CALIFORNIA

Santa Susana Field Laboratory and Lawrence Livermore National Laboratory

Background

The two primary active cleanup sites in California are the Santa Susana Field Laboratory and the Lawrence Livermore National Laboratory.

The Santa Susana Field Laboratory (SSFL) was built by North American Aviation (NAA) in 1947 on 2,850 acres in the Simi Hills, 30 miles northwest of downtown Los Angeles. NAA established the site to static-fire large rocket engines and conduct its government and commercial nuclear research and development.[1] The site is divided into four production and two buffer areas (Areas I, II, III and IV and the northern and southern buffer zones). Areas I, II and III were used for the research, development and testing of rocket engines and associated components, and Area IV was used for nuclear experimentation and research. The two NAA groups were split into separate divisions, Atomics International and Rocketdyne, in 1955.[2]

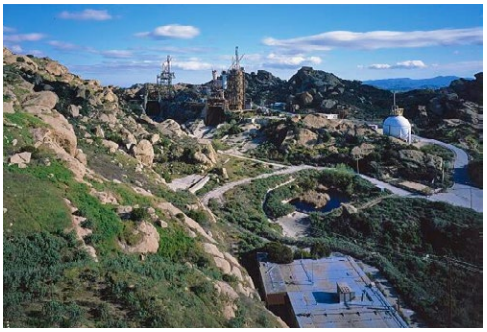

FIGURE 1: Santa Susana Field Laboratory, Coca Test Area. Coca Test Area was one of four rocket engine and component testing areas within Area II at SSFL. Photo courtesy of Library of Congress, Prints & Photographs Division, HAER, Reproduction number HAER CA-2285-8 (CT)

The Atomics International division of NAA, and later the U.S. Department of Energy, conducted several national defense programs and research, development and testing for nuclear energy at Santa Susana's Energy Technology Engineering Center (ETEC). Nuclear operations facilities at ETEC included ten nuclear reactors, seven critical facilities, a "hot laboratory," the Nuclear Materials Development Facility, the Radioactive Materials Handling Facility, and various ancillary test and storage areas. Most nuclear research-related programs at the site ceased in 1988. A 1989 DOE study found widespread chemical and radioactive contamination on the site. A resulting cleanup project overseen by the U.S. Environmental Protection Agency (EPA) began soon after and most of the site's buildings have since been razed.[3]

Boeing, NASA, and DOE are currently cleaning up the site under the direction of the California Department of Toxic Substances Control (DTSC).[4] DTSC has repeatedly confirmed that the site is safe for visitors and workers and does not pose a threat to people in surrounding areas. Boeing performs soil and groundwater investigations and cleanup work pursuant to the 2007 Consent Order, that defines the requirements for investigating contaminated soil and groundwater at SSFL.[5] NASA and DOE perform investigations and cleanup work for groundwater pursuant to the 2007 Consent Order and investigations

[1] https://www.boeing.com/resources/boeingdotcom/principles/environment/pdf/Santa_Susana_backgrounder.pdf.
[2] https://www.dtsc-ssfl.com/files/lib_doe_area_iv/epaareaivsurvey/miscplansandreports/65845_4-Site_Safety_and_Health_Plan_Revision_1_060611.pdf.
[3] Ibid.
[4] https://dtsc.ca.gov/santa_susana_field_lab/ssfl_site_activities_overview/.
[5] https://www.envirostor.dtsc.ca.gov/public/deliverable_documents/4615513682/SSFL%20Consent%20Order%202007.pdf.

and cleanup work for soils pursuant to their respective 2010 Administrative Orders on Consent.[6,7] Investigations and cleanup work are performed under the direction of the DTSC, and the Los Angeles Regional Water Quality Control Board regulates the site's stormwater permit compliance.

California's Lawrence Livermore National Laboratory (LLNL) was established in 1952 as a multidisciplinary research and development center focusing on weapons development and stewardship and national security. Soil and groundwater contamination from research activities was discovered at the site in the 1980s. The site was subsequently placed on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) list. Livermore Laboratory has since partnered with DOE, EPA, the National Nuclear Security Administration (NNSA), DTSC and the Regional Water Quality Control Boards to clean up legacy waste material.[8] DOE EM is tasked by Congress to demolish excess facilities at the site.[9]

Major Accomplishments

Santa Susana Field Lab

Since cleanup began at Santa Susana Field Lab, over 45,000 cubic yards of soil have been removed or treated, over 300 structures have been demolished, 900 acres of land have been restored, and three stormwater treatment systems and one groundwater treatment system have been built. The final demolition of the DOE-owned buildings at ETEC was completed in October 2021, and 22,000 cubic yards of waste and building materials from the demolitions were removed from the site and disposed of by January 2022.[10] DOE and DTSC will continue to focus on soil and groundwater remediation to complete cleanup activities.[11] Cleanup of soil, groundwater and related media at the site is conducted under the Corrective Action Program of the Resource Conservation and Recovery Act (RCRA), with requirements defined in the 2007 Consent Order for Corrective Action and the 2010 Administrative Orders on Consent. To date, cleanup crews have installed more than 500 on- and off-site monitoring wells, collected approximately 28,000 groundwater samples and analyzed 8,400 rock samples for contaminants in rock porewater. The sampling shows that groundwater contamination is contained within half a mile of where contaminants first entered 60 years prior.[12]

Lawrence Livermore National Laboratory

Cleanup at LLNL has resulted in the removal of about 18,000 cubic yards of contaminated soil to certified off-site disposal sites and provided alternative water supplies to residents with wells affected by contamination. LLNL has also constructed several treatment plants for groundwater pumping and treatment and for soil vapor extraction (SVE).[13]

Site-Specific Issues

Rocket engine testing and nuclear research at SSFL created significant contamination at the site over multiple decades. Historic operations included the use of chemicals, primarily the solvent trichloroethene (TCE) to remove residual petroleum-based fuel products following rocket engine testing. These operations resulted in the release of chemicals to soil, bedrock and groundwater. During active operations, ten nuclear reactors operated at SSFL, some of which experienced incidents that may have resulted in radiological releases and contamination. Other constituents of concern associated with site

[6] https://www.envirostor.dtsc.ca.gov/public/deliverable_documents/9113356649/SSFL_NASA_AOC_20101206.pdf.
[7] https://www.envirostor.dtsc.ca.gov/public/deliverable_documents/7760207951/64791_SSFL_DOE_AOC_Final.pdf.
[8] http://www.energyca.org/site-profiles/lawrence-livermore-national-laboratory.
[9] https://www.energy.gov/em/lawrence-livermore-national-laboratory.
[10] https://www.energy.gov/em/articles/remaining-demolition-waste-departs-etec.
[11] https://www.energy.gov/em/energy-technology-engineering-center-etec-2021-year-review.
[12] https://www.boeing.com/resources/boeingdotcom/principles/environment/pdf/Santa-Susana-groundwater-fact-sheet.pdf.
[13] https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0902740.

operations include other volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), petroleum hydrocarbons, metals, perchlorate and other inorganic compounds, polychlorinated biphenyls (PCBs), dioxins and furans, pesticides and herbicides, and energetics.

Relationship to Other Sites in the Complex

Lawrence Livermore National Lab is one of the national laboratories within the DOE national laboratory system. The national laboratory system was established during World War II as part of the nuclear weapons complex and has a continuing mission to address the critical scientific challenges of today.[14] Lawrence Livermore's ongoing mission includes research in the fields of biosecurity, counterterrorism, defense, energy, intelligence, nonproliferation, science and weapons development to enhance United States' national security and defense systems.[15] DOE and contractors have cleaned up much of the legacy contamination from research activities at several national labs such as Lawrence Livermore while maintaining their ability to serve as important hubs for science and innovation.

The other connection between Santa Susana Field Lab, Lawrence Livermore National Lab, and other sites in the complex is in waste disposition. According to the Waste Information Management System, most low level and mixed low-level waste from Lawrence Livermore is destined for disposal at Nevada National Security Site's low-level waste and mixed low-level waste disposal units while a smaller quantity will be shipped to commercial facilities such as Perma-Fix-Northwest in Washington State and Energy Solutions in Utah.[16] Most of the low-level waste from Santa Susana Field Lab cleanup has been shipped to the commercial disposal facility operated by Energy Solutions in Utah, with a smaller amount of low-level waste and mixed low-level waste sent to the US Ecology facility in Idaho.[17]

[14] https://www.energy.gov/national-laboratories.
[15] https://www.llnl.gov/.
[16] https://www.emwims.org/ForecastData.
[17] https://www.emwims.org/ForecastData.