DECEMBER 2016

FieldNOTE

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

PROGRESS REPORT: Demolition Phase 2

NASA continues to make headway with demolition of obsolete buildings and infrastructure to prepare the site for final cleanup. Phase 2-A, currently in progress at SSFL, focuses on areas outside of the historic districts where there are no test stands. Since the second phase of demolition began in March, NASA has successfully deconstructed and removed 11 potable water storage tanks and associated pipelines in the Skyline Road Area, the inactive Coca/Delta Fuel Farm, and the former Sewage Treatment Plant (STP). NASA has also made significant progress removing inactive power lines, transformers, poles, and obsolete pipelines.

Following the removal of pipeline that ran from the Alfa Test Area up to the North Tanks on Skyline Road, demolition crews place wattles and hydroseed on the re-graded slope to prevent erosion and promote revegetation.

Careful planning and attention to detail have guided demolition activities every step of the way. "Even with the terrain posing some unique challenges in this phase, we are successfully minimizing impacts to the natural habitat in line with NASA's overarching goal to protect the health and safety of workers, the community, and the environment," said Peter Zorba, NASA SSFL Project Director. As part of this effort, demolition crews are implementing dust and erosion control measures and a number of best management practices (BMPs), consistent with State accepted Storm Water Pollution Prevention Plan (SWPPP) protocols.

"We are successfully minimizing impacts to the natural habitat in line with NASA's overarching goal to protect the health and safety of workers, the community, and the environment."

– Peter Zorba, NASA SSFL Project Director

Additionally, demolition debris is recycled wherever possible to reduce the amount of waste requiring disposal at landfills.

Remaining demolition areas in Phase 2-A include the Alfa/Bravo Fuel Farm, the Liquid Oxygen (LOX) Area, and additional infrastructure such as inactive pipeline and utility poles. NASA is also preparing for Phase 2-B, the removal of remaining concrete surfaces and obsolete structures in the former Delta Test Area. The Delta Test Stands and nearby supporting buildings were demolished in 1982. NASA anticipates it will complete Phase 2-A by mid-2017 and Phase 2-B by end of 2017. Phase 3 of demolition will include the removal of ancillary structures and support buildings within the Alfa, Bravo, and Coca Test Areas. Phase 3 is expected to begin in Spring 2017. ■

IN THIS EDITION

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The Programmatic Agreement stipulates measures to be taken to address impacts to cultural resources—including Native American elements and NASA's historic rocket engine testing features—during the implementation of demolition and cleanup activities at SSFL.

Field Activities Help Solidify Archaeological Site Boundaries

One of NASA's top priorities during cleanup is the protection and preservation of the cultural resources found onsite at SSFL. Accordingly, in 2014 NASA entered into a Programmatic Agreement (PA) with the California State Historic Preservation Officer, the Advisory Council for Historic Preservation, and the Santa Ynez Band of Chumash Indians.

This agreement outlines measures to be taken to address impacts to cultural resources—including Native American elements and NASA's historic rocket engine testing features— during the implementation of NASA demolition and cleanup activities at SSFL.

In line with the agreement, NASA conducted two additional archaeological investigations at SSFL: Extended Phase I Testing, and Burro Flats Boundary Delineation. Both investigations were completed in 2016.

A geophysicist uses a EM38 conductivity meter during archaeological field work at SSFL. The EM38 terrain conductivity meter measures the electrical conductivity of the subsurface.

Extended Phase I Testing

A 2014 pedestrian survey found 41 new archaeological sites throughout NASA-administered areas (not including the Burro Flats area). In 2015, based on its latest soil investigation data, NASA updated the estimated footprint for soil remediation in NASA-administered areas. NASA cross-referenced the updated footprint against a map of the identified archaeological areas and found 13 of the 41 new archaeological sites to be in or near the adjusted estimated soil remediation areas. Further investigation was needed in these areas to determine the extent of the site boundaries

[SEE "BOUNDARY," PAGE 3]

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As part of the non-invasive testing, a geophysicist uses Ground Penetrating Radar (GPR) to locate geophysical abnormalities at SSFL. GPR detects variations in subsurface electrical conductance, which can be affected by geology, soil disturbance, or the presence of manmade objects.

so that steps can be taken to protect each of the sites during cleanup activities. To conduct the investigation, a standard archaeological method known as Shovel Test Pits (STPs) were used. With this technique, small holes are excavated along a grid at equal distances and depths. Then soil samples are taken and the soil is passed through a screen to look for artifacts.

All artifacts encountered were analyzed in the field and photographed or sketched, and, after field analysis, returned to where they were found. In seven of the 13 sites, artifacts were found outside of the existing site boundaries. For those seven sites, the site boundaries were adjusted accordingly.

Burro Flats Boundary Delineation

NASA also needed to determine a boundary for Burro Flats, a collection of prehistoric archaeological site located at SSFL. In October 2015, NASA began the boundary delineation investigation by performing brush-clearing activities in the study area. Next, a team of land surveyors set up a grid of 30-foot squares within the Burro Flats area. A variety of non-intrusive methods were used to collect data that could help NASA identify the site boundary, including Munsell Soil Color Assay, Ground-Penetrating Radar (GPR), Electrical Resistivity, and Magnetometer technologies.

Data from these non-intrusive methods identified 15 anomalies that could indicate the presence of archaeological materials or features. Shovel Test Pits were used to determine the presence or absence of any such features. Although a few isolated artifacts were found, no archaeological features that would determine a boundary were observed. However, surface observations made possible by the brush clearance, combined with the existing surface boundaries and landscape features, did allowed NASA to successfully identify a boundary for the Burro Flats site.

NASA compiled data from the non-intrusive methods and the Extended Phase I testing into a report and shared it with the SSFL Sacred Site Council (SSC) and the State Historic Preservation Officer (SHPO). Once the consultation with the SSC and SHPO is complete, NASA will move forward with updating the SSFL Integrated Cultural Resource Management Plan and update the Burro Flats site National Register nomination. ■

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Soil Treatability Study Results to Play Key Role in Cleanup Plans

In 2013 NASA began conducting treatability studies to test the feasibility and effectiveness of various treatment technologies to clean up soil at SSFL to the levels required by the 2010 Administrative Order on Consent (AOC). Treating soil onsite would have the potential to reduce the volume of soil to be excavated and transported offsite.

NASA down-selected from numerous remedial technologies to six promising technologies for further evaluation. These evaluations were conducted either in the laboratory, in the field, or using documented studies performed in similar areas to SSFL. The study results, summarized below, will play an integral role in the selection of effective remediation strategies for contaminated soil at SSFL, including the development of the Soil Remedial Action Implementation Plans (SRAIP). These plans will include the remedial design and describe the methods that will be used to address the impacted soil in various areas at SSFL.

Surface soil undergoing in-situ chemical oxidation (ISCO) in the Bravo Skim Pond, located in Area II at SSFL.

Technology	Description	Study Type	Chemicals Treated	Results/Conclusions
Landfarming	Landfarming is an ex-situ treatment methodology (soil is excavated or removed, and treated elsewhere) in which contaminated material is stockpiled and endogenous microorganisms metabolize the contamination. With this process, concentrations of petroleum constituents are treated through biodegradation.	White Paper	Petroleum Constituents (PAH, TPH)	Landfarming is implementable for organic chemicals that can be metabolized by microorganisms. NASA will use this technology in remedial designs.
Soil Washing	Soil washing uses physical and chemical methods to extract and concentrate contaminants of concern (COCs).	Bench Scale	Most COCs	Lab-scale testing showed this technology can achieve reductions in COCs to the required cleanup levels. However, it required a large amount of water. Given the arid/drought conditions at SSFL, NASA determined soil washing is not a practical treatment option for full-scale cleanup.
Thermal Desorption	Thermal desorption is a treatment technology in which soil is heated to temperatures that desorb, volatilize, or destroy organic contaminants.	Bench Scale	Organic Constituents (VOCs, PAH, TPH)	This technology can effectively remove organic compounds from soil at high temperatures. It is implementable for some organic chemicals found in soil at SSFL, with a few concerns such as heat sources and air emissions. NASA will consider this technology in remedial designs.
Bioventing and ISCO	Bioventing is a soil treatment technology that introduces air (oxygen) to contaminated soil to promote biological activity, which leads to the biodegradation of chemicals.	Field Study	Organic Constituents (VOCs, PAH, TPH)	The field study showed challenges in implementing this technology such as air flow rates, soil characteristics, and surface variability. This technology is not practical for full-scale cleanup efforts onsite.
Soil Vapor Extraction	Soil Vapor Extraction (SVE) is an in-situ unsaturated (vadose) zone soil remediation technology in which a vacuum is applied to the soil to induce the controlled flow of air and remove volatile contaminants from the soil.	Technical Experience	Volatile Constituents (VOCs)	SVE is implementable in soil with suitable thickness. NASA will use this technology in remedial designs, where applicable.

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