Energy Technology Engineering Center
Area IV, Santa Susana Field Laboratory
CleanUpdate
SEPTEMBER 2025

Three types of Monkey flower at SSFL
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Looking ahead to continued progress, engagement

As we move into the final quarter of the year, I reflect on the significant progress made at the Energy Technology Engineering Center (ETEC), including completing sampling for our laboratory MRL studies (see story on page 7). DOE remains steadfast in our commitment to safety and transparency as we tackle the remaining site remediation. This newsletter highlights recent developments at the Santa Susana Field Laboratory (SSFL).

Work plans for the Building 4024 basement demolition were submitted to the California Department of Toxic Substances Control (DTSC) for review and approval. The basement is the last remnant of the rich legacy of research and development of SNAP reactors (see story below). This plan sets the stage for our next milestone as we work with state regulators to gain their approval and continue progress at SSFL.

Andrew Walker (left) interviews DOE's Dr. Josh Mengers (right) about the SNAP program at SSFL on July 28, 2025. *Photo courtesy of Karen Edson.*

A recent achievement is the approval of a permit for a groundwater treatment pilot study using in-situ, or in-place, remediation techniques. We anticipate this innovative approach will accelerate our groundwater remediation efforts as we work towards the approval of our groundwater Corrective Measures Study. This pilot underscores our dedication to implementing efficient and effective remediation technologies (see story on page 3).

Community engagement continues to be a vital aspect of DOE's mission at SSFL. We will once again have a booth at the Simi Valley Street Fair in October, and I would like to invite our readers to visit us for a fun hands-on activity to create their own spectroscope (see Science Corner on page 4).

We are committed to keeping you informed of our progress and engaging with the community through various initiatives. Thank you for your continued interest in the ETEC site.

Sincerely,

Dr. Josh Mengers

Lasting legacy

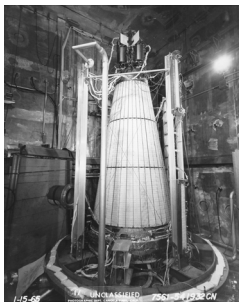
SNAP program laid 'critical groundwork' for space nuclear power systems

By Melissa Simon

The Santa Susana Field Laboratory (SSFL) is well-known for being a former rocket engine testing and nuclear research facility.

While all of the above-ground buildings belonging to the Department of Energy (DOE) no longer remain, there is still evidence of nuclear reactor research and development that once took place at the site.

DOE formerly operated the Energy Technology Engineering Center (ETEC), located in Area IV of the 2,850-acre SSFL.



A SNAP-10 reactor in the Environmental Test Facility just before testing began in 1965. The aluminum-clad walls can be seen in the background. *Photo courtesy of DOE.*

(continued p.2)

Roughly 30 feet below ground, the basement of Building 4024 holds remnants of the chambers used to test nuclear reactors as part of the System for Nuclear Auxiliary Power (SNAP) program, which began in 1955 in response to the need for innovative power sources for space exploration.

It was the legacy of SNAP that brought social media influencer Andrew Walker back to SSFL in July to film footage for his social media channel.

During his first visit in October 2024, Walker interviewed Dr. Joshua Mengers, DOE's federal project director for SSFL, about the site's history, took readings of radioactivity, and discussed the Sodium Reactor Experiment.

The SNAP program was a joint effort led by the Atomic Energy Commission, the U.S. Air Force and NASA to develop compact, lightweight and reliable atomic electric devices—reactors—for use in space and sea and on land.

Tests for these reactors were held primarily within six buildings at ETEC between 1956 and 1971, including the SNAP Environmental Test Facility (SETF), also known as Building 24 or 4024.

Andrew Walker (left) and Lucas Ray (center), a DOE contractor and radiological technician, take readings in the basement of Building 4024. Also pictured is Josh Mengers (right). *Photo courtesy of Melissa Simon.*

The SETF had large vacuum chambers that replicated the near-zero pressure of space and were equipped with thermal shrouds and radiant heaters to simulate thermal extremes encountered in orbit. This allowed for system-level testing of three fully assembled SNAP reactor prototypes, including SNAP-10.

SNAP-10A was launched April 3, 1965, aboard an Atlas-Agena D rocket from Vandenburg Air Force Base in Lompoc, California, about 140 miles northeast of SSFL. This became the only nuclear reactor the U.S. successfully sent into space.

Once in orbit, SNAP-10A provided power for 43 days before it unexpectedly shut down due to a voltage regulator not related to the reactor. The reactor remains safe, shut down and in a stable 4,000-year orbit.

"The SNAP program laid critical groundwork for future space nuclear power systems that remain foundational in the technology we see today," Mengers said.

Left image: The window (right), which would have had leaded glass panels to protect workers and the door (left) into one of the test chambers in the basement of Building 4024 where SNAP research and development occurred at SSFL. **Right image:** A view of the basement of Building 4024 where SNAP research and development took place at SSFL. *Photos courtesy of Melissa Simon.*

"We are not only proud of SNAP's legacy but all the historical research and innovation that took place at ETEC, including advances in liquid metals, ocean thermal energy conversion and nuclear power."

Today, the basement of Building 4024 is one of the last remaining items on the list as DOE continues cleaning up its portion of SSFL.

Remediation at SSFL is part of DOE's commitment to clean up the environmental legacy of innovative programs, like SNAP, that helped end World War II and win the Cold War.

Scan the QR code to learn more about the SNAP program.

Groundwater treatment pilot study approved

By Melissa Simon

The Department of Energy (DOE) recently received the go-ahead to move forward with a groundwater pilot study.

In July, the California State Water Resources Control Board approved a permit for a pilot study at the Hazardous Materials Storage Area located in Area IV at the 2,850-acre Santa Susana Field Laboratory (SSFL), the former rocket engine testing and nuclear research facility where DOE operated the Energy Technology Engineering Center (ETEC).

The in-situ, or in-place, study is an innovative remediation approach that uses biological and chemical reduction to treat contaminated groundwater, said Dr. Josh Mengers, DOE's federal project director for ETEC.

A DOE contractor is measuring water level at one of the wells onsite. *Photo courtesy of Pamela Hartman.*

During a site tour at SSFL in April 2024 for the Groundwater University series, Mengers demonstrated how the pilot study would work.

Groundwater University was an education workshop hosted by the California Department of Toxic Substances Control in cooperation with DOE, Boeing and NASA to inform the public about groundwater at SSFL and prepare them to review and comment on future decisions documents for the site.

The pilot is a small-scale study that involves injecting biological and chemical amendments into separate wells to create a reductive environment and stimulate natural degradation of the contaminants present. DOE will monitor the progress over time.

A DOE contractor checks the solar skid panel and reviews data collected by the automated pump system near the FSDF. *Photo courtesy of Sandra Ramos Hernandez.*

"We're conducting this pilot on a small scale because we want to understand the sphere of influence these amendments will have on the contaminants," Mengers said, adding that using two types of amendments will hopefully create a more robust treatment with two degradation mechanisms happening.

"We're not proposing that this is going to be the solution, but we're testing it out to see how well it works."

The pilot study is just one interim measure DOE has taken to remediate groundwater while working toward a final cleanup plan for Area IV.

In November 2020, DOE published a record of decision for groundwater cleanup that describes monitoring and treatment approaches to addressing contaminants and potential areas affected at ETEC, as well as interim actions.

The installation of a solar-powered, automated pump system at the Former Sodium Disposal Facility (FSDF) in May 2024 is another interim action DOE has done.

Pumping water manually has taken place at the FSDF since 2017 as part of interim cleanup measures. Between the manual and automated pumping, more than 67,000 gallons of contaminated groundwater have been removed.

These actions are only part of the groundwater measures DOE has taken since the late 1980s when the department installed the first monitoring well to identify the types of contaminants present.

Today, DOE has around 100 wells in Area IV, many of which are sampled quarterly.

Scan the QR code to learn more about ongoing groundwater activities.

Science Corner

HACK THE RAINBOW: USE EVERYDAY TOOLS TO EXPLORE LIGHT

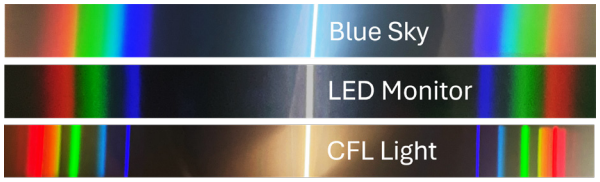
How do **astronomers** know how fast the universe is expanding? How can **geologists** identify different types of rocks? How can **archaeologists** study ancient artifacts without destroying them?

WHILE THESE FIELDS ARE DIFFERENT, THE ANSWER IS THE SAME: SPECTROSCOPY.

In spectroscopy, scientists use special equipment called spectrometers to separate light into its different components (called a spectrum) to measure small differences. A common example of this is when raindrops split sunlight into its spectrum of all colors to create what we call a rainbow. Light from every element involved – such as hydrogen, oxygen, carbon or iron – creates a unique pattern, like a fingerprint or barcode, that can be used to identify which chemicals are present.

We will be making a spectroscope that will separate white light into a rainbow of different colors based on wavelength. White light is a combination of many different colors. When light interacts with a diffraction grating – like the CD in our spectroscope – it bends the light, separating it into different wavelengths. This is similar to sunlight passing through raindrops or a sprinkler.

Different light sources will allow us to see different spectrums of color. For example, colors produced when looking into the sky (not directly at the sun) may show up closer together, whereas the spectrum produced by a compact fluorescent light (CFL) source may have more defined colors. See the image to the right for examples of how these different spectrums look.



MATERIALS:

- Paper towel or toilet paper tube
- Old CD (one that you don't mind will be destroyed)
- Card stock paper
- Packing tape
- Scissors (adults will need to help younger children use scissors)
- Safety glasses (when cutting the CD)
- Light source – sky (do not directly look at the sun), a flashlight or a CFL bulb

DIRECTIONS:

You will be creating a dark tube with a narrow slit at one end and the CD at the other. The CD will act as a diffraction grating and split the light into its spectrum. There are many options with detailed descriptions available from various sources online.

Here is a simple description of how we made our spectroscope:

1. Use packing tape to remove the metallic film from the top of the CD then, wearing safety glasses, cut a circle from the edge of it. This will be the diffraction grating for the spectroscope. Use packing tape to secure the piece of CD to the card stock paper and secure it to the tube's opening, with the disc piece facing inside.

2. Cover the other side of the tube with card stock paper that has a narrow slit in it. Before securing it, look through the CD and rotate the paper so the spectrum is on either side of the narrow slit (See the photo below of the finished spectroscope).

Your spectroscope is now finished! You can look at different light sources through the CD to see how the rainbow spectrum changes. If you turn the end with the slit, it will change the pattern of the rainbow spectrum.

WHY THIS MATTERS:

Spectroscopes allow us to see a visible display of the color spectrum,

while spectrometers quantify and measure the spectrum. Both are important tools used in many scientific fields, including forensics, botany, astronomy and more.

Spectroscopes are used to analyze unique patterns of light created by the elements present, making them excellent tools for astronomers to measure how fast the universe is expanding and look for life on other planets; for botanists to examine plant health; for archaeologists to study artifacts without destroying them; and forensic scientists to investigate crimes.

At SSFL, DOE uses spectroscopy to monitor and inform our cleanup. We take samples of soil and groundwater and send them to labs that use methods approved by the U.S. Environmental Protection Agency to tell us precise concentrations of chemicals present. We use this information to understand if these chemicals could cause harm to humans or the environment and to measure how much progress we are making in our cleanup.

https://www.energy.gov/etec/energy-technology-engineering-center

Activity courtesy of U.S. DOE Office of Environmental Management

Spotted at SSFL!

Three types of...

Monkey flower

The Santa Susana Field Laboratory (SSFL), located in the hills of Simi Valley near Los Angeles County, is home to many unique plant and wildlife species, including three types of monkey flower: sticky monkey flower (*Diplacus aurantiacus*), wide throated yellow monkey flower (*Diplacus brevipes*) and seep monkey flower (*Erythranthe guttata*).

Photo courtesy of Tara Schoenwetter.

Did You Know?

Depending on the species, monkey flowers generally bloom between March and August.

Why it's special: Of the 200 species of monkey flower, 62 of the North American taxa are globally rare.

Typical habitat: Monkey flowers thrive in a variety of habitats such as coastal sage scrub, chaparral, oak woodlands, disturbed areas and meadows. These types of natural environments are all present at SSFL.

Photo courtesy of Pamela Hartman.

Fun facts:

- There are about 200 species of monkey flowers worldwide, with 70% occurring in North America. Of those, 103 are native to California.
- The plant's name comes from the flowers that are shaped like a monkey's face.
- Many of the species are tiny annual plants and often hard to find. Monkey flowers are dependent on ample rain to show themselves.
- Some monkey flower species only live for a day.
- Through research into molecular phylogenetics or evolutionary relationships, the Mimulus group (which includes the monkey flower) has split into multiple new genera, including *Erythranthe* and *Diplacus*. Following the split of the monkey flower group, 42 new species were discovered.

Information provided by Tara Schoenwetter, biologist at SSFL since 2011.

Photo courtesy of Tara Schoenwetter.

Photo courtesy of Pamela Hartman

Soil samples are key to understanding conditions at SSFL

By Melissa Simon

Collecting soil samples is crucial to assessing and understanding the conditions present at the Santa Susana Field Laboratory (SSFL), a portion of which the Department of Energy (DOE) is responsible for remediating.

DOE formerly operated the Energy Technology Engineering Center (ETEC) in Area IV of the 2,850-acre former rocket engine testing and nuclear research facility.

"Sampling is the only way to understand the type of contamination we're dealing with, how much there is, and where it is," said Pamela Hartman, DOE's deputy federal project director for ETEC. "Without sampling, we don't have the information we need to clean up the site."

Over the past year, DOE conducted several soil sampling events to collect data for total petroleum hydrocarbons (TPH), method reporting limits (MRL) and backfill sources.

The TPH study was performed to address a data gap for a specific group of chemicals, while the MRL study aimed to understand the contaminant concentrations an instrument can reliably detect and report, Hartman said.

MRL is important because it relates to some of the values determining levels of remediation set in the 2010 Administrative Order on Consent, an agreement signed between DOE and state regulators describing cleanup.

"We're testing to see what the reasonable levels are that can be reproduced by labs, and we're also looking at what's changed since the initial Look Up Table (LUT) values were set," Hartman said.

In 2013, state regulators defined the initial LUT values for the most frequently observed radionuclides and chemicals at SSFL to determine the level of cleanup needed.

Backfill sampling tests potential sources for material to replace any soil that may be removed during cleanup.

Asked how often soil sampling events occur and how many samples might be collected, Hartman said it depends on the type of data requested and the purpose of the study. Those factors also determine how long a sampling event can take.

Over 5,800 samples were collected for the initial characterization of DOE's portion of SSFL, Hartman said. During the last year, samples were taken at 30 locations for the TPH study and at six locations for the MRL study.

Scan the QR code to learn more about soil sampling.

DOE geologists perform characterization for TPH soil samples taken at China Flats in 2024. *Photo courtesy Pamela Hartman.*

DOE contractors pack backfill source samples taken from Tapo Canyon in April 2025. The sample jars are labeled, packed on ice and shipped to the lab for analysis. *Photo courtesy of Pamela Hartman.*

A Native American monitor (right) observes MRL sampling in November 2024. Monitors are present during all field activities in case cultural artifacts are found. *Photo courtesy of Pamela Hartman.*

Looking ahead

A view of One Tree Hill from the FSDF.
Photo courtesy of Melissa Simon.

We want to hear from you! What questions do you have about the Santa Susana Field Lab? Tell us what you'd like to learn about the wildlife, plants or other cleanup-related questions.

Email questions and comments to etec@emcbc.doe.gov.

Scan the QR code to read the *CleanUpdate* online.

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