxic Substance Control Act (TSCA) regulations found in Subpart D of 40 CFR 761. Refer to the WMP for packaging and disposal requirements.
- Maintain discrete stockpiles and/or soil bins to facilitate sampling for reuse/disposal characterization. Do not mix soils from potentially radioactively contaminated areas with soils from other areas. Do not add, remove, or mix soils in stockpiles/bins from different areas after they have been sampled. Maintain records of the source location/area of each stockpile/bin.
- Label each stockpile/bin with sufficient information in order to maintain a Chain of Custody control over each stockpile/bin. The responsible person's name, phone number, date of generation, location where the soil was generated, date of sampling, and sample identification are the minimum requirements of this label.

- Segregate debris from excavated soil. However washing of debris is not required.

7. Operational Requirements

The demolition subcontractor must stop work in the general work area and immediately contact the LBNL Project Manager if any of the following conditions are encountered.

- A positive reading above a threshold level on air monitoring equipment;
- Soil that smells of oil, gasoline, or solvents/chemicals;
- Soil that contains buried debris;
- Soil that appears discolored, stained, or wet;
- Soil that contains visible non-soil materials (sheens, powders, chemicals, non-aqueous liquids such as beads of mercury);
- Broken process piping/sanitary sewer lines or signs of leaking from process piping/sanitary sewer or drain lines into surrounding soil (this is particularly important around Building 5 due to the historical use of radioactive materials);
- Detection of radioactive contamination with radiological field instruments;
- When groundwater is initially observed entering the excavation; or
- Any asbestos-containing material (ACM) is identified.

After stopping work, the LBNL Project Manager will notify the LBNL EHS Team Lead. The EH&S Team Lead then notifies the LBNL ESG and the LBNL Construction & Maintenance Field Support Team, and RPG (if radionuclides are a concern). The LBNL Construction & Maintenance Field Support Team and RPG, if necessary, will evaluate potential worker exposure to contaminants and, if warranted, prescribe additional engineering or administrative controls. If radioactive contamination is known or suspected, a RWA may be required, prior to resuming work. Work will not resume until approved by the EH&S Team Lead, with concurrence from the LBNL Construction & Maintenance Field Support Team and ESG, and RPG (if radionuclides are known or suspected).

8. Sampling and Analysis

The demolition subcontractor will prepare and submit two Sampling and Analysis Plans (SAPs) to LBNL for review and approval. The first will be prepared for all chemical and radiological testing of soil including testing for PCBs. A separate SAP will be prepared for PCBs only. The SAP must cover the following activities related to radioactive and chemical sampling of excavated and in place soil, at a minimum:

- Sampling and analysis to comply with offsite disposal waste acceptance criteria in accordance with the WMP or to determine its suitability for reuse at LBNL;
- Sampling and analysis to assess potential areas of contamination identified during the demolition process including sampling soil beneath breaks in underground utilities and Project areas where there may be a potential risk to human health or the environment based on the findings of LBNL's pre-demolition investigation; and

- Sampling and analysis to document the levels of contamination remaining in place during/after project required grading, excavation, slab removal, etc. (this is separate from the MARSSIM FSS sampling and analysis);

Guidance for preparing a SAP is provided in *Sampling and Analysis Plan Guidance and Template Version 4, General Projects R9QA/009.1* May 2014 available at <http://www.epa.gov/region9/qa/pdfs/sap-general.pdf>. The SAPs must be signed and stamped by a California-licensed Professional Geologist (PG) or other licensed professional approved by LBNL, and submitted to and approved by LBNL before any samples are collected.

At a minimum, the SAP must include the following:

- A description of the activities that require sampling and analysis;
- Identification of the chemical/radiological contaminants of potential concern (COPCs);
- Sampling design, including specification of the number, locations, and depths where samples will be collected;
- Sampling and analysis approach, including description of the sampling equipment and requirements for collecting, labeling, storing, and transporting samples to the laboratory;
- Sample analysis requirements, including specific reference to the laboratories that will perform the analyses, the analytical methods to be used, holding times, and the required reporting limits; and
- QA/QC requirements.

Attachment 1, which was reproduced from the SWPPP, provides a table listing sources and types of pollutants potentially present on the Project site and the applicable indicator constituent(s) for that pollutant. In addition, relatively high concentrations of PCBs and petroleum hydrocarbons have recently been detected in the soil in the Building 16, Building 52, and Building 52A areas and volatile organic compounds (VOCs) have been detected in Building 16 area soil vapor samples. Prior to finalizing the SAP, LBNL will provide a report to the demolition subcontractor containing subsurface sampling information for the project site and showing the areas where specific chemicals/radionuclides of potential concern (COPCs) have been detected in the soil.

Analysis of samples must include the following at a minimum:

- VOCs by EPA Method 8260
- PCBs by EPA Method 8082
- Total Petroleum Hydrocarbons (TPH) (diesel- and motor oil-ranges) by EPA Method 8015
- Metals by EPA Method 6000 and 7000 series

In addition, samples from areas potentially impacted by radionuclides must be analyzed for the radionuclides of potential concern. Analytical methods for radionuclides must be capable of meeting the Reporting Limits listed in Attachment 2.

Note that where soils are disposed of offsite, the disposal facility may have additional sampling/analytical requirement needed to comply with their Waste Acceptance Criteria (WAC) (refer to the WMP for additional guidance).

Sampling procedures for characterization of PCBs must comply with 40 CFR 761 Subpart N or equivalent. Verification sampling for PCBs must comply with 40 CFR 761 Subpart O or equivalent.

Samples submitted for chemical testing must be analyzed by a CDPH accredited laboratory that has been approved by ESG or WMG.

Samples submitted for radioactive testing must be analyzed by a DOECAP qualified laboratory and which has been approved by RPG or WMG.

Particular attention must be paid around process piping and sanitary sewer lines for indications of radioactive contamination. Radiological soil scanning shall employ probes that are optimized for low energy photons and alpha and beta contamination as applicable.

9. Soil Profiling, Release, and Disposal

Soil testing (*i.e.* chemical/radioactive sampling and laboratory analyses) is not required for soil that has no indication of contamination and that is replaced in the same general area where it was excavated, provided approval is obtained from the LBNL Project Manager.

Soil that contains chemical constituents below the levels specified in Attachment 3 of this document and radionuclides (if from an area potentially impacted by radionuclides) at concentrations below the limits provided in Attachment 2 of this document may be reused within the same area that the soil was generated, provided approval is obtained from the LBNL Project Manager.

NOTE: the Attachment 2, Table 1 levels are based on only one radionuclide being present, if multiple radionuclides are present in the sample, "Sum of the Fractions" method applies.

All surplus soil (not needed for backfilling or other on-site reuse) must be disposed offsite in accordance with the WMP. Requirements for offsite waste soil disposal are specified in the WMP.

10. Soil Management Reporting

The demolition subcontractor will prepare and submit two Soil Management Reports to LBNL for review and approval. The first will be prepared for all soil management activities including PCBs. The second will be prepared for PCBs only. The Soil Management Reports must be signed and stamped by a California-licensed Professional Geologist (PG) or other licensed professional approved by LBNL, and submitted to and approved by LBNL. The reports must include the following information related to soil management, at a minimum:

- Documentation with maps, tables, and text of the locations, depths, and volumes where soil was excavated;

- Documentation with maps, tables, and text of the locations and depths where samples were collected;
- Copies of all laboratory analytical reports including Chain of Custody (COC) records;
- Tables with analytical results, including detection limits;
- Final disposition (e.g. specific disposal facility or onsite reuse location) of all excavated soil, referenced to the location where the corresponding soil was excavated;
- Sources of and test results for any imported backfill and locations where placed. Testing is not required for soil taken from the LBNL onsite borrow area;
- Copies of all applicable soil profiling, waste acceptance applications and approvals, waste manifests, along with transport and disposal documentation; and
- Photo-documentation (photograph and date) of soil management activities including potential release locations from underground utilities and observations;

The locations of excavations and soil sampling locations must be accurately located and determined by either survey or other appropriate method approved by the LBNL Project Manager.



Figure 1. Aerial View of Old Town Demolition Project.

Attachment 1

Potential Pollutants and Indicator Constituents – Old Town		
Pollutant Source	Pollutant	Indicator Constituent
General		
Cleaning Products	Bleaches	Residual Chlorine
Painting Products	Paint Strippers	VOCs
	Sealants	COD
	Solvents	COD
	Thinners	COD
	Adhesives	Phenols
	Lead	Metal (Pb)
PCBs	PCBs	PCBs
Building Pad B40 and B41,		
Metals	paint/lead storage	Metal (Pb)
Building Pad 52/52A Demolition		
Halogenated VOCs in groundwater	PCE, TCE, 1,1-DCE, cis-1,2-DCE	VOCs
Radioactive Materials	Low levels of induced radioactivity	Alpha and Beta
Total Petroleum Hydrocarbons in surrounding soils	Total petroleum hydrocarbons (TPH)	TPH (diesel and motor oil ranges)
Metal from Plating shop	Beryllium	Metal (Be)
	Chromium	Metal (Cr Total)
	Hexavalent Chromium	Metal (Cr+6)
	Cobalt	Metal (Co)
	Copper	Metal (Cu)
	Mercury	Metal (Hg)
	Silver	Metal (Ag)
	Vanadium	Metal (V)
	Zinc	Metal (Zn)

Attachment 1, cont.		
Pollutant Source	Pollutant	Indicator Constituent
Building 5, B16, B16A, and the B16 Electrical Pad Demolition		
Halogenated VOCs in groundwater	PCE, TCE, 1,1-DCE, cis-1,2-DCE	VOCs
Polycyclic aromatic hydrocarbons (PAHs)	PAH	PAHs
Total Petroleum Hydrocarbons in surrounding soils	Total petroleum hydrocarbons (TPH)	TPH (diesel and motor oil ranges)
Metals from machine shop	Beryllium	Metal (Be)
	Chromium	Metal (Cr Total)
	Hexavalent Chromium	Metal (Cr+6)
	Cobalt	Metal (Co)
	Copper	Metal (Cu)
	Mercury	Metal (Hg)
	Silver	Metal (Ag)
	Vanadium	Metal (V)
PCBs from oil filled transformers	Zinc	Metal (Zn)
	PCBs	PCBs
Radioactive Materials	Europium-152/154	Europium-152/154
	Americium-241	Americium-241
	Cesium-137	Cesium-137
	Plutonium-239/240	Plutonium-239/240
	Uranium-238	Uranium-238

Source: Modified from *Stormwater Pollution Prevention Plan, Old Town Demolition Project*, Lawrence Berkeley National Laboratory. Revision 3, June 2014.

Attachment 2

Table 1. Limits for Residual Radionuclide Concentrations in Soil for the Old Town Project

Radionuclide	DCGL (RESRAD ICRP 60; 1 mrem per year)*, pCi/g	Analysis Method RL
Cs-137	2.0	0.1 pCi/g
Eu-152	1.0	0.5 pCi/g
Eu-154	1.0	0.5 pCi/g
Eu-155	45.8	0.5 pCi/g
H-3	6,470	1 pCi/mL
Sr-90	137	3 pCi/g
Am-241	51.3	1 pCi/g
Cm-243/244	10.6	1 pCi/g
Pu-238	64.6	1 pCi/g
Pu-239/240	58.5	1 pCi/g
Pu-242	62.6	1 pCi/g
U-234	436	1 pCi/g
U-235	8.6	1 pCi/g
U-238	36.6	1 pCi/g

Source: EWRP 04, Limits for Residual Radionuclide Concentrations in Soil for the Old Town Project. Revision 1.

*DCGL: Derived Concentration Guideline Level

NOTE: Concentrations listed in Table 1 are based on having only one radionuclide present. If multiple radionuclides are present in the MARSSIM Survey Unit, the “Sum of the Fractions” method must be used to establish the acceptable concentrations for that Survey Unit.

Table 2. Critical Levels for Gross Alpha and Gross Beta Radioactivity in Soil

Radionuclide	Critical Level (L _c)	Reporting Limit (RL)	Analytical Method
	pCi/g		
Gross Alpha	12	2	E900-4925
Gross Beta	28	2	E900-4927

Source: EWRP 05, Release Limits for Gross Alpha and Gross Beta Radioactivity in Soil for the Old Town Project, Revision 0.

Attachment 3

Limits for Residual Chemical Concentrations in Soil for the Old Town Project

Chemical	Concentration (mg/kg)
<u>Volatile Organic Compounds</u>	
Benzene	0.044
Carbon tetrachloride	0.11
Chloroform	0.72
Trichloroethene (TCE)	0.01
Cis-1,2-dichloroethene (cis-1,2-DCE)	0.05
1,1-Dichloroethene (1,1-DCE)	0.18
1,1-Dichloroethane (1,1-DCA)	0.20
1,2-Dichloroethane (1,2-DCA)	0.0045
Methylene chloride	0.077
Tetrachloroethene (PCE)	0.15
Toluene	2.90
Trans-1,2-Dichloroethene (trans 1,2-DCE)	0.45
1,1,1-Trichloroethane (1,1,1-TCA)	3.21
Vinyl chloride	0.085
Xylenes	2.30
<u>Petroleum Hydrocarbons</u>	
Diesel	570
Oil	28,000
<u>PCBs</u>	
PCBs (total Aroclors)	1
<u>Metals</u>	
Antimony	470
Arsenic	24
Barium	220,000
Beryllium	183
Cadmium	6.37
Chromium (Hexavalent)	6.5
Chromium (Total)	1,800,000
Cobalt	350
Copper	47,000
Lead	320
Mercury	40
Molybdenum	5,800
Nickel	22,000
Selenium	5,800
Silver	5,800
Thallium	12
Vanadium	5,800
Zinc	350,000

Source and/or method of calculation: Refer to *Workplan for Preliminary Subsurface Investigation Old Town Demolition Project: Buildings 5, 16, 16A, 40, 41, 52, and 52*, Lawrence Berkeley National Laboratory