SUMMER 2023

FieldNOTE

An Update on NASA's Cleanup Efforts at the Santa Susana Field Laboratory

NASA proceeds with demolition of Coca

NASA has made significant progress with Phase 6 demolition in the Coca Test Area. NASA began pre-demolition activities in January, which included biological surveys, abatement, and other preparations. NASA began demolition in earnest in February, beginning with the deconstruction of the over 200-foot-tall Coca Test Stand 4.

NASA's is making progress with Phase 6 demolition and the desconstruction of Coca Test Stand 4 (left).

Demolition crews are us ing an excavator equipped with shears to cut through the steel test stand. Shears consist of two jaws made of hardened steel that come together to efficiently cut through the targeted material, in this case, steel. Using shears allows the crews to strategically focus on specific sections while leaving others intact until they are ready for safe removal.

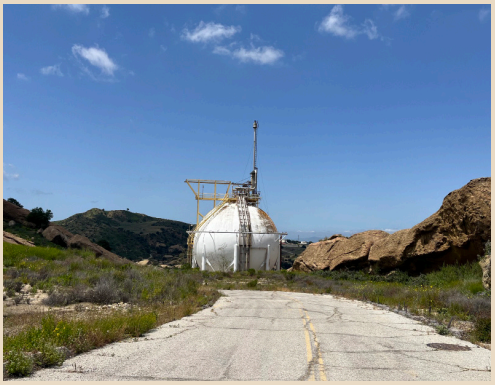
In many instances, once the steel is removed from the main test stand structure, it must be downsized into smaller pieces to facilitate safe loading onto trucks for transport offsite.

Phase 6 demolition also includes the removal of the h ydrogen sphere located in the Coca Test Area (pictured below). NASA expects to complete the demolition of both Coca Test Stand 4 and the hydrogen sphere by the end of this year.

"NASA's progress with the Coca demolition takes us an other step closer to starting our final comprehensive cleanup," said Peter Zorba, NASA SSFL Project Director.

The former historical operational areas are significan t sources of contamination. Removing the structures and infrastructure associated with past operations will facilitate access to those areas when it is time to implement final cleanup plans.

Demolition crews are shown taking apart, piece by piece, the metal flame bucket located at the bottom of Test Stand 4.



The Coca hydrogen sphere, located just down the road from Coca 4 Test Stand, is slated for demolition in Phase 6.

All Coca demolition activities are expected to be completed by the end of 2025. Phase 7 will take place in 2024 and will include the demolition of Coca Test Stand 1 and the much smaller Coca Test Stand 2. NASA expects the final phase of Coca dem-olition, Phase, 8, to begin in early 2025. Phase 8 will cover the removal of the Control House, as well as the remaining concrete in the spillways and throughout the Coca Test Area.

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NASA Continues Progress with Groundwater Cleanup Plans

Plans in development identify two phases for cleanup effort in NASA areas

NASA's groundwater team has been working hard to prepare and plan for final groundwater cleanup activities in NASA areas at SSFL. The groundwater cleanup at SSFL is guided by the 2007 Consent Order for Corrective Action, which was signed by NASA, Boeing, and the Department of Energy with the Department of Toxic Substances Control (DTSC). The 2007 Consent Order uses the Resource Conservation and Recovery Act (RCRA) process to develop cleanup plans. NASA is working with DTSC through this process to formulate a detailed groundwater cleanup plan for NASA-administered areas at SSFL.

There are three key documents involved in the RCRA cleanup process: the RCRA Facility Investigation (RFI) report, the Corrective Measures Study (CMS), and the Corrective Measures Implementation (CMI) plan (see sidebar for more details).

DTSC approved NASA's 2018 Draft RFI report in 2021. NASA will undertake the groundwater cleanup in two phases, and the subsequent RCRA documents reflect this approach. The Phase 1 CMS (and subsequent CMI) addresses source areas in the groundwater and bedrock with the highest concentrations of trichloroethylene (TCE), which is NASA's primary concern for groundwater cleanup. The Phase 2 CMS (and CMI) will cover the remaining groundwater and bedrock vapor contamination.

Phase 1

NASA is currently completing the Phase I CMS evaluating cleanup alternatives at the three highest groundwater contaminant concentration areas. NASA submitted its draft Phase 1 CMS to DTSC in 2020 and has been working with DTSC to address their comments. The agency expects to complete the final Phase 1 CMS this summer. Under RCRA, as the regulatory agency, DTSC will select a preferred remedy and issue a Statement of Basis summarizing the RFI and CMS reports, as well as identifying a preferred remedy. Community members and interested parties will have the opportunity to review and comment on the document during the public comment period. Once NASA has a final, DTSC-approved Phase 1 CMS, the agency will proceed with producing a Phase 1 CMI.

Phase 2

NASA is awaiting data from the ongoing Enhanced In-Situ Bioremediation (EISB) and Bedrock Vapor Extraction (BVE) pilot studies, as well as the Groundwater Extraction Treatment System (GETS) interim measure, to complete the development of the Phase 2 CMS. DTSC will use the final Phase 2 CMS report to identify the preferred Phase 2 groundwater remedy and issue the Statement of Basis for public review and comment. Once NASA has a final, DTSC-approved Phase 2 CMS, it can begin developing the Phase 2 CMI.

Key Groundwater Cleanup Plan Documents

RFI Report

Provides a comprehensive assessment of the nature and extent of contamination in NASA areas at SSFL, identifies areas of concern, and provides a basis for determining the need for cleanup actions.

CMS

Evaluates corrective actions and recommends corrective measures required to clean up groundwater in NASA areas.

CMI

Provides a detailed roadmap for addressing the contamination. Describes specific corrective measures to be taken, the timeline for implementation, and the associated costs.

Statement of Basis

A DTSC-produced document submitted for public review and comment that summarizes essential information from the RFI and CMS reports and identifies the preferred cleanup remedy.

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NASA employs innovative approach to removing vapor contaminants trapped in SSFL bedrock

Initial results of NASA's ongoing Bedrock Vapor Extraction (BVE) pilot study show promising potential for the challenge of removing trichloroethylene (TCE) trapped within the bedrock beneath the Santa Susana Field Laboratory (SSFL). Since NASA's BVE system began operating in March, it has successfully removed more than 3.5 pounds a day of TCE from the bedrock beneath the Alfa Test Area.

SSFL is a geologically complex site with an underlying bedrock matrix. Bedrock contains natural pores and fractures that allow certain contaminants to penetrate deep into the rock. The low permeability of rock restricts their movement, meaning, fortunately, the contaminants can't easily migrate offsite. Unfortunately, it also makes them difficult to remove from the bedrock.

BVE is an innovative approach to removing contaminants from bedrock. It applies a method similar to the better-known and commonly used soil vapor extraction (SVE). Both vapor extraction technologies apply a vacuum to draw out vapors, but as the names indicate, SVE applies the vacuum to soil and BVE applies a vacuum to bedrock. BVE can be a more process because although bedrock is porous, it is much less so than soil.

"Not only are we working with a promising technology, we are also utilizing green engineering principles that align with NASA's greater mission of sustainability."

- Peter Zorba, NASA SSFL Pr oject Director

NASA designed the BVE system to use solar power and to be portable so it can be used across multiple locations onsite in the future.

"I am genuinely excited about our BVE pilot study," said Peter Zorba, NASA SSFL Project Director. "Not only are we working with a promising technology, we are also utilizing green engineering principles that align with NASA's greater mission of sustainability," he said.

The NASA-designed BVE treatment system is powered entirely by clean, solar energy. Not only does this promote energy efficiency, the design eliminated the need for the construction of additional power lines to the Alfa Test Area to power the system.

Vapors are pulled through the bedrock and pumped from the extraction well into these containers of activated carbon where they are treated.

Another unique aspect of the system is its portable design, which minimizes materials use waste and allows for easy relocation. NASA anticipates this system will be used in the future throughout the SSFL site as part of the final cleanup plans, as there are other source areas with similar conditions optimal for BVE use.

NASA achieved promising results from two short-term studies conducted in 2014 and 2015. During these studies, NASA successfully used BVE to achieve significant mass removal of chlorinated volatile organic compounds (VOCs). The current study expands on the earlier work and is evaluating BVE on a larger scale and for a longer duration in the Alfa Test Area where there is a thick vadose zone and a significant bedrock fracture network.

For more information about the BVE system, NASA produced a fact sheet that can be found at https://ssfl.msfc.nasa.gov/Files/FactSheets/BVE-Fact-Sheet.pdf

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NASA to evaluate Soil Backfill Options and Lab Capabilities

Study comes amid NASA and DTSC discussions to resolve technical issues with soil cleanup

NASA submitted a work plan to DTSC in March detailing a plan to evaluate backfill soil needed for post-cleanup restoration measures and to evaluate the technical capabilities of multiple analytical laboratories. This move was in response to a Department of Toxic Substances Control (DTSC) October 2022 letter asking NASA to analyze and evaluate two specific technical issues associated with soil cleanup at SSFL:

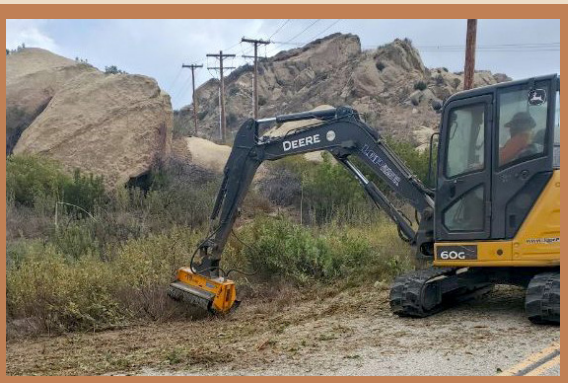
Issue 1: Finding adequate backfill that meets the 2010 Administrative Order on Consent (AOC) chemical Look-Up Table (LUT) values and also is capable of supporting natural habitat restoration following soil cleanup.

Backfill is critical for the stabilization, revegetation, and restoration of habitat impacted by cleanup activities. A combined estimated 2.1 million cubic yards of soil would require removal under an AOC cleanup (870,000 cubic yards in NASA areas alone). Over 1.4 million cubic yards of backfill would be required to replace that excavated soil to stabilize the surface soil and support native revegetation restoration (448,000 of that in NASA areas). Previous evaluations of soil from multiple potential offsite backfill locations have not been able to identify soil that both meets AOC standards and restores or sustains the native plant life.

Issue 2: Determining processing capabilities and attainable reporting limits (RLs) for analytical laboratories to be used in the post-soil cleanup confirmation sampling.

DTSC established LUT values in 2013 based on a DTSC chemical background study and the method reporting limits of laboratory equipment. Method reporting limits represent the lowest level at which a contaminant can be accurately measured. Both DTSC and NASA have recognized issues with identifying laboratories with the capability to accurately and consistently measure and then turn around results in a timely manner for the large number of soil samples that are anticipated under an AOC cleanup.

NASA is working toward having a DTSC-approved work plan by the end of the summer, and expects to begin the investigation in the fall of 2023.



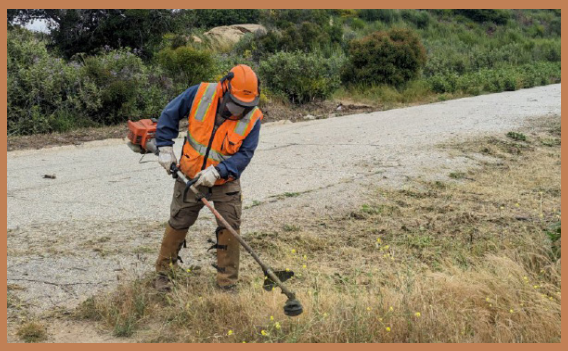
Brush-clearing ramps up ahead of summer

After record rainfall during the rainy season that stimulated robust vegetation growth, NASA stepped up brush-clearing efforts SSFL in advance of Ventura County's June 1 deadline.

Brush clearing plays a vital role in wildfire prevention, and NASA is doing its part throughout NASA areas at SSFL in support of Ventura County's Fire Hazard Reduction Program (FHRP).

Dry vegetation, such as brush, can serve as fuel for wildfires, enabling them to spread more quickly. By reducing the amount of overgrown vegetation, the intensity and speed of a potential fire can be diminished. In addition, brush clearing can create defensible spaces for firefighting personnel to control and suppress wildfires.

In addition to fire risk reduction, brush-clearing has the added benefits of reducing competition among plant species, reducing the spread of invasive species, and enhancing biodiversity.



A worker clears brush along a roadside in NASA's Area II ahead of the county's June 1 deadline.

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