

**STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION**

**STAFF SUMMARY REPORT: David Tanouye
MEETING DATE: November 13, 2024**

ITEM: 6

**United States Department of Energy – Laboratory Cleanup Sites and Program
Update**

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United States Department of Energy – Laboratory Cleanup Sites and Program Update

DISCUSSION

This informational item provides an update on the United States Department of Energy (DoE) Cleanup Program and cleanup sites in our Region:

- Lawrence Livermore National Laboratory
- Stanford Linear Accelerator Center (SLAC) National Accelerator Laboratory
- Sandia National Laboratory
- Lawrence Berkeley National Laboratory

The DoE Cleanup Program is a key component of our environmental cleanup site portfolio that involves complex technical and regulatory considerations. These DoE sites are large, active, federally funded research and development facilities for a variety of scientific, engineering, and technological research programs, and are essential to safeguarding national security and advancements in academic, scientific, and economic competitiveness. This update describes our oversight of the environmental remediation efforts at these sites, highlighting our goals and achievements, as well as the challenges involved in regulating cleanup activities at these federal facilities. This work is supported by one staff and one supervisor in the Groundwater Protection and Waste Containment Division, and funding for these initiatives is supported both through cost recovery and a DoE grant, which enhances our capacity to address environmental concerns. The last update to the Board was in March 2018.

Overview of Department of Energy Laboratories

The two main sites of focus in the DoE Cleanup Program are Lawrence Livermore National Laboratory and the SLAC National Accelerator Laboratory, where we participate in monthly meetings with the laboratories and their consultants, DoE, and other regulatory agencies. We also participate in annual meetings with the active community group at Lawrence Livermore National Laboratory to discuss stakeholder concerns over the priorities and progress of the DoE National Nuclear Security Administration which is responsible for the environmental cleanup. Our involvement at the other two sites is limited. An overview of our work at each DoE site in our Region is presented below.

Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory consists of two locations: the Livermore Site, which is approximately 800 acres and adjacent to Sandia National Laboratories, and Site 300 in Tracy, which is managed separately by the United States Environmental Protection Agency (U.S. EPA), Department of Toxic Substances Control (DTSC), and the Central Valley Regional Water Board. Cleanup oversight is through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the site is on the National Priorities List. U.S. EPA is the lead federal regulatory agency, with the DTSC and our organization representing the State of California. In 1988, federal and state regulatory agencies along with the DoE entered into a Federal Facilities Agreement (FFA) to ensure comprehensive remediation of the site. The Federal Facilities Agreement details the responsibilities, authorities, and dispute mechanisms for FFA signatories.

At the Livermore Site, primary contaminants of concern include volatile organic compounds (VOCs), which have infiltrated deep groundwater aquifers and historically migrated offsite, as well as tritium. The remediation actions include:

- Groundwater extraction to provide hydraulic containment of contaminant plumes on-site and source area mass removal
- Several enhanced source area treatment facilities utilizing technologies such as in-situ bioremediation and zero-valent iron subgrade panel injections to address solvent source areas
- Soil vapor extraction to mitigate vapor intrusion concerns, supported by an extensive indoor air sampling program to monitor potential vapor intrusion in site buildings

SLAC National Accelerator Laboratory

The SLAC National Accelerator Laboratory is located in Menlo Park at a 426-acre property owned by Stanford University. We serve as the lead regulatory agency with minimal involvement from U.S. EPA and DTSC. In 2009, the Regional Water Board issued a Site Cleanup Requirements Order and Time Schedule Order for the site. The Orders name the DoE and Stanford University as responsible parties. Cleanup at the SLAC National Accelerator Laboratory historically included dual-phase extraction at four operable units and accelerated removal actions to address volatile organic compound source areas and polychlorinated biphenyls (PCBs). Significant remediation progress has been made, with several areas cleaned up to levels suitable for unrestricted use and a few areas with ongoing dual-phase extraction. Some remediations are deferred due to restricted access (i.e., inaccessible soil near utilities or building infrastructure) and will be tracked for potential future action when redevelopment occurs.

Sandia National Laboratory

The Sandia National Laboratory is adjacent to Lawrence Livermore National Laboratory on a separate 410-acre property. Sandia National Laboratory does not have ongoing remediation activities, so our oversight is limited to reviewing monitoring reports and closing out sites that are no longer environmental concerns, such as recently closed historical sanitary sewer lines.

Lawrence Berkeley National Laboratory

The Lawrence Berkeley National Laboratory is a facility operated by the University of California and located on a 202-acre property in the Berkeley/Oakland hills. Cleanup at the Lawrence Berkeley National Laboratory is primarily overseen by DTSC, so while we have established cost recovery, our role is limited to reviewing monitoring reports.

Program Management and Funding

The DoE Cleanup Program is unique in that funding for staff is provided through a combination of Site Cleanup Program cost recovery reimbursement and a federal grant from the DoE and National Nuclear Security Administration. Overall, the DoE Cleanup Program funds about 0.4 staff/supervisor positions annually.

Currently, the Lawrence Livermore National Laboratory and Sandia National Laboratory are the only sites receiving DoE grant funding on a three-year cycle, which can be extended based on annual time spent on the projects. Federal grant funding typically requires approval through a State Water Board Resolution, but due to the limited grant budget amounts we request, the process is streamlined to be completed by Regional Water Board staff and administered through the State Water Board. The grant covers about 0.2 staff/supervisor positions, with staff responsible for grant management and collaborating with State Water Board staff for budget projections, grant requests, and financial reports.

SLAC National Accelerator Laboratory previously received grant funding but has recently established cost recovery accounts because the cleanup is gradually transitioning to a long-term monitoring phase. The cost recovery mechanism was developed in coordination with laboratory project managers and involved significant efforts to navigate their internal accounting and administrative procedures. SLAC funding accounts for approximately 0.15 staff/supervisor positions. Lawrence Berkeley National Laboratory is also funded through cost recovery accounting for less than 0.1 staff/supervisor positions.

Department of Energy Laboratory Cleanup Accomplishments

Vapor Intrusion Risk Evaluations

At the Lawrence Livermore National Laboratory, staff have collaborated with regulatory agencies to establish an indoor air sampling program aimed at identifying buildings with the highest risk of vapor intrusion. This effort was especially challenging because of the

coordination to accommodate sampling schedules and consideration of current chemical uses in active operations. Over the initial five years, semiannual sampling was conducted in 33 buildings. Results indicated no significant vapor intrusion or associated risks to occupants, demonstrating that current remediation efforts are currently protective of human health and the environment. Based on this data presented in a Five-Year Review Addendum, regulatory agencies have recently approved a transition to annual sampling.

Effective Cleanup Progress

Significant reductions in concentrations of contaminants of concern have been achieved at both the Lawrence Livermore National Laboratory and SLAC National Accelerator Laboratory since the implementation of dual-phase extraction.

- At the Lawrence Livermore National Laboratory, remediation efforts that began in 1989 have treated approximately 7.4 billion gallons of groundwater and 1.6 billion cubic feet of soil vapor, resulting in the removal of an estimated 3.9 tons of volatile organic compounds. Recent advancements in source area treatments have shown effective trichloroethene degradation through in-situ bioremediation, with minimal rebound observed since 2022. This progress may allow the expansion of bioremediation techniques to other areas of the facility.
- The SLAC National Accelerator Laboratory has successfully reduced contamination levels in groundwater and soil vapor to thresholds acceptable for unrestricted use. The facility has met risk-based remedial goals and/or reached practical limits for mass removal at most operable units. Pending rebound testing over the next few years SLAC may be able to discontinue dual-phase extraction operations, shifting to long-term monitoring without further active remediation.

Successful PCB Remediation

From 2016 to 2018, the SLAC National Accelerator Laboratory implemented accelerated soil removal actions to address PCB contamination in soil and drainage channels. A hydrodynamic sedimentation unit was installed in 2017 to eliminate suspended sediments potentially containing residual PCBs. Subsequent monitoring has demonstrated significant decreases in PCB levels in sediment, with most monitoring sites achieving suitability for unrestricted land use.

Challenges

While we continue working collaboratively with our partners, there are inherent challenges working on complex site remediation issues in the DoE Cleanup Program. Some of these challenges are described below.

Per- and Polyfluoroalkyl Substances (PFAS)

Lawrence Livermore National Laboratory is currently developing a site assessment work plan to evaluate the impacts of PFAS on groundwater. Historical use and storage of

PFAS at the site have led to identification of several areas of concern that necessitate sampling of both soil and groundwater. The challenge to address potential PFAS contamination, which can persist in the environment and pose significant health risks, lies in the emerging and evolving regulatory landscape, making it imperative to ensure that comprehensive evaluations meet future guidelines and public health standards.

Soil Vapor Data Gaps

Regional Water Board staff has expressed concerns regarding potential data gaps in evaluating the impacts of shallow subsurface soil vapor across Lawrence Livermore National Laboratory. There is uncertainty regarding vapor intrusion risks from some areas above groundwater plumes that do not have ongoing soil vapor extraction, which has raised questions about the conceptual site model. We continue to work collaboratively to align on a path forward, as addressing these data gaps requires coordination and commitment to robust data collection and analysis. These unresolved issues could affect remediation timeframes if new areas of concern requiring further cleanup are identified.

Funding

DoE adheres to CERCLA and other federal regulatory processes; however, these protocols can sometimes lead to stalled progress due to funding constraints or inconsistent policy considerations. For example, because these are active facilities that use hazardous chemicals and substances in their operations, we must evaluate whether contaminants detected from indoor air sampling may be associated with workplace processes and therefore subject to Occupational Safety and Health Administration guidelines rather than CERCLA cleanup oversight. With projected budget cuts at the Lawrence Livermore National Laboratory in the coming years, only essential operations and high-priority projects will be funded, which could delay additional studies and remediation efforts. This funding uncertainty could hinder our ability to address unanticipated contamination issues and could extend the timeline for necessary interventions.

Climate Change

Because the DoE laboratories in the Region are located inland, they are not directly affected by concerns related to sea level rise or groundwater rise; however, there are climate change related effects such as drought conditions and severe storms that have potential to impact remediation and remedy protectiveness. These factors were evaluated during the five-year review process at the Lawrence Livermore National Laboratory and SLAC National Accelerator Laboratory to ensure that cleanup activities are resilient and protective in the future.