Draft Field Sampling Plans

for Santa Susana Field Laboratory

Prepared for

National Aeronautics and Space Administration
George C. Marshall Space Flight Center

December 2011

This page intentionally left blank.

1.8 Group 3–Alfa Area Summary

1.8.1 Sampling Objectives

This subsection provides references to previous sampling and historical site activities and identifies new information and comments that could affect the proposed sampling for the Alfa Area. The objective of additional sampling, as outlined in this sampling approach plan, is to adequately evaluate the nature and extent of COPCs in comparison to available background values for each respective COPC, or RLs of specific compounds that do not have established background values.

1.8.2. Solid Waste Management Units and Areas of Concern

A total of three SWMUs have been designated within the Alfa Area. The three Alfa Test Stands have been given the designation of SWMU 5.9. Testing of the Atlas, Thos, Navajo, Jupiter, Delta, and RS-27 engines primarily was conducted at this site. These test stands used blends of petroleum fuels, mostly in the diesel and kerosene carbon range, and solvents (TCE) to flush system piping before and after tests. SWMU 5.10 is the designation for three ASTs associated with the testing operations. Two ASTs were 1,500-gallon tanks used to store spent TCE. The third tank was a 5,000-gallon tank used to store waste RP-1 fuel. The three tanks have been empty since 1995. The third SWMU associated with the Alfa Area, SWMU 5.11, is the former Alfa skim and retention ponds, which includes the associated earthen drainage system. Cooling water that had the potential to carry fuels and solvents was discharged to this system. Accumulated, skimmed wastes reportedly were burned.

Two AOCs are associated with the Alfa Area site. Two leach fields, one associated with Building 2208 and the other with Building 2212, have been designated as AOCs, similar to other leach fields within Area II at SSFL. Building 2208 was reported to be a recording center and Building 2212 was a pretest shop.

1.8.3. Site History

NASA acquired the Alfa Area in 1973, along with the remainder of the Area II property (known as USAF Plant 57 under ownership of the USAF). Two engine test stands are present in the Alfa Area; a third was active until 1957 and has since been dismantled. The buildings, facilities, and their related purposes are described in the following subsections.

1.8.3.1 Structures

Building 2208, constructed in 1955, served as the Control Center for Alfa Area test operations. The concrete building contained control, monitoring, and video equipment. A former leach field, associated with the control center, is located west of the building. As of 2008, this building was known as the Alfa Recording Center, and is still in existence. No chemicals were reported to have been used in the building; therefore, NASA does not believe that COPCs are associated with Building 2208 operations.

Pole-top transformers were located north of B2208. These transformers burned in the 2005 wildfire and were then removed.

Building 2208A was the Alfa CC trailer used for offices. Building 2208A is immediately west of Building 2208.

Building 2209, constructed in 1955, was used as the Terminal House for Test Stand 1 (Building 2727). The concrete building is east of Test Stand 1 and housed electronic components and wiring associated with testing activities. The engines were instrumented during testing activities to monitor performance. The wiring associated with these instruments was connected to the electronic components in this building, which then transmitted the data to the control center (Building 2208). Adjacent to the eastern side of the Terminal House is a hazardous materials storage area that is covered by an awning. This hazardous materials storage area has a floor trench to contain releases in this area.

Building 2212 is in a paved area northeast of the test stands. It was constructed in 1956 and designated as the Pretest Shop. Building 2212S was added as an extension to the Pretest Shop (construction date unknown). The Pretest Shop was used as a workshop to handle the engines and make modifications to parts of the test stands, as required, for the various test and engine configurations. A leach field associated with these two buildings is located to the north.

1.8.3.2 Alfa Test Area

Building 2212B was designated as the Alfa Area Entry Guard Shack. The building was located on Alfa Road and to the east of the ABFF. The construction date of this building is unknown, and as of 2008, the building had been removed.

Buildings 2727A, 2209A, and 2729A were designated as the Alfa 1, 2, and 3 ECS Shacks, respectively. Their construction dates are unknown; however, it can be deduced that each facility was constructed along with the construction of the test stands in approximately 1955. The buildings house electrical components and switches for the Alfa Area Test Stands 1 and 3.

Two test stands (Test Stand 1 and Test Stand 3 [Buildings 2727 and 2729, respectively]) currently are located in the Alfa Area. The open-framed metal structures with concrete foundations were built between 1955 and 1956. Test Stand 1 was deactivated in 2000 and Test Stand 3 was active until March 2006.

These test stands are positioned with the exhaust buckets facing in a southerly direction. These facilities were used to test the Atlas, Thor, Navaho, Jupiter, and Delta engines. The Alfa Area was constructed to support operations at these test stands. Petroleum-based fuels including RP-1 and JP-4 were used as the fuel sources for combustion at these tests stands. Early testing activities included cleaning using TCE that was flushed through the thrust chamber and the LOX dome to remove hydrocarbon deposits from the engine components.

Test Stand 2 (Building 2728) was active until 1957 and was demolished in the mid-1960s. Test Stand 2 was owned by the government, which would have transferred the stand to private ownership if the private owners would pay taxes resulting from the property transfer. An agreement could not be reached; therefore, the stand was dismantled and sold as scrap metal (NASA, 1993).

Building 2739 was designated as the Alfa Area Talker Shack. The construction date of this building is unknown. Pole-top transformers were once located south of B2739, but they have been removed. The date(s) these transformers were removed is unknown.

Building 2X is the Pillbox for Test Stand 1 (Building 2727). The Pillbox, constructed of reinforced concrete, was used to view engine tests in progress, thus providing a safe viewing angle for SSFL personnel. The construction date of this building is unknown.

Building 2Y is the Pillbox for Test Stand 3 (Building 2729). The Pillbox, constructed of reinforced concrete, was used to view engine tests in progress, thus providing a safe viewing angle for SSFL personnel. The construction date of this building is unknown.

1.8.3.3 Liquid Oxygen Cleaning

Liquid oxygen (LOX) is used to oxidize fuel (RP-1 or liquid hydrogen [LH2]) in rocket engines. Because LOX is a strong oxidizer, the tanks and pipelines used to store or transport LOX have to be clean. NASA has developed a "LOX clean" standard for tanks and pipelines that allows virtually no oils or grease to be present on the metal. TCE (and/or potentially Freon) is used to clean tanks and pipelines to meet the LOX Clean standard. The LOX clean standard was developed for testing LOX and RP-1 engines at NASA's MSFC. There were no SSFL-specific LOX cleaning standards or procedures identified in the currently available historical documents.

TCE was used during the build-up or construction phase of the test stands to clean the LOX systems. The LOX run tanks, usually located on the top of the test stands, were cleaned once by spraying inside them with TCE and hand wiping the inside surfaces. LOX storage tanks, usually located adjacent to the test stands, were cleaned by spraying TCE into the tanks and hand wiping the inside walls of the tanks. The LOX tanks adjacent to the test stands were connected to the run tank on the top of the stand for testing purposes via pipelines. A second pipeline was used to connect the LOX run tank to the engine to supply it with the oxidizer during testing. The LOX piping was cleaned by pumping or gravity feeding TCE through the pipelines. The amount of TCE used to clean the storage tanks and pipelines varied, depending on the size of the tanks and pipelines. The LOX pipelines are constructed of thick stainless-steel and are connected using flange fittings. The pipelines are designed to transport LOX at more than 3,000 pounds per square inch; therefore, it is not expected that TCE would leak from the pipeline fittings.

An extensive LOX distribution system was not present at SSFL. The LOX required for engine testing was manufactured at the LOX Plant in Area 1. The LOX was loaded into trucks and transported to each test stand as needed. Therefore, there was not an extensive LOX distribution system at SSFL, and each test stand operated independently with regard to the storage and use of LOX for engine testing purposes. The LOX was unloaded from the trucks into the LOX storage tank adjacent to the test stand. Before testing, LOX was pumped via piping to the run tanks on the test stand.

It should be noted that TCE quantities used for engine cleaning after testing were significantly more than those used for TCE cleaning of LOX tanks and lines. Therefore, the TCE released to the subsurface is mostly attributable to engine testing activities rather than to LOX cleaning

1.8.3.4 TCE Cleaning

TCE primarily was used to decontaminate the large engines to prevent the risk of explosion during testing. Hydrocarbon deposits and vapors from previous engine tests were removed during flushing. If the deposits were not removed, LOX could become contaminated during subsequent tests and create a combustible mixture, thus creating a potential for premature ignition.

TCE also was used to clean small engines and engine components, and as a utility solvent for washing down test areas and cleaning tools and parts. Waste liquids from this type of cleaning generally were captured and placed in a collection tank.

Test stands were designed to allow water to flow from the flame deflectors into concrete spillways beneath the stands. The spillways drained through unlined channels into unlined skim and retention ponds, which could then drain into the surface drainage system for recycle or discharge.

TCE from engine flushing operations was recovered by large, metal catch pans. The catch pans contained an underdrain that was connected by hose and pipeline to a collection storage tank or drum. The design of test pans was determined by individual test stand engineers and varied considerably. The differences in the pans and draining procedures resulted in variable TCE recovery because of evaporative losses and splashing. Depending on the depth of the catch pan, TCE could splash out or overflow. The material initially used for the flexible drain hose was not compatible with TCE, and leaks and breaks in the hose sometimes occurred. Other leaks occurred because of problems with the TCE transfer hoses.

Before beginning TCE recovery efforts in 1961, the TCE from engine flushing operations was discharged from the test stands into the spillways, channels, and ponds. During the 1970s, the recovery systems gradually were improved until they reached a 90-percent TCE recovery rate. In the early 1980s, the TCE transfer line was replaced and secondary containment was added at the storage and recovery tanks.

The total volume of TCE released to the ground throughout SSFL (including Alfa) from 1954 through 1983 was 530, 400 gallons. Approximately 97 percent of the total release (512,900 gallons) occurred before TCE recovery began (NASA, 1993). Alfa-specific TCE releases have been documented in February and March 1978 and in January 1983.

Sometime between February 7 and 17, 1978, a sight gauge ruptured and caused a release of approximately 1,500 gallons of TCE. On February 23, arrangements were made for removing approximately 5,000 gallons from the Alfa/Bravo Skim Pond, assuming that the 5,000 gallons would contain trapped TCE. Because of weather conditions, there was a delay in finding a suitable disposal site. However, heavy rains began falling on February 26. The liquid waste contractor arrived on March 1 to remove liquid. The removal did not occur because weather and terrain conditions prevented the truck from accessing the site (Rocketdyne, 1978).

Weather conditions necessitated a discharge from ponds in the Alfa area. A sheen was noted on the water surface in a downstream pond; it was established that TCE from the February 1978 release was being carried through the reclaimed water system and also was being released. It was estimated that the sheen represented about 15 gallons of oil in a total of 35 million gallons of water that had gone through the drainage system during the torrential rains (Rocketdyne, 1978).

In January 1983, 2,000 gallons of TCE leaked from the Test Stand 3 TCE storage tank because the lower connection of a sight gauge was broken and the hand valve feeding the gauge was open. TCE leaked from the tank into a trench and pipe system, which deposited the material on the concrete spill way (Rocketdyne, 1983).

1.8.4 Chemical Use Areas

This subsection provides a summary of the chemical use areas (CUAs) identified at the Alfa Area. The accompanying Table 1.8-1 highlights these CUAs and the analytical groups of concern within each CUA.

1: ABFF Pipeline and Water Conveyance Pipeline

The newly identified portions of aboveground piping probably are related to fuel delivery to Alfa Test Stand 3 and to a cooling water and cleaning discharge line related to Alfa Test Stand 1. Samples will be collected near visually apparent leaking portions of the piping, including both deteriorated portions of the piping and physical couplings and phalanges, and analyzed for TAL/TCL, TPHs, energetics, and dioxin parameters.

2: AA Transformer

Pole-top transformers were located north of B2208. These transformers burned in the 2005 wildfire and were then removed.

3: B208 Leach Field

The B208 Leach Field and septic tank have both been abandoned. The date of abandonment is unknown. The leach field was composed of two trenches and measured 45 ft by 3 ft x 4 ft. The septic tank had a 750-gallon capacity.

4: B212 Leach Field

The B212 Leach Field and septic tank have both been abandoned. The date of abandonment is unknown. The leach field was composed of eight trenches and measured 85 ft by 3 ft, with an unknown depth. The septic tank had a 1,500-gallon capacity.

5: Alfa Debris Area

The Alfa Debris Area, identified during an aerial photo review, was seen on 1972 aerial photos. The *Draft Debris Survey Santa Susanna Field Laboratory Ventura County, California* (NASA, 2009) does not indicate that field teams found debris in the area.

6: B2212 Area

At Buildings 2212 and 2212S, the Alfa Pre-Test Shop was reported to have stored hazardous materials including igniters used during engine testing activities. Buildings 2727A and 2729A reportedly stored igniters, as well. These igniters contained tetraethylaluminum (TEA) and tetrabutylammonium (TBA).

7: Alfa Test Stand Area

Test Stands 1 and 3 (Buildings 2727 and 2729, respectively) performed engine tests using petroleum-based fuels. Hazardous materials stored or used at Test Stands 1 and 2 included JP-4, RP-1, Ramjet (RJ)-1, hydraulic oil, oronite, TCE, TCA, and waste RP-1 (The Boeing Company, 2007).

Three waste ASTs, identified as SWMU 5.10, are located to the south of Test Stand 2 in a concrete-lined secondary containment area. These ASTs include two 1,500-gallon waste TCE tanks (Tanks V-1277 and V-1278) and one 4,775-gallon waste RP-1 tank (Tank V-57). These tanks were installed in 1983 and removed in 2008. Before these tanks were installed, a former AST, located slightly to the north, was used from the 1950s to 1983.

Originally, a cleaning process using TCE was employed after engine testing activities to remove residual fuel from engine components. The TCE waste was discharged to the spillways leading to the Alfa Skim Pond, and eventually to the Alfa/Bravo Skim Pond. To capture the waste TCE, a TCE recycling system was implemented in 1961. TCE was then captured in a catch pan and contained in a storage tank after being flushed through the engines. The TCE was later sold for recycling. After TCE was no longer used, TCA was used until 1994, when the use of solvents for engine cleaning was discontinued (NASA, 1993; MWH, 2005d).

To the east of Building 2209, a hazardous material storage area stored oronite, hydraulic oil, preservative oil, and rust foil.

Seven tanks were identified during the aerial photograph review. Three of these tanks are still onsite. One existing tank is north of the Alfa I Test Stand and has been present at Alfa since 1977. The two others, north of the western corner of Building 2212, have been present since 1960. Four other tanks were identified but are no longer present at Alfa. Three tanks were located to the east of Alfa III Test Stand and were visible from 1960 to 1963. Another tank was north of the Alfa I Test stand and was visible from 1957 to 1963.

8: AA Drainage and Ponds

Cleaning waste solvents were discharged to the spillways (Upper and Mid Drainage) leading to the Alfa Retention Pond, Alfa Skim Pond, and eventually the Alfa/Bravo Skim Pond (discussed in Section 1.9.2 of the Remedial Investigation Work Plan [NASA, March 2011]).

In response to DTSC Comment Alfa-17 for the RI report, additional soil gas samples have been proposed.

9: Alfa Aerial Deposition Area

The 70-percent probability line, as modeled in December 2010, represents the anticipated deposition of 70 percent of the maximum concentration projected, assuming a staged rocket testing schedule and a weather pattern averaged over 5 years. Considering the materials used during rocket engine testing, the sampling suite for this area will include energetics, VOCs, TPHs, and dioxins.

1.8.5 Historical Aerial Photograph Review Findings Summary

In response to DTSC's sitewide comments, NASA conducted a historical aerial photograph review of the various RI reporting sites, including the Alfa Area. The objective of the aerial photography review was to identify features that were not discussed at the time the RI report was submitted. A building survey also was conducted subsequent to the RI document submittal. Within the Alfa RI Area, 12 features were identified during the aerial photography review. Figure 1.8-1 shows the features identified during the 2010 aerial photography review.

Newly identified features within the Alfa Area include the following:

- Pipelines. Three portions of aboveground piping were located at this site. The piping in the southeastern corner of the site appears to be part of the reclaimed cooling water system. It is unknown how the second and third set of pipelines, aligned northwest-to-southeast at Alfa I Test Stand, and from Alfa II Test Stand toward Alfa III Test Stand, were used; however, considering their positions, they might be related to the fuel delivery system.

- Buildings. Two new buildings were identified during the aerial photograph review. It is assumed that one building is Alfa II Test Stand. The other is at the current location of Building 2208A. It is unknown what operations occurred in the other building at the current location of Building 2208A. Sampling previously was conducted around both structures, and no additional sampling is proposed.
- Tanks. The contents of seven newly identified tanks at Alfa are unknown. On the basis of their locations, it is likely that the contents were the same as those in other tanks at Alfa (TCE, fuel, LOX, waste fuel, and solvents). Sampling is proposed near the newly identified tanks for TAL/TCL, TPH, and dioxin analyses. Only three of the newly identified tanks are still onsite.

1.8.6 Sample Locations

Site groundwater is treated as a potential source of drinking water and risks associated with the direct groundwater pathway are presented in the risk assessment. Direct exposure risks also are presented.

Figure 1.8-2 shows the individual proposed sampling locations for the Alfa Area. The rationale for these samples is provided in Table 1.8-2, the Data Quality Objectives Table.

The vertical profiling default depth of 5 ft bgs is based on previous sampling efforts and general site knowledge. Conditions in the field ultimately will determine the depth of subsurface soil samples, which probably will vary from the 5 ft bgs reported in the DQO table. As a generalized guidance, field personnel will take the following steps in determining subsurface soil sampling intervals:

- If refusal (top-of-rock) is encountered deeper than 2 ft bgs, but shallower than 5 ft bgs, a subsurface soil sample will be collected at the depth of refusal.
- If refusal (top-of-rock) is encountered deeper than 5 ft bgs, but shallower than 7 ft bgs, a subsurface soil sample will be collected at the depth of refusal and replace the 5 ft bgs sample.
- If refusal is not encountered, field personnel will note such and the station is to be identified as a potential candidate for additional subsurface soil sampling, if warranted.

The current samples that have been collected around the test stands probably are sufficient to characterize the TCE usage for LOX cleaning and engine testing. However, the current samples will be reevaluated on a site-by-site basis using maps in which site features are mapped with the appropriate detail to assess the adequacy of the samples. If data gaps are identified during the reevaluation of the site characterization, additional samples will be collected using a site-specific strategy to address the identified data gaps.

1.8.7 Groundwater Contribution to VOC Contamination

There are three possible locations within the Alfa Area where detected VOCs in the soil are related to groundwater contamination. Historical VOC samples collected at the Alfa Area had elevated concentrations of VOCs reported in the deep subsurface samples. As discussed in the Draft Site-Wide Groundwater Remedial Investigation Report, a TCE groundwater plume is located beneath the Alfa Area (MWH, 2009). VOCs, specifically TCE, also have been detected in the groundwater at concentrations exceeding the screening criteria at this site.

Because the VOC exceedances in the Alfa Area are likely to be related to groundwater contamination, characterization and planning for the soil VOC remedial action in this area will be addressed as part of the groundwater RI/FS. These areas are shown in yellow in Figure 1.8-2. However, to address DTSC's requirements to evaluate other potential solvent impacts outside of these known release areas, additional VOC samples have been proposed at selected locations within the Alfa Area.

1.9 Group 3–Bravo Area

1.9.1 Sampling Objectives

This subsection provides references to previous sampling and historical site activities and identifies new information and comments that could affect the proposed sampling for the Bravo Area site. The objective of additional sampling, as outlined in this sampling approach plan, is to evaluate the nature and extent of COPCs adequately in comparison to available background values for each respective COPC, or RLs of specific compounds that do not have an established background value.

1.9.2 Site History

The Area II Bravo Area primarily consisted of three test stands (Bravo Test Stands 1, 2, and 3), which were positioned so that the exhaust buckets faced an easterly direction. The open-frame metal structures were secured by concrete foundations. The test stands were associated with turbo pump and rocket engine testing that used petroleum-based fuels and LOX as the oxidizer. The Bravo Area was designed for thrust chamber testing, but shortly after initiation, large engine testing began to slow down (eventually ending in the 1960s) and the test stands transitioned to testing only Atlas engine components and Vernier engines (small engines, usually with only a few thousand pounds thrust, used for rocket maneuvering and control).

The Bravo Area was constructed to support operations at these test stands, which were active from 1956 until 2005. Petroleum-based fuels such as RP-1 and JP-4 were used as the fuel sources for combustion at these test stands. Early testing was preceded by and followed by cleaning using TCE. TCE was used to flush (clean) the engine and/or components to remove hydrocarbon deposits and vapors from the fuel. Originally, the TCE would fall onto the concrete spillways beneath the test stands and drained to unlined channels, ultimately being deposited in the unlined surface impoundments. In 1961, a TCE recycling system was installed to recover the TCE used during flushing activities. The TCE recycling system captured and supplied TCE to Bravo Test Stands 1 and 2, and consisted of a 1,500-gallon tank, two pumps, and four filters. The location of the TCE recycling system is undocumented.

The Bravo Area was active from 1956 until 2005, when the last engine test was completed. Most of the activity occurred at the Bravo Area during the 1950s and 1960s. Nine buildings, two test stands, two former skim ponds, an AST waste tank area, a groundwater reclamation and remediation facility, drainage channels, and underground drainage pipes are areas associated with and within the boundary of the Bravo Area site. Some of these features are designated as SWMUs or AOCs. The five SWMUs that have been designated within the Bravo Area are described in the following bullets:

- **Former Alfa Bravo Skim Pond (ABSP) (SWMU 5.12):** The ABSP was an unlined surface impoundment with an estimated 200,000-gallon capacity, which received cooling water (containing TCE and petroleum-based fuels) from both the Alfa and Bravo test stands. The ABSP was active from 1957 to 1985. The ABSP also was used to prevent TCE from flowing to the Silvernale Reservoir and emergency spill containment. Because the ABSP was located in a natural drainage channel, surface water was collected in the pond, even after 1985. Closure of the ABSP began in 1988 and included draining and drying out the pond (the pond water was sampled and discharged into the reclaimed water system), followed by

excavation of pond soil down to bedrock. The ABSP was backfilled with clean soil, and a bypass pipeline for water discharges from Alfa and Bravo testing operations was installed. The bypass pipeline allows for water from the Alfa and Bravo Areas to pass through the pipeline and discharge to natural drainages leading to the Silvernale Pond, a pond in Area III with a 6-million-gallon capacity. The ABSP was closed by the DTSC in 1994. Monitoring is conducted for the ABSP as a component of the Post-Closure Permit.

- **Bravo Test Stands 1, 2, and 3 (SWMU 5.13):** Bravo Test Stands 1A and 1B, in the center portion of the site, are designated as Building 2730. Bravo Test Stand 1A was activated in August 1956 and initially used for the Atlas Program, but also was used for the E-1 Program. Tests known to have used TCE for flushing are reported to have occurred primarily between 1956 and 1959 at Bravo Test Stand 1A. Bravo Test Stand 1B was activated in December 1957 and used for the Atlas Program; however, limited Atlas tests have been reported for this test stand. Tests known to have used TCE for flushing are reported to have occurred primarily between 1957 and 1958.

  Bravo Test Stand 2 is a large engine test stand and is southeast of Bravo Test Stands 1A and 1B. The test stand (B731) was activated in May 1956 and used for the Atlas Program. Tests known to have used TCE for flushing are reported to have occurred primarily between 1956 and 1957. Subsequent to TCE flushing activities, Bravo Test Stand 2 ran approximately five Atlas engines from the 1960s to the 1980s using RP-1 and LOX as propellants. Vertical and horizontal ASTs for storing LOX, RP-1, and deionized water are located between Bravo Test Stands 1A/1B and 2.

  Bravo Test Stand 3 was a large engine test stand south of Bravo Test Stand 2. The test stand was activated in August 1956. Prior to the Thor Program in 1959, it is unknown what other programs were tested at this stand between 1956 and 1959. However, tests known to have used TCE for flushing are reported to have occurred between 1956 and 1959. Both storable and non-storable propellants were used at Bravo Test Stand 3, including hydrazine, which was reported to have been used in 1958. Hydrazine is a compound that readily breaks down to n-nitrosodimethylamine (NDMA). The Bravo Test Stand 3 was dismantled in 1969. Detailed information supporting the rationale for the demolition of Bravo Test Stand 3 is not available.

- **The Bravo Waste Tank (SWMU 5.14):** This waste tank is a 1,000-gallon steel AST, located below Bravo Test Stand 2 in a gunite-lined drainage channel (spillway), that was installed in 1972 and 1973. The secondary containment around the AST was built in 1992. There has been no documented release from this AST, which received mixtures of hydraulic oil, RP-1, and water from testing operations.

- **Bravo Skim Pond (SWMU 5.15):** The Bravo Skim Pond is an unlined surface impoundment with an estimated 150,000-gallon capacity, and was the primary retention pond for spent cooling water and residual TCE from the Bravo Area testing and cleaning activities. The pond discharges to the ABSP via unlined drainage channels. The Bravo Skim Pond SWMU includes the drainage leading to the pond from the test stands and drainage leading to the ABSP (SWMU 5.12). Currently, the Bravo Skim Pond is inactive and dry; however, surface water will collect in the pond on occasion during rainy seasons.

- **Bravo Groundwater Air Stripping Towers (SWMU 5.27):** The Bravo Groundwater Air Stripping Towers were in the southwestern portion of the Bravo Area and consisted of four towers. Since its operations began in 1987, this unit has been used in facility-wide reclamation and remediation of groundwater (primarily treating TCE and 1,2-DCE) underlying the SSFL facility and was permitted by the Ventura County Air Pollution Control District (VCAPCD) and DTSC. The treated groundwater was discharged through drainage channels west of Bravo Road to Silvernale Pond. The system has been shut down and the towers have been removed.

The three AOCs associated with the Bravo Area are described in the following bullets:

- **Building 2213 Leach Field:** The septic system and leach field associated with the Bravo Control Building 2213 is east of the Bravo Area, as shown in the Rocketdyne Waste Disposal System–Industrial and Domestic Drawing 10 of 12 (June 1959). The septic tank is approximately 10 ft from the southeastern corner of Building 2213 and has a 525-gallon capacity. From the septic tank, approximately 20 ft of piping leads in a southwest direction to the distribution box that feeds the leach field. The leach field is approximately 10 ft to the south of the building, with two trenches each approximately 60 ft long, 6 ft wide, and 4 ft deep, at 6 ft on center. The trenches are in a northeast to southwest direction from the distribution box. Operations associated with Building 2213 include controls for test stands and monitoring equipment. The septic tank and leach field were abandoned in 1995.
- **Building 2217 Leach Field:** The septic system and leach field associated with Bravo Pretest Building 2217 is in the southwestern portion of the Bravo Area, as shown in the Rocketdyne Waste Disposal System–Industrial and Domestic Drawing 9 of 12 (June 1959). The septic tank is approximately 15 ft from the northern side of Building 2217 and has a 1,500-gallon capacity. From the septic tank, approximately 125 ft of piping leads to a distribution box, adjacent to the southeastern portion of the leach field. The leach field is approximately 100 ft northwest of the septic tank and had 5 trenches, each approximately 60 ft long, 6 ft wide, 4 ft deep, and 6 ft on center. The trenches are in a southern to northern direction. The system included three water closets, three urinals, and five wash basins. Operations associated with Building 2217 included cleaning parts for and tooling for the test stand activities. The Building 2217 septic tank and leach field have been abandoned.
- **Drainage Piping beneath the Former Alfa/Bravo Skim Pond:** This piping was installed following the excavation of the related ABSP closure activities in 1988 and was used as a bypass for the spent process water used at the Alfa and Bravo test stands. Surface water from the Alfa or Bravo area entered inlets to the drainage pipes before reaching the closed ABSP. The pipes then conveyed the runoff through the underground pipes to an unlined drainage channel downstream of the ABSP, where any surface runoff then entered the Silvernale Reservoir. The drainage pipes were not in use when TCE flushing activities were implemented for parts and engine cleaning.

The buildings and facilities associated with the Bravo Area, along with their related purposes, are described in the following text.

Building 2213: Building 2213 was constructed in 1956 and served as a control center for the Bravo Area test operations. The concrete building contained control, monitoring, and video equipment. A former leach field and septic tank, associated with the control center, has been

recognized south of the building and designated as an AOC (discussed previously). No chemicals were known to be associated with this building. Additionally, three existing pole-top transformers are to the northeast of Building 2213 and are designated as transformers 302, 303, and 304. During a visual inspection in 2005, each of the three transformers contained "non-PCB" stickers, and was no evidence of leaks or corrosion was observed.

Building 2214: Building 2214, constructed in 1956, was used as the Terminal House. The concrete building, located next to Building 2732 (between Bravo Test Stand 2 and Bravo Test Stand 3), housed electronic components and wiring associated with testing activities. The wiring associated with these instruments was connected to the electronic components in this building, which then transmitted the data to the control center (Building 2208). Adjacent to the northern side of the Terminal House is a valve pit, which consists of a grated, concrete vault.

Building 2217: Building 2217, which was destroyed by wildfires in 2005, was in a paved area southwest of the test stands. Its construction date is unknown, but it was designated as the Pretest Shop. The Pretest Shop was used as a workshop to handle the engines and make modifications to parts of the test stands, as required, for the various test and engine configurations. Building 2217 is reported to have stored hazardous materials, including new and spent igniters. No details are available regarding the specific activities conducted in Building 2217 or the waste disposal practices. A leach field and septic tank associated with this building have been observed to the north of the former building location, which is noted as an AOC (discussed previously). An awning was attached to the southeastern corner of the building. It is not known what was stored beneath the awning. Building 2217A, also destroyed by wildfires in 2005, was an Engineering Trailer for the Pretest Shop. In approximately 1982, the septic system was abandoned and a new sewer system was connected to Building 2217. Additionally, an existing elevated transformer bank, containing transformers 165, 166, and 167, is between former B2217 and the LOX tanks (Unknown-AT-BV-22 through Unknown-AT-BV-25) along the southern Bravo area. There is no evidence of leaks or corrosion from these transformers.

Buildings 2730A and 2731A: Buildings 2730A and 2731A were designated as the Bravo 1 and 2 Electrical Control Shacks (ECSs), respectively. Their construction dates are unknown; however, it can be deduced that each facility was constructed along with the construction of the test stands in 1956. The buildings house electrical components and switches for the Bravo Area Test Stands 1 and 2, respectively. Buildings 2730A and 2731A are northwest of their respective test stands, in the opposite direction from the exhaust buckets. A hydraulic tank and motor pump on the western side of Building 2731A are situated within a concrete secondary containment berm. Two ASTs were identified during the recent aerial photograph review and are adjacent to Building 2731A. On the basis of the geographic information system (GIS) legacy information, one AST is believed to have contained fuel or oil (UnknownTank-BV-7). The contents for the second AST (UnknownTank-BV-6) are unknown.

Building 2732: Building 2732 is positioned south of Building 2214, between Bravo Test Stand 2 and Bravo Test Stand 3. The building was used as a storage building for the Bravo Area. The building is of sheet metal siding; its construction date is unknown. During a field investigation, it was noted that the building still houses a variety of miscellaneous equipment and parts.

Building 2V was designated as the Bravo Area Entry Guard Shack. The building was destroyed by the 2005 wildfires; its original construction date is unknown. This building was located along the northernmost portion of Bravo Road, near Test Area Road.

Building 2Z is the Bravo Area Pillbox. The Pillbox, constructed of reinforced concrete, was used to view engine tests in progress, providing a safe viewing angle for SSFL personnel. Its construction date is unknown. Building 2Z is on the hillside southwest of the Bravo Area.

The Bravo Area is currently inactive. Most of the facility is still intact, the exceptions being the demolished test stand (Bravo Test Stand 3), the buildings lost in the 2005 wildfires (Buildings 2217, 2217A, and 2V), and the former Alfa Bravo Skim Pond, which has been excavated and closed. Field investigations and interviews with current and former employees provided information that some miscellaneous process equipment has been removed since operations ceased for recycling, disposal, or use in other maintenance activities.

The Group 3 RI Report (NASA, 2009) included the samples associated with 2008 and 2009 building inspections, which were collected adjacent to and within buildings at locations of potential concern. Samples that were collected at sewer manholes and along the sewer pipelines to investigate potential releases from cracks and/or ruptures in the sewer line also were included in the Group 3 RI Report.

Additionally, samples have been collected from three identified debris piles immediately outside the Bravo Area. One debris pile was northwest of the B217 leach field and contained empty 1-gallon metal cans. The second debris pile was west of the Bravo Air Stripping Towers and contained a 5-gallon bucket full of soil and a 1-gallon metal can. The third debris pile was southwest of the B213 leach field and contained soil piles intermixed with rebar, metal pipe, concrete, and asphalt.

1.9.2.1 LOX Tank and Pipeline Cleaning

As discussed previously in this section, LOX was used to oxidize fuel (RP-1 or LH2) in rocket engines. Because LOX is a strong oxidizer, the tanks and pipelines used to store or transport LOX required cleaning. NASA has developed a "LOX clean" standard for tanks and pipelines that allows virtually no oils or grease to be present on the metal. TCE (and/or potentially Freon) is used to clean tanks and pipelines to meet the LOX clean standard. The LOX clean standard was developed for testing LOX and RP-1 engines at NASA's MSFC. There were no SSFL-specific LOX cleaning standards or procedures identified in the currently available historical documents.

TCE was used during the build-up or construction phase of the test stands to clean the LOX systems. The LOX run tanks, usually located on the top of the test stands, were cleaned once by spraying the inside with TCE and hand wiping the inside surfaces. LOX storage tanks, usually located adjacent to the test stands, were cleaned by spraying TCE in the tanks and hand wiping the inside walls of the tanks. The LOX tanks adjacent to the test stands were connected to the run tank on the top of the stand for testing purposes via pipelines. A second pipeline was used to connect the LOX run tank to the engine to supply it with the oxidizer during testing. The LOX piping was cleaned by pumping or gravity feeding TCE through the pipelines. The amount of TCE used to clean the storage tanks and pipelines varied, depending on the size of the tanks and pipelines. The LOX pipelines are constructed of thick stainless steel and are connected using flange fittings. The pipelines are designed to transport LOX at more than

3,000 pounds per square inch; therefore, it is not expected that TCE would leak from the pipeline fittings.

The LOX required for engine testing was manufactured at the LOX Plant in Area 1. The LOX was loaded into trucks and transported to each test stand as needed. Therefore, there was not an extensive LOX distribution system at SSFL and each test stand operated independently with regard to the storage and use of LOX for engine testing purposes. The LOX was unloaded from the trucks into the LOX storage tank adjacent to the test stand. Before testing, LOX was pumped via piping to run tanks on the test stand.

Multiple LOX ASTs within the Bravo Area, which supported testing activities at the test stands, were in the southern portion of the site. Four existing ASTs (Unknown-AT-BV-22 through Unknown-AT-BV-25) approximately 40,000 gallons in capacity, are south of Building 2217. Additional existing LOX tanks are in the Bravo Test Stand 2 area. It has not been confirmed whether piping from these tanks extends to the test stands.

It should be noted that the TCE quantities used for engine cleaning after testing were significantly more than those used for TCE cleaning of LOX tanks and lines. Therefore, the TCE released to the subsurface is attributable primarily to engine testing activities rather than to LOX cleaning.

1.9.3 Chemical Use Areas

This subsection provides a summary of the five individual CUAs identified at the Bravo Area. These areas were designated based on locations where chemicals were reported to be and/or are used, stored, spilled, or discharged. The CUA list has been revised since the submittal of the Group 3 RI Report (NASA, 2009), based on additional historical information and site reconnaissance efforts. The individual CUAs are described in the following text. The accompanying Table 1.9-1 highlights these CUAs and the analytical groups of concern within each CUA.

1: Alfa Bravo Skim Pond

The ABSP received cooling water (containing TCE and petroleum-based fuels) from both the Alfa and Bravo test stands. Other engine testing wastes discharged down the test stand spillways were deposited in the ABSP, including hydraulic oil, solvents, LOX, Braycote 756, gaseous nitrogen (GN2), kerosene, waste oil, and water.

2: The Bravo Skim Pond

The Bravo Skim Pond, the Bravo test stands' primary retention pond, was used for spent cooling water and residual TCE from the Bravo Area testing and cleaning activities. This CUA includes the drainage leading to the pond from the test stands and drainage leading to the ABSP (SWMU 5.12). Chemicals associated with the Bravo Skim Pond include solvents, hydraulic oil, LOX, Braycote 756, GN2, kerosene, waste oil, and water.

Outfall 013 is located adjacent and to the north of the drainage channel, between Bravo Test Stands 2 and 3 and the Bravo Skim Pond. Outfall 013 discharges stormwater runoff from the vicinity of the inactive Bravo Test Stands to the Bell Creek Drainage. Engineered controls have been installed to improve the quality of the water before it is discharged. These engineered controls include a sandbag barrier with a drain pipe that conveys stormwater into a series of

carbon and zeolite filter bags that clean the stormwater before its release into the drainage upstream from Outfall 018. These outfalls are monitored under the National Pollutant Discharge Elimination System (NPDES) permit.

3: Building 2217

At Building 2217, the former Bravo Pre-Test Shop was reported to have stored hazardous materials, including igniters used during engine testing activities. These igniters contained TEA and TBA. Wastes stored at Building 2217 included spent igniters, waste caustic debris, waste solvent debris, waste aerosols, and waste alkaline batteries. The septic and sewer system maintained five wash basins to support activities in the building. The Building 2217 septic tank, leach field, and sewer lines are included in this CUA.

4: Building 2214

At Building 2214, the Terminal House, a minor release (0.03-ounce) of mercury occurred in the building from a broken thermometer (Rockwell, 1991). Flammable material storage lockers were observed on the western side of Building 2214 during a 2005 visual site inspection of the building (NASA, 2006). On the northern side of the building is a valve pit, which consists of a grated, concrete vault. It is unknown what chemicals were used here.

Additionally, a former solvent storage area (no building number) was located to the south of Test Stand 3. This storage area consisted of a concrete pad approximately 30 ft long and 15 ft wide and had an awning (MWH, 2005d). The area does not have secondary containment or a berm to encompass the storage area. No details regarding the types of solvents and/or quantities of solvents stored in this area are available.

5: Bravo Area Test Stands

The Bravo Area Test Stands were used to test rocket engines using petroleum-based fuels and LOX as the oxidizer. Bravo Test Stands 1 and 2 (Buildings 2730 and 2731) and Bravo Test Stand 3 reportedly performed engine tests using JP-4, RP-1, and LOX. Hazardous materials stored and used at Test Stand 1 included RP-1, JP-4, hydraulic oil, oronite, TCE, TCA, LOX, Braycote 756, gaseous nitrogen (GN2), kerosene, waste oil and water, and kerosene fuel composite standard-waste (The Boeing Company, 2007).

Originally, a cleaning process using TCE was employed after engine testing activities to remove residual fuel from engine components. The TCE waste was discharged to the spillways leading to the former Bravo Skim Pond and eventually to the former Alfa/Bravo Skim Pond. To capture the waste TCE, a TCE recycling system was implemented in 1961. Using TCE for this purpose was discontinued in approximately 1965 when the Bravo Area completed the transition from LOX kerosene engine and thrust chamber tests, which needed TCE flushing, to other components and Vernier engine testing, which did not require TCE flushing. TCA continued to be used for parts cleaning at Bravo until 1994 (NASA, 2006; MWH, 2005d).

A 1,000-gallon Bravo Waste Tank (SWMU 5.14) at Test Stand 2 was used to store waste RP-1, hydraulic oil, and water from testing activities. The Bravo Waste Tank was immediately beneath Test Stand 2 in the gunite-lined drainage channel. The tank was installed in 1973 and had a secondary containment system built in 1992 (MWH, 2005d). During a 2005 site visit, igniters containing TEA and TEB were stored in a portable steel container on an asphalt-paved area to the south of Building 2731 (NASA, 2006).

6: Bravo Rocket Testing Dispersion Area

The Bravo Rocket Testing Dispersion Area is on the western side of the Bravo Area south of the ABSP. The 70-percent probability line, as modeled in December 2010, represents the anticipated deposition of 70 percent of the maximum concentration projected, assuming a staged rocket testing schedule and a weather pattern averaged over 5 years. Considering the materials used during rocket engine testing, the sampling suite for this area will include energetics, VOCs, TPHs, and dioxins.

1.9.4 Historical Aerial Photograph Review Findings Summary

In response to DTSC's sitewide comments, NASA conducted a historical aerial photograph review of the various reporting sites, including the Bravo Area. The objective of the aerial photography review was to identify features that were not discussed at the time the RI Report (NASA, March 2009) was submitted. During the aerial photograph review, additional site historical use information identified 21 new features. Three portions of aboveground piping were identified at this site for the first time in the 1972 aerial photograph. The pipelines' uses are unknown.

A section of piping, approximately 250 ft long was found along Bravo Road, between Building 2213 and the Bravo Skim Pond. On the basis of a field observation, this section of piping appears to be a 4-inch steel raw sewage pipe, with flow traveling east to west from Building 2213. This pipeline extends beneath Bravo Road and surfaces at a small lift station that connects to the 80-ft section of aboveground pipeline (the second new pipeline feature identified) that traverses the northwestern portion of the Bravo Skim Pond in preliminary remediation area (PRA) Bravo-9. During visual inspections of these pipelines, no degraded areas or leaks were observed. No samples have been collected previously along this section of pipeline on Bravo Road; therefore, sampling currently is proposed to address this new feature. The 80-ft section of piping within the PRA Bravo-9 has been sampled as part of the Bravo Skim Pond evaluation, with the exception of the southwestern portion of the piping. Limited extent sampling on the southwestern end of this section of piping is proposed. Samples might be adjusted in the field based on observation and locations of physical couplings and flanges, and will be analyzed for VOCs, TPH, and dioxin parameters. The analytical approach is consistent with previous sampling efforts within this site.

The third feature identified as piping is outside the western side of the Bravo Area and south of the Hazardous Waste Storage Area (HWSA), currently owned by Boeing. This feature is approximately 50 ft long. During a visual inspection of this feature, no evidence of a pipe could be confirmed; however, a concrete swale that flows south to north down an embankment was observed. Additionally, an I-beam approximately 4 ft west of the swale might have been used to hold piping. Sampling is proposed along this swale.

Five new ASTs were identified west of the Bravo Area. One AST was located within the HWSA (owned by Boeing) and the remaining four ASTs were east-southeast of the Hazardous Waste Coolant Tank (HWCT) Area (also owned by Boeing). It is unknown what the tanks contained, but they were visible from approximately 1967 to 1972. Boeing will address the new features identified with the HWSA and HWCT areas. The remaining features identified during the aerial photograph review are dirt roads, most all of which are no longer used and have become overgrown with vegetation.

1.9.5 Groundwater Contribution to VOC Contamination

There are three possible locations within the Bravo Area where detected VOCs in the soil are related to groundwater contamination. Historical VOC samples collected at the Bravo Area had elevated concentrations of VOCs reported in the deep subsurface samples. As shown in the 2009 Draft Site-Wide Groundwater Remedial Investigation Report, a TCE groundwater plume is located beneath the Bravo Area (MWH, 2009). VOCs, specifically TCE, also have been detected in the groundwater at concentrations exceeding the screening criteria at this site.

Since the VOC exceedances in the Bravo Area are likely to be related to groundwater contamination, characterization and planning for the soil VOC remedial action in this area will be addressed as part of the groundwater RI/FS. These areas are shown in yellow in Figure 1.9-2. However, to address DTSC's requirements to evaluate other potential solvent impacts outside of these known release areas, additional VOC samples have been proposed at selected locations within the Bravo Area.

1.9.6 Sample Locations

Figure 1.9-2 shows the individual proposed sampling locations for the Bravo Area. The rationale for these samples is provided in Table 1.9-2, the Data Quality Objectives Table.

The vertical profiling default depth of 5 ft bgs is based on previous sampling efforts and general site knowledge. Conditions in the field ultimately will determine the depth of subsurface soil samples and probably will vary from the 5 ft bgs reported in the DQO table. As a generalized guidance, field personnel will take the following steps in determining subsurface soil sampling intervals:

- If refusal (top-of-rock) is encountered deeper than 2 ft bgs, but shallower than 5 ft bgs, a subsurface soil sample will be collected at the depth of refusal.
- If refusal (top-of-rock) is encountered deeper than 5 ft bgs, but shallower than 7 ft bgs, a subsurface soil sample will be collected at the depth of refusal and replace the 5 ft bgs sample.
- If refusal is not encountered, field personnel will note such and the station is to be identified as a potential candidate for additional subsurface soil sampling if warranted.

The current samples that have been collected around the test stands probably are sufficient to characterize the TCE usage for LOX cleaning and engine testing. However, the current samples will be reevaluated on a site-by-site basis using maps in which site features are mapped with the appropriate detail to assess the adequacy of the samples. If data gaps are identified during the reevaluation of the site characterization, additional samples will be collected using a site-specific strategy to address the identified data gaps.

Analytical results from the samples previously collected from the perimeter of the ABSP were reported as "non-detections" in excess of the applicable reporting limits. However, the sediment from the ABSP operations had been excavated; therefore, to address the reporting limit exceedances, a data gap was identified outside the perimeter of the ABSP. To address the data gap, samples are proposed to be collected as extent samples around the ABSP instead of reevaluating the samples.

This page intentionally left blank.

Tables

TABLE 1.8-1
Chemical Use Areas at Alfa Area
NASA SSFL Field Sampling Plan

Chemical Use Area Types and Typical Target Analytical Suites						
	Petroleum Fuels / Solvents	**Energetic Constituents / Propellants**	**Transformers**	**Oil-Related Materials and Debris**		
Chemical Use Area Name	**TPH, VOCs [1]**	**Hydrazine, NDMA, UDMH, MMH, NTO, Formaldehyde, Metals**	**PCBs**	**SVOCs, PAHs [2], TPH, PCBs, Metals**	**Dioxins**	**Pesticides**
1 - ABFF Pipeline and Water Conveyance Pipeline	X	X			X	
2 - AA Transformer			X		X	
3 - B208 Leach Field	X	X		X	X	
4 - B212 Leach Field	X	X		X		X
5 - Alfa Debris Area				X		
6 - B2212 Area	X			X		
7 - Alfa Test Stands	X	X		X		
8 - AA Drainage and Ponds	X	X		X	X	X
9 - Alfa Aerial Deposition Area	X					

Notes:
MMH = monomethyl hydrazine
NDMA = n-nitrosodimethylamine
NTO = nitrogen tetroxide
hydrocarbon
PCB = polychlorinated biphenyl
SPA = Storable Propellant Area
SVOC = semivolatile organic compound
TPH = total petroleum hydrocarbons
UDMH = unsymmetrical dimethyl hydrazine
VOC = volatile organic compound
ABFF = Alfa/Bravo Fuel Farm
1. VOCs are a COPC for TPH-gasoline.
2. SVOCs and PAHs are COPCs for TPH-diesel.

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
8	1	SS	0			X	X	X	X		X	X			X			Alfa-3, Alfa-9, Alfa-17	Southwestern extent evaluation of Alfa-1. COCs include SVOCs, TPHs, metals, energetics, pesticides and dioxins. Sample AABS40 had a Non-Detected TPH Concentration that exceeded screening criteria. Other COCs are proposed because of Alfa-1 chemical use history.
		SO	5			H	H	X	H		H	H			H				
8	2	SS	0			X	X	X	X		X	X			X			Alfa-3, Alfa-9, Alfa-17	Northwestern extent evaluation of Alfa-1. COCs include SVOCs, TPHs, metals, energetics, pesticides and dioxins. Samples AABS0047 and AABS19 had detections and/or non-detected concentrations that exceeded screening criteria for metals, PAHs, phthalates, SVOCs, TPH, and VOCs. Other COCs are proposed because of Alfa-1 chemical use history.
		SO	5			H	H	X	H		H	H			H				
8	1SV	SV	5	X														Alfa-3, Alfa-9, Alfa-16, Alfa-17	Soil vapor extent evaluation, western side of Alfa-1.
8	3	SS	0			X	X	X	X		X	X			X			Alfa-3, Alfa-9, Alfa-17	Southern extent evaluation of Alfa-1. COCs include SVOCs, TPHs, metals, energetics, pesticides and dioxins.
		SO	5			H	H	X	H		H	H			H				
8	4	SS	0			X	X	X	X		X	X			X			Alfa-3, Alfa-9, Alfa-17	Northeastern extent evaluation of Alfa-1. COCs include SVOCs, TPHs, metals, energetics, pesticides and dioxins. Sample AABS41 had non-detected TPH concentrations that exceeded screening criteria. Other COCs are proposed because of Alfa-1 chemical use history.
		SO	5			H	H	X	H		H	H			H				
8	5	SS	0			X	X	X	X		X	X			X			Alfa-3, Alfa-9, Alfa-17	Southeastern extent evaluation of Alfa-1. COCs include SVOCs, TPHs, metals, energetics, pesticides and dioxins. Sample AABS1030 had a non-detected TPH concentration that exceeded screening criteria. Other COCs are proposed because of Alfa-1 chemical use history.
		SO	5			H	H	X	H		H	H			H				
8	6	SS	0		X	X	X	X	X		X	X			X			Alfa-3, Alfa-9, Alfa-17	Eastern extent evaluation of Alfa-1 and Western extent evaluation of Alfa-5. COCs include VOCs, SVOCs, TPHs, metals, energetics, pesticides and dioxins. Samples AABS41 and AABS1050 had detections and/or non-detected concentrations that exceeded screening criteria for dioxins, energetics, metals, pesticides, PAHs, phthalates, SVOCs, TPH, and VOCs.
		SO	5		X	H	H	X	H		H	H			H				
8	2SV	SV	5	X														Alfa-3, Alfa-9, Alfa-16, Alfa-17	Soil vapor extent evaluation Alfa-1 and Alfa-5.
8	7	SS	0		X	X	X	X	X		X	X			X			Alfa-3, Alfa-9, Alfa-17	Southeastern extent evaluation of Alfa-1 and Southwestern extent evaluation of Alfa-5. COCs include VOCs, SVOCs, TPHs, metals, energetics, pesticides and dioxins. Samples AABS1050 and ARPC-20 had detections and/or non-detected concentrations that exceeded screening criteria for dioxins, energetics, metals, pesticides, PAHs, phthalates, SVOCs, TPH, and VOCs.
		SO	5		X	H	H	X	H		H	H			H				
8	8	SS	0		X	X	X		X		X	X			X			Alfa-3, Alfa-9, Alfa-17	Northwestern extent evaluation of Alfa-5. COCs include VOCs, SVOCs, metals, energetics, pesticides and dioxins. Samples AABS1049 and ARPC-22 had detections and/or non-detected concentrations that exceeded screening criteria for dioxins, energetics, metals, pesticides, PAHs, phthalates, SVOCs, and VOCs.
		SO	5		X	H	H		H		H	H			H				
8	9	SS	0		X	X	X		X		X	X			X			Alfa-3, Alfa-9, Alfa-17	Southwestern extent evaluation of Alfa-5. COCs include VOCs, SVOCs, metals, energetics, pesticides and dioxins. Samples AABS1049 and ARPC-22 had detections and/or non-detected concentrations that exceeded screening criteria for dioxins, energetics, metals, pesticides, PAHs, phthalates, SVOCs, and VOCs.
		SO	5		X	H	H		H		H	H			H				

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
8	10	SS	0			X	X	X	X		X	X		X	X	X	X	Alfa-3, Alfa-9, Alfa-17	Northeastern extent evaluation of Alfa-5 and Western extent evaluation of Alfa-7. COCs include TPHs, SVOCs, formaldehyde, NDMA, perchlorate, metals, energetics, pesticides and dioxins. Samples AABS1046, AABS1047, and ARPC-29 had detections and/or non-detected concentrations that exceeded screening criteria for dioxins, energetics, metals, pesticides, PAHs, phthalates, SVOCs, and VOCs. Additional COCs are proposed because of Alfa-7 chemical use history.
		SO	5			H	H	X	H		H	H		H	H	H	H		
8	11	SS	0			X	X	X	X		X	X			X			Alfa-3, Alfa-9, Alfa-17	Southeastern extent evaluation of Alfa-5 and Southwestern extent evaluation of Alfa-7. COCs include SVOCs, TPHs, metals, energetics, pesticides and dioxins. Samples AABS1046, AABS1047, and ARPC-29 had detections and/or non-detected concentrations that exceeded screening criteria for dioxins, energetics, metals, pesticides, PAHs, phthalates, SVOCs, and VOCs. Additional COCs are proposed because of Alfa-7 chemical use history.
		SO	5			H	H	X	H		H	H			H				
8	12	SS	0			X		X	X		X	X	X	X	X	X	X	Alfa-3, Alfa-9, Alfa-17	Northwestern extent evaluation of Alfa-7. COCs include TPHs, SVOCs, formaldehyde, NDMA, metals, energetics, perchlorate, pesticides and dioxins. Samples AABS1046 and AASV1029 had detections and/or non-detected concentrations that exceeded screening criteria for dioxins, metals, and VOCs.
		SO	5			H		X	H		H	H	H	H	H	H	H		
8	3SV	SV	5	X														Alfa-3, Alfa-9, Alfa-16, Alfa-17	Soil vapor extent evaluation Alfa-7.
8	13	SS	0			X	X	X	X		X		X	X	X	X	X	Alfa-3, Alfa-9, Alfa-17	Southern extent evaluation of Alfa-7. COCs include TPHs, SVOCs, formaldehyde, NDMA, energetics, perchlorate, pesticides and dioxins. Samples AABS1044, AABS1045, AABS16, and B-6 had detections and non-detected concentrations that exceeded screening criteria for dioxins, metals, PAHs, phthalates, TPH, and VOC. Additional COCs are proposed based on Alfa-7 chemical use history.
		SO	5			H	H	X	H		H		H	H	H	H	H		
8	4SV	SV	5	X														Alfa-3, Alfa-9, Alfa-16, Alfa-17	Soil vapor extent evaluation Alfa-7.
8	14	SS	0			X	X	X	X		X		X	X	X	X	X	Alfa-3, Alfa-9, Alfa-17	Northeastern extent evaluation of Alfa-7. COCs include TPHs, SVOCs, formaldehyde, NDMA, energetics, perchlorate, pesticides and dioxins. Samples AABS1006, AABS1007, AABS0046, AABS1009, AABS20, and AASV1028 had detections and non-detected concentrations that exceeded screening criteria for dioxins, metals, PAHs, phthalates, SVOCs, TPH and VOCs.
		SO	5			H	H	X	H		H		H	H	H	H	H		
8	5SV	SV	5	X														Alfa-3, Alfa-9, Alfa-16, Alfa-17	Soil vapor extent evaluation Alfa-7.
--	6SV	SV	5	X														Alfa-16	Soil vapor data gap evaluation.
8	15	SS	0			X	X	X	X		X		X	X	X	X	X	Alfa-3, Alfa-4, Alfa-6, Alfa-9, Alfa-17	Eastern extent evaluation of Alfa-7 and southwestern extent evaluation of Alfa-10. COCs include TPHs, SVOCs, formaldehyde, NDMA, energetics, perchlorate, pesticides and dioxins. Samples AASV1026, B-5A, and AABS17 had detections and non-detected concentrations that exceeded screening criteria for dioxins, metals, PAHs, phthalates, SVOCs, TPH and VOCs.
		SO	5			H	H	X	H		H		H	H	H	H	H		
8	16	SS	0			X	X	X	X	X	X	X		X	X	X	X	Alfa-3, Alfa-4, Alfa-6, Alfa-9, Alfa-17	Eastern extent evaluation of Alfa-7, southwestern extent evaluation of Alfa-10, and data gap evaluation. COCs include TPHs, energetics, perchlorate, SVOCs, formaldehyde, NDMA, PAHs, PCBs, metals, pesticides and dioxins. Samples AABS1043 and AASV12 had detections and non-detected concentrations that exceeded screening criteria for VOCs. Additional COCs are proposed based on Alfa-7 chemical use history.
		SO	5			H	H	X	H	H	H	H		H	H	H	H		
1, 7	17	SS	0			X	X	X		X		X			X			Alfa-3, Alfa-4, Alfa-6, Alfa-9	Western extent evaluation of Alfa-10 and data gap evaluation. COCs include TPHs, energetics, SVOCs, PAHs, PCBs, and Metals. Samples AABS38, AASV05, and SV-5.9-6 had detections and non-detected concentrations that exceeded screening criteria for TPH and VOCs. Additional COCs are proposed based on Alfa-10 chemical use history.
		SO	5			H	H	X		H		H			H				

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
1, 7	7SV	SV	5	X														Alfa-3, Alfa-4, Alfa-6, Alfa-9, Alfa-16	Soil vapor data gap evaluation and Alfa-10 extent evaluation.
1, 7	18	SS	0			X	X	X	X	X		X			X			Alfa-3, Alfa-4, Alfa-6, Alfa-9	Western extent evaluation of Alfa-10 and data gap evaluation. COCs include TPHs, energetics, SVOCs, PAHs, PCBs, metals, and pesticides. Samples ATSC-1-8, AABS33, and AASV03 had detections and/or non-detected concentrations that exceeded screening criteria for energetics, pesticides, PAHs, phthalates, SVOCs, TPH, and VOCs.
		SO	5			H	H	X	H	H		H			H				
1, 7	8SV	SV	5	X														Alfa-3, Alfa-4, Alfa-6, Alfa-9, Alfa-16	Soil vapor data gap evaluation and Alfa-10 extent evaluation.
8	19	SS	0			X	X	X	X	X	X	X			X			Alfa-3, Alfa-4, Alfa-6, Alfa-9, Alfa-17	Southern extent evaluation of Alfa-10. COCs include TPHs, energetics, SVOCs, PAHs, PCBs, Metals, dioxins, and pesticides. Sample AABS1041 had detections and/or non-detected concentrations that exceeded screening criteria for metals, PAHs, phthalates, PCBs, and VOCs. Additional COCs are proposed based on Alfa-10 chemical use history.
		SO	5			H	H	X	H	H	H	H			H				
1,7	20	SS	0		X	X	X	X		X	X	X			X			Alfa-2, Alfa-3, Alfa-4, Alfa-6, Alfa-9	Extent evaluation of Alfa-10 and evaluation of potential releases from water conveyance pipeline. COCs include TPHs, VOCs, energetics, SVOCs, PAHs, PCBs, metals, and dioxins. Samples SV-5.9-5, AASV1024, AABS09, and AABS1040 had detections and/or non-detected concentrations that exceeded screening criteria for PCBs, TPH, and VOCs. Additional COCs are proposed based on Alfa-10 chemical use history.
		SO	5		X	H	H	X		H	H	H			H				
1,7	9SV	SV	5	X														Alfa-3, Alfa-4, Alfa-6, Alfa-9, Alfa-16	Extent evaluation of Alfa-10 and evaluation of potential releases from water conveyance pipeline.
7	21	SS	0		X	X	X	X		X		X			X			Alfa-2, Alfa-3, Alfa-4, Alfa-6, Alfa-9	Alfa-10 extent and data gap evaluation. COCs include energetics, metals, pesticides, PAHs, PCBs, phthalates, SVOCs, TPH, and VOCs. Samples AASV1022, AABS0069, AABS32, ATSC-2-8, and C-12-01 had detections and/or non-detected concentrations that exceeded screening criteria for energetics, pesticides, PAHs, PCBs, phthalates, SVOCs, TPH, and VOCs. Additional COCs are proposed based on Alfa-10 chemical use history.
		SO	5		X	H	H	X		H		H			H				
7	10SV	SV	5	X														Alfa-3, Alfa-4, Alfa-9, Alfa-16	Evaluation of Alfa-10 extent and data gap.
7	22	SS	0		X	X	X	X		X	X	X			X			Alfa-2, Alfa-4, Alfa-9	Extent evaluation of Alfa-10. COCs include TPHs, VOCs, energetics, SVOCs, PAHs, PCBs, metals, and dioxins. Sample ATSC-3-3 had detections and/or non-detected concentrations that exceeded screening criteria for energetics, pesticides, PAHs, phthalates, SVOCs, and VOCs. Additional COCs are proposed based on Alfa-1 chemical use history.
		SO	5		X	H	H	X		H	H	H			H				
7	23	SS	0		X	X	X	X		X	X	X			X			Alfa-2, Alfa-4	Extent evaluation of Alfa-16. Proposed COCs include TPHs, VOCs, energetics, SVOCs, PAHs, PCBs, metals, and dioxins, based on Alfa-16 chemical use history and data gap evaluation.
		SO	5		X	H	H	X		H	H	H			H				
7	24	SS	0		X		X	X		X		X			X				Extent evaluation of Alfa-16. COCs include TPH, VOCs, energetics, PAHs, PCBs, and metals. Samples ATSC-3-11 and AABS1032 had detections and/or non-detected concentrations that exceeded screening criteria for energetics, pesticides, PAHs, phthalates, SVOCs, TPH, and VOCs.
		SO	5		X		H	X		H		H			H				

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
--	25	SS	0			X	X												Data gap evaluation. COCs include SVOCs. Sample AABS1095 had non-detected concentrations that exceeded screening criteria for PAHs, phthalates, and SVOCs.
		SO	5			H	H												
1	26	SS	0		X	X	X	X	X		X				X				Extent evaluation of Alfa-16 and the ABFF Pipeline and Water Conveyance Pipeline. COCs include TPHs, VOCs, energetics, dioxins, pesticides, and SVOCs. Sample ATSC-3-17 had detections and/or non-detected concentrations that exceeded screening criteria for energetics, pesticides, PAHs, phthalates, SVOCs, and VOCs. Additional COCs are proposed based on Alfa-16 and pipeline chemical use history.
		SO	5		X	H	H	X	H		H				H				
1	27	SS	0		X			X			X	X			X				Evaluation of potential releases from the ABFF Pipeline and Water Conveyance Pipeline. COCs include TPH, VOCs, energetics, metals, and dioxins.
		SO	5		X			X			H	H			H				
1	28	SS	0			X		X											Extent evaluation for Alfa-18. Debris extent samples will be collected within 10 feet of where debris was found. COCs include TPH and SVOCs. Sample AABS1029 had detections and/or non-detected concentrations that exceeded screening criteria for phthalates and TPH.
		SO	5			H		X											
1	29	SS	0		X		X	X			X	X			X				Evaluation of Alfa-18 extent and potential releases from the ABFF Pipeline and Water Conveyance Pipeline. COCs include TPH, VOCs, energetics, metals, dioxins, and PAHs.
		SO	5		X		H	X			H	H			H				
1	30	SS	0		X			X			X	X			X				Evaluation of potential releases from the ABFF Pipeline and Water Conveyance Pipeline. COCs include TPH, VOCs, energetics, metals, and dioxins.
		SO	5		X			X			H	H			H				
1	31	SS	0		X			X			X	X			X				Evaluation of potential releases from the ABFF Pipeline and Water Conveyance Pipeline. COCs include TPH, VOCs, energetics, metals, and dioxins.
		SO	5		X			X			H	H			H				
1	32	SS	0		X		X	X			X	X			X				Extent evaluation of Alfa-19 and potential releases from the ABFF Pipeline and Water Conveyance Pipeline. Debris extent samples will be collected within 10 feet of where debris was found. COCs include TPH, VOCs, energetics, metals, and dioxins. Sample AABS1102 had detections and/or non-detected concentrations that exceeded screening criteria for metals, PAHs, phthalates, SVOCs, VOCs, and TPH. Additional COCs are proposed based on historic Alfa-19 and pipeline chemical use.
		SO	5		X		H	X			H	H			H				
1	33	SS	0		X		X	X			X	X			X				Extent evaluation of Alfa-19 and potential releases from the ABFF Pipeline and Water Conveyance Pipeline. Debris extent samples will be collected within 10 feet of where debris was found. COCs include TPH, VOCs, energetics, metals, and dioxins. Sample AABS1102 had detections and/or non-detected concentrations that exceeded screening criteria for metals, PAHs, phthalates, SVOCs, VOCs, and TPH. Additional COCs are proposed based on historic Alfa-19 and pipeline chemical use.
		SO	5		X		H	X			H	H			H				
1	34	SS	0		X		X	X			X	X			X				Evaluation of potential releases from the ABFF Pipeline and Water Conveyance Pipeline. COCs include TPH, VOCs, energetics, metals, and dioxins. Samples AABS1098, AABS0050S70, and AABS053S01 had detections and/or non-detected concentrations that exceeded screening criteria for metals, PCBs, PAHs, phthalates, SVOCs, TPH, and VOCs. Additional COCs are proposed based on historic pipeline chemical use.
		SO	5		X		H	X			H	H			H				
1	35	SS	0		X			X		X	X	X							Evaluation of Alfa-17 and potential releases from the ABFF Pipeline and Water Conveyance Pipeline. COCs include TPH, VOCs, metals, PCBs, and dioxins. Samples AABS0050S70 and AABS053S01 had PCB detections. Additional COCs are proposed based on historic Alfa-17 and pipeline chemical use.
		SO	5		X			X		H	H	H							

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
1	36	SS	0		X			X		X	X	X			X				Evaluation of Alfa-17 and potential releases from the ABFF Pipeline and Water Conveyance Pipeline. COCs include TPH, VOCs, energetics, metals, PCBs, and dioxins. Samples AABS0050S70 and AABS053S01 had PCB detections. Additional COCs are proposed based on historic Alfa-17 and pipeline chemical use.
		SO	5		X			X		H	H	H			H				
1	37	SS	0		X	X	X	X	X		X								Extent evaluation of Alfa-16 and the ABFF Pipeline and Water Conveyance Pipeline. COCs include TPHs, VOCs, energetics, dioxins, pesticides, and SVOCs. Sample ATSC-3-17 had detections or non-detected concentrations that exceeded screening criteria for energetics, pesticides, PAHs, phthalates, SVOCs, and VOCs. Additional COCs are proposed based on historic Alfa-16 and pipeline chemical use.
		SO	5		X	H	H	X	H		H								
1	38	SS	0		X	X		X	X		X				X				Extent evaluation of Alfa-16. COCs include TPHs, VOCs, energetics, dioxins, pesticides, and SVOCs.
		SO	5		X	H		X	H		H				H				
1	39	SS	0		X	X		X	X		X				X				Evaluation of data gap associated with tanks discovered during aerial review, Alfa-15 extent, and ABFF Pipeline and Water Conveyance Pipeline. COCs include TPHs, VOCs, energetics, dioxins, pesticides, and SVOCs.
		SO	5		X	H		X	H		H				H				
1	11SV	SV	5	X														Alfa-16	Evaluation of data gap associated with tanks discovered during aerial review, Alfa-15 extent, and ABFF Pipeline and Water Conveyance Pipeline.
1	40	SS	0		X	X		X	X		X				X				Evaluation of data gap associated with tanks discovered during aerial review, Alfa-15 extent, and ABFF Pipeline and Water Conveyance Pipeline. COCs include TPHs, VOCs, energetics, dioxins, pesticides, and SVOCs.
		SO	5		X	H		X	H		H				H				
7	41	SS	0		X	X		X	X		X				X			Alfa-2, Alfa-3, Alfa-4, Alfa-6, Alfa-9	Extent evaluation of Alfa-10 and Alfa-16. COCs include TPHs, VOCs, energetics, dioxins, pesticides, and SVOCs. Samples AABS1038 and AASV1022 had detections and/or non-detected concentrations that exceeded screening criteria for VOCs. Additional COCs are proposed based on historic Alfa-10 and Alfa-16 chemical use.
		SO	5		X	H		X	H		H				H				
7	12SV	SV	5	X														Alfa-4, Alfa-9, Alfa-16	Evaluation of Alfa-10 extent and data gap.
7	42	SS	0		X	X		X	X		X				X			Alfa-2, Alfa-3, Alfa-4, Alfa-6, Alfa-9	Extent evaluation of Alfa-10 and Alfa-15. COCs include TPHs, VOCs, energetics, dioxins, pesticides, and SVOCs. Samples AASV09, AASV10, AABS0067, and AABS1060 had detections and/or non-detected concentrations that exceeded screening criteria for metals, PCBs, phthalates, TPH, and VOCs. Additional COCs are proposed based on historic Alfa-10 and Alfa-15 chemical use.
		SO	5		X	H		X	H		H				H				
1	13SV	SV	5	X														Alfa-16	Evaluation of data gap associated with tanks discovered during aerial review, Alfa-15 extent, and ABFF Pipeline and Water Conveyance Pipeline.
6	43	SS	0		X		X	X				X							Extent evaluation of Alfa-14. COCs include TPHs, VOCs, and metals. Samples AATS01S05 and AABS1020 had detections or non-detected concentrations that exceeded screening criteria for energetics, metals, pesticides, PAHs, phthalates, SVOCs, TPH, and VOCs.
		SO	5		X		H	X				H							
6	14SV	SV	5	X														Alfa-16	Extent evaluation of Alfa-14.
6	44	SS	0			X						X							Southeast extent evaluation of Alfa-20. Debris extent evaluation will be collected within 10 feet of where debris was found. COCs include VOCs, TPH, SVOCs, and metals. Samples AABS1103 and AABS1104 had detections and/or non-detected concentrations that exceeded screening criteria for metals, SVOCs, TPH, and VOCs.
		SO	5			H						H							

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
6	45	SS	0			X						X							Northeast extent evaluation of Alfa-20. Debris extent evaluation will be collected within 10 feet of where debris was found. COCs include VOCs, TPH, SVOCs, and metals. Samples AABS1103 and AABS1104 had detections and/or non-detected concentrations that exceeded screening criteria for metals, SVOCs, TPH, and VOCs.
		SO	5			H						H							
6	46	SS	0				X					X							Extent evaluation of Alfa-14 and Alfa-20. Debris extent evaluation will be collected within 10 feet of where debris was found. COCs include PAHs and metals.
		SO	5				H					H							
6	47	SS	0		X		X			X		X							Extent evaluation of Alfa-14. COCs include VOCs, PAHs, PCBs, and metals. Samples AABS43 and AABS44 had PCB detections. Additional COCs are proposed based on historic chemical use at Alfa-14.
		SO	5		X		H			H		H							
6	15SV	SV	5	X														Alfa-16	Extent evaluation of Alfa-14.
6, 7	48	SS	0		X	X	X	X		X		X			X			Alfa-2, Alfa-3, Alfa-4, Alfa-6, Alfa-9	Extent evaluation of Alfa-10, Alfa-11, and Alfa-13. Also evaluation potential releases from tanks found during aerial review. COCs include TPHs, VOCs, energetics, SVOCs, PAHs, PCBs, and metals. Sample AABS0063 had detections and/or non-detected concentrations that exceeded screening criteria for metals, PAHs, PCBs, phthalates, SVOCs, TPH, and VOCs. Additional COC proposed based on historic chemical use at Alfa-10, Alfa-11, and Alfa-13.
		SO	5		X	H	H	X		H		H			H				
6, 7	16SV	SV	5	X														Alfa-3, Alfa-4, Alfa-6, Alfa-9,	Extent evaluation of Alfa-10, Alfa-11, and Alfa-13. Also evaluation potential releases from tanks found during aerial review.
6	49	SS	0		X	X	X	X		X		X			X				Extent evaluation of Alfa-11 and Alfa-14. Also evaluation potential releases from tanks found during aerial review. COCs include TPHs, VOCs, energetics, SVOCs, PAHs, PCBs, and metals. Samples AATS01S04 and AASV1011 had detections and/or non-detected concentrations that exceeded screening criteria for TPH and VOCs. Additional COCs proposed based on historic chemical use at Alfa-11 and Alfa-14.
		SO	5		X	H	H	X		H		H			H				
6	17SV	SV	5	X														Alfa-16	Extent evaluation of Alfa-11 and Alfa-14 and potential releases from tanks found during aerial review.
6	50	SS	0		X	X	X	X		X		X							Extent evaluation of Alfa-14. COCs include TPHs, VOCs, PAHs, PCBs, and metals.
		SO	5		X	H	H	X		H		H							
4	51	SS	0			X	X	X	X	X		X			X			Alfa-8, Alfa-9	Extent evaluation of Alfa-12. COCs include TPH, energetics, PAHs, PCBs, metals, and pesticides. Sample AABS1004 had detections or non-detected concentrations that exceeded the screening criteria for energetics, metals, pesticides, PAHs, PCBs, phthalates, SVOCs, TPH, and VOCs.
		SO	2			H	H	X	H	H		H			H				
4	52	SS	0				X	X	X	X		X			X			Alfa-8, Alfa-9	Extent evaluation of Alfa-12. COCs include TPH, energetics, PAHs, PCBs, metals, and pesticides.
		SO	2				H	X	H	H		H			H				
4	53	SS	0				X	X	X	X		X			X			Alfa-8, Alfa-9	Extent evaluation of Alfa-12. COCs include TPH, energetics, PAHs, PCBs, metals, and pesticides.
		SO	2				H	X	H	H		H			H				

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
4	54	SS	0				X	X	X	X		X			X			Alfa-8, Alfa-9	Extent evaluation of Alfa-12. COCs include TPH, energetics, PAHs, PCBs, metals, and pesticides.
		SO	2				H	X	H	H		H			H				
4	55	SS	0				X	X	X	X		X			X			Alfa-8, Alfa-9	Extent evaluation of Alfa-12. COCs include TPH, energetics, PAHs, PCBs, metals, and pesticides. Sample AABS42 had detections or non-detected concentrations that exceeded the screening criteria for metals, TPH, and VOCs. Additional COCs proposed based on historic chemical use at Alfa-12.
		SO	2				H	X	H	H		H			H				
4	56	SS	0				X	X	X	X		X			X			Alfa-8, Alfa-9	Extent evaluation of Alfa-12. COCs include TPH, energetics, PAHs, PCBs, metals, and pesticides. Sample AABS42 had detections or non-detected concentrations that exceeded the screening criteria for metals, TPH, and VOCs. Additional COCs proposed based on historic chemical use at Alfa-12.
		SO	2				H	X	H	H		H			H				
4	57	SS	0				X	X	X	X		X			X			Alfa-8, Alfa-9	Extent evaluation of Alfa-12. COCs include TPH, energetics, PAHs, PCBs, metals, and pesticides.
		SO	2				H	X	H	H		H			H				
10	58	SS	0					X											Evaluation of Alfa Aerial Deposition Area. COCs include TPH.
		SO	2					X											
10	59	SS	0					X											Evaluation of Alfa Aerial Deposition Area. COCs include TPH.
		SO	2					X											
10	60	SS	0					X											Evaluation of Alfa Aerial Deposition Area. COCs include TPH.
		SO	2					X											
10	61	SS	0					X											Evaluation of Alfa Aerial Deposition Area. COCs include TPH.
		SO	2					X											
10	62	SS	0					X											Evaluation of Alfa Aerial Deposition Area. COCs include TPH.
		SO	2					X											
10	63	SS	0					X											Evaluation of Alfa Aerial Deposition Area. COCs include TPH.
		SO	2					X											
10	64	SS	0					X											Evaluation of Alfa Aerial Deposition Area. COCs include TPH.
		SO	2					X											
7	65	SS	0		X	X	X	X	X	X		X		X	X	X	X	Alfa-2, Alfa-4, Alfa-9	Extent evaluation of Alfa-8. COCs include TPH, VOCs, energetics, perchlorate metals, PCB, pesticide, PAHs, SVOCs, and formaldehyde, NDMA. Samples AASV1013 and AABS22 had detections or non-detected concentrations that exceeded the screening criteria for TPH and VOCs. Additional COCs are proposed based on historic chemical use at Alfa-8.
		SO	5		X	H	H	X	H	H		H		H	H	H	H		

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
7	18SV	SV	5	X														Alfa-4, Alfa-9, Alfa-16	Extent evaluation of Alfa-8.
--	66	SS	0		X	X	X	X		X		X			X				Data gap evaluation for tanks discovered during aerial review. COCs include TPHs, VOCs, energetics, SVOCs, PAHs, PCBs, and metals. Sample AATS01S01 had a TPH detection.
		SO	5		X	H	H	X		H		H			H				
--	67	SS	0		X	X	X	X		X		X			X				Data gap evaluation for tanks discovered during aerial review. COCs include TPHs, VOCs, energetics, SVOCs, PAHs, PCBs, and metals. Sample AATS01S02 had a TPH detection.
		SO	5		X	H	H	X		H		H			H				
7	68	SS	0		X	X	X	X	X	X		X			X			Alfa-2, Alfa-3, Alfa-4, Alfa-6, Alfa-9	Extent evaluation of Alfa-10 and Alfa-11. COCs include TPH, VOCs, energetics, metals, PCB, pesticide, PAHs, and SVOCs. Samples AASV1062, AABS1083, AABS1012, AABS1033, and AATS01S03 had detections or non-detected concentrations that exceeded screening criteria for metals, PAHs, phthalates, TPH, and VOCs. Additional COCs are proposed based on historic chemical use at Alfa-10 and Alfa-11.
		SO	5		X	H	H	X	H	H		H			H				
7	19SV	SV	5	X														Alfa-3, Alfa-4, Alfa-6, Alfa-9,	Extent evaluation of Alfa-10 and Alfa-11.
1, 7	69	SS	0		X	X	X	X		X	X	X		X	X	X	X	Alfa-2, Alfa-3, Alfa-4, Alfa-6, Alfa-9	Eastern extent evaluation of Alfa-8 and western extent evaluation of Alfa-10. Sample will be collected beneath pipeline. COCs include TPH, VOCs, energetics, perchlorate dioxins, SVOCs, formaldehyde, NDMA, PAHs, PCBs, and metals Samples AASV1013, AASV08, and AABS1010 had detections or non-detected concentrations that exceeded screening criteria for TPH and VOCs. Additional COCs are proposed based on historic chemical use at Alfa-8 and Alfa-10.
		SO	5		X	H	H	X		H	H	H		H	H	H	H		
1,7	20SV	SV	5	X														Alfa-3, Alfa-4, Alfa-6, Alfa-9,	Eastern extent evaluation of Alfa-8 and western extent evaluation of Alfa-10.
1	70	SS	0		X	X		X			X			X	X	X	X		Western extent evaluation of Alfa-8. Sample will be collected beneath pipeline. COCs include TPH, VOCs, SVOCs, formaldehyde, NDMA, energetics, perchlorate and dioxins. Sample AABS23 had a TPH detection. Additional COCs are proposed based on historic chemical use in pipelines.
		SO	5		X	H		X			H			H	H	H	H		
1	21SV	SV	5	X														Alfa-16	Extent evaluation of Alfa-8.
1	71	SS	0		X			X			X				X	X			Eastern extent evaluation of Alfa-6. Sample will be collected beneath pipeline. COCs include TPH, VOCs, energetics, perchlorate and dioxins. Sample AABS23 had a TPH detection. Additional COCs are proposed based on historic chemical use in pipelines.
		SO	5		X			X			H				H	H			
1	72	SS	0		X			X			X				X	X			Northern extent evaluation of Alfa-6. COCs include TPH, VOCs, energetics, perchlorate and dioxins. Sample AABS1034 had a PCB detection. Additional COCs are proposed based on historic chemical use at Alfa-6.
		SO	5		X			X			H				H	H			
1	73	SS	0		X			X			X				X	X			Southern extent evaluation of Alfa-6. COCs include TPH, VOCs, energetics, perchlorate and dioxins. Sample AABS1034 had a PCB detection. Additional COCs are proposed based on historic chemical use at Alfa-6.
		SO	5		X			X			H				H	H			

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
1	74	SS	0		X			X			X				X	X			Western extent evaluation of Alfa-6. Sample will be collected beneath pipeline. COCs include TPH, VOCs, energetics, perchlorate and dioxins. Sample AABS25 had a TPH detection. Additional COCs are proposed based on historic chemical use at Alfa-6.
		SO	5		X			X			H				H	H			
1, 2	75	SS	0		X			X		X	X				X				Eastern extent evaluation of Alfa-2 and AA Transformer. COCs include TPH, VOCs, energetics, PCBs, and dioxins. Samples AABS45 and ABSV1027 had PCB detections and non-detected VOC concentrations that exceeded the screening criteria. Additional COCs are proposed based on historic chemical use at Alfa-22 and the transformer.
		SO	5		X			X		H	H				H				
1, 3	76	SS	0		X	X		X		X	X	X			X			Alfa-9	Eastern extent evaluation of Alfa-2, northern extent evaluation of Alfa-4, and evaluation of potential releases from B208 Leach Field. COCs include TPH, VOCs, energetics, SVOCs, PAHs, PCBs, metals, and dioxins. Samples AABS25 and AABS1087 had detections or non-detected concentrations that exceeded screening criteria for TPH, phthalates, and VOCs. Additional COCs are proposed based on historic chemical use at Alfa-2 and Alfa-4.
		SO	5		X	H		X		H	H	H			H				
1,3	22SV	SV	5	X														Alfa-9, Alfa-16	Extent evaluation of Alfa-2 and Alfa-4, and evaluation of potential releases from B208 Leach Field.
3	77	SS	0		X	X	X	X		X	X	X			X			Alfa-9, Alfa-17	Eastern extent evaluation of Alfa-4 and evaluation of potential releases from B208 Leach Field. COCs include TPH, VOCs, energetics, SVOCs, PAHs, PCBs, metals and dioxins. Samples AABS1084, AABS1088, AABS1089, AABS1090, and ARPC-20 had detections or non-detected concentrations that exceeded screening criteria for energetics, pesticides, PAHs, phthalates, SVOCs, TPH, and VOCs. Additional COCs proposed based on historic chemical use at Alfa-4 and the B208 Leach Field.
		SO	5		X	H	H	X		H	H	H			H				
3	78	SS	0		X	X	X	X		X	X	X			X			Alfa-9, Alfa-17	Eastern extent evaluation of Alfa-3, Western extent evaluation of Alfa-4 and evaluation of potential releases from B208 Leach Field. COCs include TPH, VOCs, energetics, SVOCs, PAHs, PCBs, metals and dioxins. Samples AABS1003 and AABS1087 had detections or non-detected concentrations that exceeded screening criteria for energetics, metals, pesticides, PAHs, phthalates, SVOCs, TPH, and VOCs. Additional COCs proposed based on historic chemical use at Alfa-3, Alfa-4 and the B208 Leach Field.
		SO	5		X	H	H	X		H	H	H			H				
3	79	SS	0		X	X	X	X		X	X	X			X			Alfa-9, Alfa-17	Western extent evaluation of Alfa-3 and evaluation of potential releases from B208 Leach Field. COCs include TPH, VOCs, energetics, SVOCs, PAHs, PCBs, metals, and dioxins. Sample AABS1002 had detections or non-detected concentrations that exceeded screening criteria for energetics, pesticides, PAHs, phthalates, SVOCs, and VOCs. Additional COCs proposed based on historic chemical use at Alfa-3 and the B208 Leach Field.
		SO	5		X	H	H	X		H	H	H			H				
3	23SV	SV	5	X														Alfa-9, Alfa-16	Extent evaluation of Alfa-2.
1, 3	80	SS	0		X	X	X	X		X	X	X			X			Alfa-9	Western extent evaluation of Alfa-2. Sample will be collected beneath pipeline. COCs include TPH, VOCs, energetics, SVOCs, PAHs, PCBs, metals, and dioxins. Sample ABSV1029 had detections or non-detected concentrations that exceeded screening criteria for VOCs. Additional COCs proposed based on historic chemical use at Alfa-2 and the pipeline.
		SO	5		X	H	H	X		H	H	H			H				
1,3	24SV	SV	5	X														Alfa-9, Alfa-16	Extent evaluation of Alfa-2.
1	81	SS	0		X			X			X	X			X				Data gap evaluation. COCs include TPHs, VOCs, energetics, metals, and dioxins. Sample AABS28 had a TPH detection.
		SO	5		X			X			H	H			H				

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
1	82	SS	0		X			X			X	X			X				Data gap evaluation. COCs include TPHs, VOCs, energetics, metals, and dioxins. Sample AABS28 had a TPH detection.
		SO	5		X			X			H	H			H				
1	83	SS	0		X			X			X	X			X				Data gap evaluation. COCs include TPHs, VOCs, energetics, metals, and dioxins. Samples AABS29 and ABSV1030 had TPH detections and non-detected VOC concentrations that exceeded screening criteria.
		SO	5		X			X			H	H			H				
1	25SV	SV	5	X														Alfa-16	Data gap evaluation.
1	84	SS	0		X		X	X			X	X			X				Data gap evaluation. COCs include TPHs, VOCs, energetics, metals, and dioxins. Sample AABS30 and AABS1100 had detections and non-detected concentrations that exceeded screening criteria for dioxins, metals, PAHs, phthalates, and TPH.
		SO	5		X		H	X			H	H			H				
--	85	SS	0			X	X	X			X	X							Extent evaluation of Alfa-9. Debris extent samples will be collected within 10 feet of where debris was found. COCs include SVOCs. Sample AABS30 and AABS1100 had detections and non-detected concentrations that exceeded screening criteria for dioxins, metals, PAHs, phthalates, and TPH.
		SO	5			H	H	X			H	H							
--	86	SS	0			X	X	X			X	X							Extent evaluation of Alfa-9. Debris extent samples will be collected within 10 feet of where debris was found. COCs include SVOCs. Sample AABS30 and AABS1100 had detections and non-detected concentrations that exceeded screening criteria for dioxins, metals, PAHs, phthalates, and TPH.
		SO	5			H	H	X			H	H							
--	87	SS	0			X	X	X			X	X							Extent evaluation of Alfa-9. Debris extent samples will be collected within 10 feet of where debris was found. COCs include SVOCs. Sample AABS30 and AABS1100 had detections and non-detected concentrations that exceeded screening criteria for dioxins, metals, PAHs, phthalates, and TPH.
		SO	5			H	H	X			H	H							
5	88	SS	0			X	X	X		X		X							Evaluation of the Alfa Debris Area. Debris extent samples will be collected within 10 feet of where debris was found. COCs include SVOCs, PAHs, TPH, PCBs, and Metals.
		SO	5			H	H	X		H		H							
5	89	SS	0			X	X	X		X		X							Evaluation of the Alfa Debris Area. Debris extent samples will be collected within 10 feet of where debris was found. COCs include SVOCs, PAHs, TPH, PCBs, and Metals.
		SO	5			H	H	X		H		H							
5	90	SS	0			X	X	X		X		X							Evaluation of the Alfa Debris Area. Debris extent samples will be collected within 10 feet of where debris was found. COCs include SVOCs, PAHs, TPH, PCBs, and Metals.
		SO	5			H	H	X		H		H							
5	91	SS	0			X	X	X		X		X							Evaluation of the Alfa Debris Area. Debris extent samples will be collected within 10 feet of where debris was found. COCs include SVOCs, PAHs, TPH, PCBs, and Metals.
		SO	5			H	H	X		H		H							

TABLE 1.8-2
Data Quality Objectives: Alfa Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s)* (Top Depth, ft bgs)	VOCs (SV) (EPA Method 8260B)	VOCs [1,2] EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C SIM)	TPH (EPA Method 8015B)	Pesticides (EPA Method 8081)	PCBs (EPA Method 8082)	Dioxans/Furans (EPA Method 8290 1613B)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Formaldehyde (EPA Method 8315A)	Energetics (EPA Method 8330A)	Perchlorate (EPA Method 8321/331.0/6850/6869)	NDMA (EPA Method 1625C)	DTSC GSU Comment No(s).	Rationale / Comments [2]
5	92	SS	0			X	X	X		X		X							Evaluation of the Alfa Debris Area. Debris extent samples will be collected within 10 feet of where debris was found. COCs include SVOCs, PAHs, TPH, PCBs, and Metals.
		SO	5			H	H	X		H		H							

Notes:
CUA = chemical use area
ID = identification
ft bgs = feet below ground surface
VOC = volatile organic compound
EPA = Environmental Protection Agency
SVOC = semivolatile organic compound
PAH = polycyclic aromatic hydrocarbon
NDMA = n-nitrosodimethylamine
SIM = select ion monitoring
H = Sample will be held until it is needed; that is, to delineate a detection in shallower samples at the same location or nearby locations.

* Per comment on response to DTSC Comment 98, it is assumed that the disturbed area was regraded, affecting the top 6" to 1 ft of soil; therefore, the shallow samples will be collected at 1' bgs. Samples will continue to be collected in successive 5-ft intervals and just above bedrock. Per comment on response to DTSC Comment 87, due to soil disturbance and redistribution, analytical results for shallow samples cannot be assumed to be an indicator of underlying conditions, and deeper samples should be analyzed. This applies for all Alfa locations where post-demolition grading has occurred and for the Alfa standard or supplemental suite chemicals proposed for analyses.

1. Hold VOC samples where TPH samples also are collected. The VOC suite will be analyzed if TPHs are detected at elevated concentrations.
2. Surface soil VOC samples should be collected from 1 to 2 feet.

TABLE 1.9-1
Chemical Use Areas at the Bravo Area
NASA SSFL, Ventura County, California

Chemical Use Area Types and Typical Target Analytical Suites							
	Petroleum Fuels / Solvents		**Energetic Constituents / Propellants**	**Transformers**	**Oil-Related Materials and Debris**		
Chemical Use Area Name	**TPH, VOCs [1]**	**PAHs[2] and SVOCs**	**Hydrazine, NDMA, UDMH, MMH, NTO, Formaldehyde, Metals**	**PCBs**	**SVOCs, PAHs [2], TPH, PCBs, Metals**	**Dioxins**	**Pesticides**
1 - Alfa Bravo Skim Pond and Associated Drainage Channels	X	X	X		X	X	X
2 - Bravo Skim Pond and Associated Drainage Channels	X	X	X		X	X	X
3 - B217 Leach Field	X		X	X	X		
4 - B2214 and Solvent Storage Shed	X				X	X	
5 - Bravo Test Stands	X		X		X		
6 - Bravo Aerial Deposition Area	X						

Notes:
MMH = monomethyl hydrazine
NDMA = n-nitrosodimethylamine
NTO = nitrogen tetroxide
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
SVOC = semivolatile organic compound
TPH = total petroleum hydrocarbons
UDMH = unsymmetrical dimethyl hydrazine
VOC = volatile organic compound
[1.] VOCs are a COPC for TPH-gasoline.
[2.] SVOCs and PAHs are COPCs for TPH-diesel.

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
1	1	SS	0		X	X	X			X	X	X	X			X	Extent evaluation of PRA Bravo-5 and south of sample APBS-277 which reported ND in excess of applicable RLs, however, a data gap has been identified outside and to the southwest of PRA Bravo-5. Also, sample SB_APSB-1 had an exceedance of SVOC/PAHs and is located to the north. Additional analysis will evaluate for COPCs which include VOCs, SVOC/PAHs, TPH, PCBs, metals, dioxins, and energetics.
		SO	5		X	H	H			X	H	H	H			H	
1	1SV		5	X													Soil vapor sample to address the data gap identified southwest of PRA Bravo-5.
1	2	SS	0		X	X	X			X	X	X	X			X	Extent evaluation south of sample APBS-289 which reported ND in excess of applicable RLs, however, a data gap has been identified outside the Alfa Bravo Skim Pond. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, dioxins, and energetics.
		SO	5		X	H	H			X	H	H	H			H	
1	2SV		5	X													Soil vapor sample to address the data gap identified on the south side of the Alfa Bravo Skim Pond.
1	3	SS	0			X	X			X	X	X	X			X	Extent evaluation of PRA Bravo-4 and east of sample SB_ABSP-3 which reported an exceedance of SVOCs. Additionally, an evaluation sample north of the Alfa Bravo Skim Pond will address extent of data gap. Additional analysis will address COPCs which include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5			H	H			X	H	H	H			H	
1	3SV	SV	5	X													Soil vapor sample to address the data gap identified on the north side of the Alfa Bravo Skim Pond.
1	4	SS	0		X	X	X			X	X	X	X			X	Extent evaluation southeast of sample APBS-334 which reported exceedance of VOCs. Additionally, a data gap has been identified south the Alfa Bravo Skim Pond. Additional analysis will address COPCs which include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5		X	H	H			X	H	H	H			H	

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
1	4SV	SV	5	X													Soil vapor sample to address the data gap identified on the southern side of the Alfa Bravo Skim Pond.
1	5	SS	0		X	X	X			X	X	X	X			X	Extent evaluation northwest of sample APBS-53 which reported ND in excess of applicable RLs, however, a data gap has been identified outside the Alfa Bravo Skim Pond. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5		X	H	H			X	H	H	H			H	
1	5SV	SV	5	X													Soil vapor sample to address the data gap identified on the north side of the Alfa Bravo Skim Pond.
1	6	SS	0		X	X	X			X	X	X	X			X	Extent evaluation southeast of sample APBS-95 which reported ND in excess of applicable RLs, however, a data gap has been identified outside the Alfa Bravo Skim Pond. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5		X	H	H			X	H	H	H			H	
1	6SV	SV	5	X													Soil vapor sample to address the data gap identified on the north side of the Alfa Bravo Skim Pond.
1	7	SS	0		X	X	X									X	Reevaluate soils at sample ARPC-2. Initial sampling reported ND in excess of applicable RLs. Evaluate for COPCs that include VOCs, SVOCs/PAHs, and energetics.
		SO	5		X	H	H									H	
1	7SV	SV	5	X													Soil vapor sample to address the data gap identified east of the Alfa Bravo Skim Pond.
1	8	SS	0		X	X				X	X	X	X			X	Data gap evaluation sample on the northwest side of the Alfa Bravo Skim Pond. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5		X	H				X	H	H	H			H	
1	8SV	SV	5	X													Soil vapor sample to address the data gap identified on the northwest side of the Alfa Bravo Skim Pond.
1	9	SS	0			X	X			X						X	Extent evaluation of PRA Bravo-4 and north of sample SB_ABSP-3 in the Bravo Test Stand 1 Area. Additional analysis will address COPCs which include SVOC/PAHs, TPH, and energetics.
		SO	5			H	H			X						H	

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
1	10	SS	0		X	X	X			X	X		X			X	Extent evaluation of PRA Bravo-4, and west of sample SB_ABSP-3 in the Bravo Test Stand 1. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5		X	H	H			X	H		H			H	
1	9SV	SV	5	X													Extent soil vapor sample to address VOC exceedance in sample BVSP02, located west of the Alfa Bravo Skim Pond.
1	11	SS	0			X	X			X	X	X	X			X	Extent evaluation of PRA Bravo-3, east of sample BVBS0049, with an exceedance in TPH, west of the Alfa Bravo Skim Pond. Additional analysis will address the reported ND in excess of applicable RLs. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5			H	H			X	H	H	H			H	
1	12	SS	0			X	X			X	X	X	X			X	Extent evaluation of PRA Bravo-3, northwest of sample BVBS0049, with an exceedance in TPH, west of the Alfa Bravo Skim Pond. Additional analysis will address the reported ND in excess of applicable RLs and pipeline. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5			H	H			X	H	H	H			H	
1	13	SS	0			X	X			X	X	X	X			X	Extent evaluation of PRA Bravo-3, southwest of sample BVBS0049, with an exceedance in TPH, west of the Alfa Bravo Skim Pond. Additional analysis will address the reported ND in excess of applicable RLs. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5			H	H			X	H	H	H			H	
1	14	SS	0			X	X			X	X	X	X			X	Extent evaluation of PRA Bravo-3 and south of sample BVBS0049, with an exceedance in TPH, west of the Alfa Bravo Skim Pond. Additional analysis will address the reported ND in excess of applicable RLs. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5			H	H			X	H	H	H			H	

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
1	15	SS	0			X	X			X	X	X	X			X	Extent evaluation south of PRA Bravo-3, west of the Alfa Bravo Skim Pond. Additional analysis will address the reported ND in excess of applicable RLs. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5			H	H			X	H	H	H			H	
--	16	SS	0		X					X				X			Extent evaluation to the north of PRA Bravo-13, to address TPH exceedance at debris pile containing soil piles intermixed with construction debris. Sample will be collected within 10 feet of where debris is located. COPCs include VOCs, Hg and TPH.
		SO	5		X					X				H			
--	17	SS	0		X					X				X			Extent evaluation to the west of PRA Bravo-13, to address TPH exceedance at debris pile containing soil piles intermixed with construction debris. Sample will be collected within 10 feet of where debris is located. COPCs include VOCs, Hg and TPH.
		SO	5		X					X				H			
--	18	SS	0		X					X				X			Extent evaluation to the south of PRA Bravo-13, to address TPH exceedance at debris pile containing soil piles intermixed with construction debris. Sample will be collected within 10 feet of where debris is located. COPCs include VOCs, Hg and TPH.
		SO	5		X					X				H			
--	19	SS	0		X					X				X			Extent evaluation to the west of PRA Bravo-13, to address TPH exceedance at debris pile containing soil piles intermixed with construction debris. Sample will be collected within 10 feet of where debris is located. COPCs include VOCs, Hg and TPH.
		SO	5		X					X				H			
--	20	SS	0										X				Extent evaluation northeast of PRA Bravo-15, east of B213, to address an exceedance of zinc and thallium in sample BVBS0053. COPCs include SVOC/PAHs, PCBs, metals, and energetics.
		SO	5										X				
--	21	SS	0								X						Reevaluate soils at sample BVBS45, adjacent to transformer. Initial sampling reported ND in excess of applicable RLs for PCBs only. COPCs include PCBs.
		SO	5								X						

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
--	22	SS	0		X	X										X	Extent evaluation northeast of PRA Bravo-14, southeast of B213, to address an exceedance of phenol in leach field sample BVBS1013. Additional analysis will address the reported ND in excess of applicable RLs (Energetics). COPCs include VOCs, SVOC/PAHs, PCBs, metals, and energetics.
		SO	5		X	H										H	
--	23	SS	0		X	X										X	Extent evaluation south of PRA Bravo-14, south of B213, to address an exceedance of phenol in leach field sample BVBS1013. Additional analysis will address the reported ND in excess of applicable RLs (Energetics). COPCs include VOCs, SVOC/PAHs, PCBs, metals, and energetics.
		SO	5		X	H										H	
--	24	SS	0		X	X	X									X	Reevaluate soils at sample BVBS1012. Initial sampling reported ND in excess of applicable RLs. Evaluate for COPCs that include VOCs, SVOCs/PAHs, and energetics.
		SO	5		X	H	H									H	
--	25	SS	0		X					X							Reevaluate soils at sample BVBS1066, adjacent to debris pile. Initial sampling reported ND in excess of applicable RLs. Sample will be collected within 10 feet of where debris is located. Evaluate for COPCs that include VOCs and TPH.
		SO	5		X					X							
--	10SV	SV	5	X													Extent soil vapor sample north of PRA Bravo-2, to address VOC exceedance in sample BVSV0021, located northwest of the B217 leach field.
		SV	10	X													
--	11SV	SV	5	X													Extent soil vapor sample southwest of PRA Bravo-2, to address VOC exceedance in sample BVSV0021, located northwest of the B217 leach field.
		SV	10	X													
--	12SV	SV	5	X													Extent soil vapor sample south of PRA Bravo-2, to address VOC exceedance in sample BVSV0021, located northwest of the B217 leach field.
		SV	10	X													
--	13SV	SV	5	X													Extent soil vapor sample east of PRA Bravo-2, to address VOC exceedance in sample BVSV0021, located northwest of the B217 leach field.
		SV	10	X													

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
--	26	SS	0		X					X							Reevaluate soils at sample BVBS1067, adjacent to debris pile. Initial sampling reported ND in excess of applicable RLs. Sample will be collected within 10 feet of where debris is located. Evaluate for COPCs that include VOCs and TPH.
		SO	5		X					X							
--	27	SS	0		X	X				X		X	X				Data gap evaluation sample on the west side of the Bravo Area, adjacent to pipeline identified during aerial photograph review. Sample will be collected beneath observed pipeline. COPCs include VOCs, SVOC/PAHs, TPH, metals, and dioxins.
		SO	5		X	H				X		H	H				
--	14SV	SV	5	X													Soil vapor sample to address the new pipeline feature identified during the aerial photograph review.
--	28	SS	0		X	X	X			X		X	X				Data gap evaluation sample on the west side of the Bravo Area, adjacent to pipeline identified during aerial photograph review. Sample will be collected beneath observed pipeline. COPCs include VOCs, SVOC/PAHs, TPH, metals, and dioxins.
		SO	5		X	H	H			X		H	H				
--	15SV	SV	5	X													Soil vapor sample to address the new pipeline feature identified during the aerial photograph review.
6	29	SS	0							X							Bravo Area Rocket Testing Dispersion Area sampling. COPCs include VOCs, TPHs, dioxins, and energetics.
		SO	2							X							
6	30	SS	0							X							Bravo Area Rocket Testing Dispersion Area sampling. COPCs include VOCs, TPHs, dioxins, and energetics.
		SO	2							X							
6	31	SS	0							X							Bravo Area Rocket Testing Dispersion Area sampling. COPCs include VOCs, TPHs, dioxins, and energetics.
		SO	2							X							
6	32	SS	0							X							Bravo Area Rocket Testing Dispersion Area sampling. COPCs include VOCs, TPHs, dioxins, and energetics.
		SO	2							X							

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
6	33	SS	0							X							Bravo Area Rocket Testing Dispersion Area sampling. COPCs include VOCs, TPHs, dioxins, and energetics.
		SO	2							X							
6	34	SS	0							X							Bravo Area Rocket Testing Dispersion Area sampling. COPCs include VOCs, TPHs, dioxins, and energetics.
		SO	2							X							
6	35	SS	0							X							Bravo Area Rocket Testing Dispersion Area sampling. COPCs include VOCs, TPHs, dioxins, and energetics.
		SO	2							X							
6	36	SS	0							X							Reevaluate soils at sample BVBS29, west of PRA Bravo-1. Initial sampling reported ND in excess of applicable RLs for TPH only. Evaluate for COPCs that include TPH.
		SO	5							X							
6	37	SS	0				X			X							Extent evaluation of PRA Bravo-1 and north of sample BVBS1038 which reported TPH exceedances at 4.5 and 6.5 ft bgs, and ND in excess of applicable RLs for SVOC/PAHs along Bravo Road. COPCs include SVOC/PAHs and TPH.
		SO	5				H			X							
		SO	10				H			X							
6	63SV	SV	5	X													Reevaluate soil vapor at sample BVSV1000, north of PRA Bravo-1. Initial sampling reported ND in excess of applicable RLs.
--	38	SS	0							X							Extent evaluation of PRA Bravo-2 and north of vapor sample BVSV0021 which reported exceedances. COPCs include TPH.
		SO	5							X							
--	39	SS	0							X							Extent evaluation of PRA Bravo-2 and east of vapor sample BVSV0021 which reported exceedances. COPCs include TPH.
		SO	5							X							
--	40	SS	0							X							Extent evaluation of PRA Bravo-2 and south of vapor sample BVSV0021 which reported exceedances. COPCs include TPH.
		SO	5							X							

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
--	41	SS	0							X							Extent evaluation of PRA Bravo-2 and southwest of vapor sample BVSV0021 which reported exceedances. COPCs include TPH.
		SO	5							X							
6	42	SS	0				X			X							Extent evaluation of PRA Bravo-1 and southeast of sample BVBS1018 which reported exceedances TPH and PAH exceedances. COPCs include TPH and SVOCs.
		SO	5				H			X							
6	16SV	SV	5	X													Evaluate soil vapor at sample southeast PRA Bravo-1 with a TPH exceedance in soil sample BVBS1018.
6	43	SS	0		X	X	X			X	X	X	X				Extent evaluation of PRA Bravo-1 and south of sample BVBS1053 which reported exceedances of TPH-diesel only. Additional analysis will address the pipelines in the area. Sample will be collected beneath pipeline. COPCs include TPH and SVOCs.
		SO	5		X	H	H			X	H	H	H				
6	17SV	SV	5	X													Evaluate soil vapor south of PRA Bravo-1 with a TPH-diesel exceedance in soil sample BVBS1053.
6	44	SS	0				X			X							Extent evaluation of PRA Bravo-1 and west of sample BVBS1053 which reported exceedances of TPH-diesel only. COPCs include TPH and SVOCs.
		SO	5				H			X							
6	18SV	SV	5	X													Evaluate soil vapor west of PRA Bravo-1 with a TPH-diesel exceedance in soil sample BVBS1053.
6	19SV	SV	5	X													Reevaluate soil vapor at sample BVSV1002, east of PRA Bravo-1. Initial sampling reported ND in excess of applicable RLs.
5	20SV	SV	5	X													Reevaluate soil vapor at sample BVSV1003, north of B2730. Initial sampling reported ND in excess of applicable RLs.
5	45	SS	0							X							Reevaluate soils at sample BVBS35, northwest of B2730. Initial sampling reported ND in excess of applicable RLs for TPH only. Evaluate for COPCs that include TPH.
		SO	5							X							

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
5	21SV	SV	5	X													Extent soil vapor at sample due to exceedance in BVSV10, north of B2730.
5	22SV	SV	5	X													Extent soil vapor at sample due to exceedance in BVSV10, northwest of B2730.
5	46	SS	0										X				Reevaluate soils at sample BVBS1006, north of B2730 for exceedance of cadmium only. COPCs include TPH and metals.
		SO	5										H				
5	23SV	SV	5	X													Extent soil vapor at sample due to exceedance in BVSV10, north of B2730.
5	47	SS	0		X	X	X			X	X	X	X			X	Evaluation south of Bravo Skim Pond drainage channel. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5		X	H	H			X	H	H	H			H	
5	24SV	SV	5	X													Extent evaluation to the east of soil vapor exceedance in BVPV03.
	48	SS	0		X	X	X			X	X		X			X	Evaluation south of Bravo Skim Pond drainage channel, adjacent to a rock outcrop. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5		X	H	H			X	H		H			H	
2	25SV	SV	5	X													Extent evaluation to the southeast of soil vapor exceedance in BVPV03.
2	49	SS	0										X	X			Extent evaluation southwest of PRA Bravo-9, and west of sample BVSS01, BVSS08, and BVBS1024 to address exceedances of metals. COPCs include SVOC/PAHs, PCBs, metals, and energetics.
		SO	5										H	H			
2	50	SS	0		X	X	X			X	X		X	X		X	Reevaluate soils at sample BVSS04, southwest of PRA Bravo-9 to address exceedance for metals only. Additional analysis will address the data gap. COPCs include VOCs, SVOC/PAHs, PCBs, metals, and energetics.
		SO	5		X	H	H			X	H		H	H		H	

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
2	26SV	SV	5	X													Evaluation to the address data gap identified southwest of PRA Bravo-9.
2	51	SS	0		X	X				X	X	X	X		X		Extent evaluation in the northwest corner of the B217 leach field to address exceedance BVBS07 in PRA Bravo-7. Additional analysis will address operations associated with B217. COPCs include VOCs, SVOC/PAHs, PCBs, TPH, metals, dioxins, and perchlorate.
		SO	5		X	H				X	H	H	H		H		
2	27SV	SV	5	X													Extent evaluation soil vapor sample in the northwest corner of the B217 leach field to address exceedance from SV-LF217-1, in PRA Bravo-7.
2	52	SS	0							X	X		X	X			Extent evaluation of PRA Bravo-9, south of Bravo Skim Pond for exceedances of Aroclor 1254 and TPH in sample BVBS1029, and exceedances of metals in sample BVSS02. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5							X	H		H	H			
--	53	SS	0							X							Reevaluate soils at sample BVBS36, along Bravo Road (and adjacent to pipeline) for reported ND in excess of applicable RLs for TPHs. COPCs include TPHs.
		SO	5							X							
2	54	SS	0		X	X	X			X	X	X	X			X	Data gap evaluation sample in the southernmost portion of PRA Bravo-9, within the drainage channel from the test stands to Bravo Skim Pond. COPCs include VOCs, SVOC/PAHs, TPH, metals, PCBs, and energetics.
		SO	5		X	H	H			X	H	H	H			H	
2	28SV	SV	5	X													Evaluation to the address data gap identified in southernmost portion of PRA Bravo-9.
2	55	SS	0		X	X	X			X	X		X			X	Data gap evaluation sample in the southernmost portion of PRA Bravo-9, within the drainage channel from the test stands to Bravo Skim Pond. COPCs include VOCs, SVOC/PAHs, TPH, metals, PCBs, and energetics.
		SO	5		X	H	H			X	H		H			H	
2	29SV	SV	5	X													Evaluation to the address data gap identified in southernmost portion of PRA Bravo-9.

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
2	56	SS	0										X	X			Extent evaluation of PRA Bravo-9, south of Bravo Skim Pond for exceedance of metals in sample BVSS03. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5										H	H			
2	57	SS	0			X	X			X	X		X				Extent evaluation of PRA Bravo-9, south of Bravo Skim Pond for exceedances of TPH, PCBs, metals, SVOC/PAHs in sample BVSS07 and BVBS1031. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5			H	H			X	H		H				
2	58	SS	0			X	X			X	X						Extent evaluation of PRA Bravo-9, southeast of Bravo Skim Pond for exceedances of PCBs and additional analysis to address reported ND in excess of applicable RLs for Phalates/PAHs and TPH in sample BVBS04. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5			H	H			X	H						
2	30SV	SV	5	X													Extent evaluation to the address exceedance in BVSV06, located in the southeast portion of Bravo Skim Pond of PRA Bravo-9.
2	59	SS	0			X	X			X	X			X			Extent evaluation of PRA Bravo-9, southeast of Bravo Skim Pond for exceedances of PCBs and mercury and additional analysis to address reported ND in excess of applicable RLs for Phalates/PAHs and TPH in sample BVBS04. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5			H	H			X	H			H			
2	31SV	SV	5	X													Reevaluate soil vapor at sample BVSV1006, northeast of PRA Bravo-9. Initial sampling reported ND in excess of applicable RLs.
2	32SV	SV	5	X													Reevaluate soil vapor at sample BVSV1005, north of PRA Bravo-9. Initial sampling reported ND in excess of applicable RLs.
2	60	SS	0							X							Extent evaluation for soils at sample BVBS22, northwest of PRA Bravo-9. Initial sampling reported exceedance of TPH at 14.5 ft bgs. COPCs include TPH.
		SO	5							X							
		SO	10							X							
		SO	15							X							

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
2	61	SS	0		X		X			X	X						Extent evaluation of PRA Bravo-9, west of Bravo Skim Pond for exceedances of VOCs, TPH, and PAHs in sample BVBS23 to 10 ft bgs. Additional analysis will address reported ND in excess of applicable RLs for PCBs. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and energetics.
		SO	5		X		H			X	H						
		SO	10		X		H			X	H						
2	33SV	SV	5	X													Extent soil vapor sample to address VOC exceedance in sample BVSV20, west of Bravo Skim Pond.
2	62	SS	0								X	X	X				Extent evaluation of PRA Bravo-9, southwest of Bravo Skim Pond for exceedances of dioxin, metals, and PCBs in sample BVSS08. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, dioxins, and energetics.
		SO	5								H	H	H				
2	34SV	SV	5	X													Extent soil vapor sample to address VOC exceedance in sample BVSV1004, west of Bravo Skim Pond.
2	63	SS	0		X	X	X			X	X	X	X		X	X	Extent evaluation of PRA Bravo-9, southwest of Bravo Skim Pond and along the drainage channel. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, dioxins, perchlorate, and energetics.
		SO	5		X	H	H			X	H	H	H		H	H	
2	64	SS	0		X	X	X			X	X	X	X		X	X	Extent evaluation of PRA Bravo-9, southwest of Bravo Skim Pond and along the drainage channel. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, dioxins, perchlorate, and energetics.
		SO	5		X	H	H			X	H	H	H		H	H	
--	65	SS	0		X	X	X			X	X		X				Data gap evaluation will address the an above ground pipe identified during the aerial photograph review. Sample will be collected beneath observed pipeline. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, and metals.
		SO	5		X	H	H			X	H		H				
--	35SV	SV	5	X													Evaluate soil vapor sample to address aboveground pipe northeast of the Bravo Skim Pond.
--	66	SS	0		X	X	X			X	X		X				Data gap evaluation will address the an above ground pipe identified during the aerial photograph review. Sample will be collected beneath observed pipeline. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, and metals.
		SO	5		X	H	H			X	H		H				

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
--	36SV	SV	5	X													Evaluate soil vapor sample to address aboveground pipe northeast of the Bravo Skim Pond.
--	67	SS	0		X	X	X			X	X		X				Data gap evaluation will address the an above ground pipe identified during the aerial photograph review. Sample will be collected beneath observed pipeline. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, and metals.
		SO	5		X	H	H			X	H		H				
--	37SV	SV	5	X													Evaluate soil vapor sample to address above ground pipe located northeast of the Bravo Skim Pond.
--	68	SS	0		X	X	X			X		X	X				Evaluation will address a former unknown AST identified during the aerial photograph review. Additional analysis will address the adjacent pipelines. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X	H	H			X		H	H				
--	38SV	SV	5	X													Evaluate soil vapor sample to address aboveground pipenortheast of the Bravo Skim Pond.
3	69	SS	0		X					X							Extent evaluation to the east of the B217 leach field to address exceedance BVBS07 in PRA Bravo-7. COPCs include VOCs, and TPH.
		SO	5		X					X							
3	39SV	SV	5	X													Extent evaluation soil vapor sample to address exceedance from SV-LF217-1, in PRA Bravo-7, adjacent to Bravo Road and the B217 leach field.
3	70	SS	0		X	X	X			X	X	X	X		X		Extent evaluation in the B217 leach field to address exceedance BVBS07 in PRA Bravo-7. Additional analysis will address operations associated with B217. COPCs include VOCs, SVOC/PAHs, PCBs, TPH, metals, dioxins, and perchlorate.
		SO	5		X	H	H			X	H	H	H		H		
3	40SV	SV	5	X													Extent evaluation soil vapor sample in B217 leach field to address exceedance from SV-LF217-1, in PRA Bravo-7.
5	71	SS	0							X							Extent evaluation east of B217 leach field and PRA Bravo-7, to address TPH exceedance in sample BVBS07. Proposed sampling is adjacent to the sewer distribution box. COPCs include VOCs and TPH.
		SO	5							X							
5	41SV	SV	5	X													Extent evaluation soil vapor sample in B217 leach field to address exceedance from SV-LF217-1, in PRA Bravo-7.

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
3	72	SS	0							X							Extent evaluation east of B217 leach field and south of PRA Bravo-7, to address TPH exceedance in sample BVBS07. COPCs include VOCs and TPH.
		SO	5							X							
3	42SV	SV	5	X													Extent evaluation soil vapor sample northwest of B731 and north of PRA Bravo-8, to address exceedances from BVSB01 and BVSB02.
5	73	SS	0		X	X	X			X			X				Extent evaluation adjacent to B731A and east of PRA Bravo-8, to address TPH exceedance in sample BVBS11. Location is also adjacent to a former AST, therefore, additional analysis will address the AST. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X	H	H			X			H				
5	43SV	SV	5	X													Extent evaluation soil vapor sample adjacent to B731A and east of Bravo-8, to address exceedances from BVSB01 and BVSB02.
5	74	SS	0							X							Extent evaluation and re-evaluation adjacent to B731A and east of PRA Bravo-8, to address TPH exceedances in samples BVBS11 and BVBS33, southeast of PRA Bravo-8. COPCs include VOCs and TPH.
		SO	5							X							
5	75	SS	0							X							Extent evaluation northwest between PRA Bravo-7 and Bravo-8, to address TPH exceedances in samples BVBS07 and BVBS11. COPCs include VOCs and TPH.
		SO	5							X							
5	44SV	SV	5	X													Extent evaluation soil vapor sample between PRA Bravo-7 and Bravo-8, to address exceedance from BVSB01.
3 & 5	76	SS	0		X					X			X				Extent evaluation northwest between PRA Bravo-6 and Bravo-8, to address TPH and chromium exceedances in samples BVBS1062 and TPH in sample BVBS11. COPCs include VOCs, TPH, and metals.
		SO	5		H					X			H				
3 & 5	45SV	SV	5	X													Extent evaluation soil vapor sample between PRA Bravo-6 and Bravo-8, to address exceedance from BVSV19.
3	77	SS	0		X	X	X			X	X	X	X		X		Extent evaluation northwest between PRA Bravo-6 to address TPH and chromium exceedances in samples BVBS1061 and BVBS1062. Additional analysis will address TPH in sample BVBS11, and the septic tank for B217 operations. COPCs include VOCs, TPH, metals, and perchlorate.
		SO	5		X	H	H			X	H	H	H		H		

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
3	46SV	SV	5	X													Extent evaluation soil vapor sample north of PRA Bravo-6, to address exceedances from BVSV1022 and BVSV1023.
3	78	SS	0		X	X	X			X		X	X				Extent evaluation southwest between PRA Bravo-6 to address TPH and chromium exceedances in sample BVBS1061. Additional analysis to address reported ND in excess of applicable RLs for VOCs and phalates adjacent pipeline. COPCs include VOCs, SVOCs/PAHs, TPH, and metals.
		SO	5		X	H	H			X		H	H				
3	47SV	SV	5	X													Reevaluate soil vapor at sample BVSV09, north of PRA Bravo-6. Initial sampling reported ND in excess of applicable RLs.
3	48SV	SV	5	X													Reevaluate soil vapor at sample BVSV15, west of PRA Bravo-6. Initial sampling reported ND in excess of applicable RLs.
3	49SV	SV	5	X													Reevaluate soil vapor at sample BVSV15, southwest of PRA Bravo-6. Initial sampling reported ND in excess of applicable RLs.
3	79	SS	0		X	X	X			X			X				Reevaluate soils to the southwest of PRA Bravo-6 to address reported ND in excess of applicable RLs for VOCs, SVOC/PAHs, and energetics in sample BVBS1000. Additional extent evaluation to address VOC and manganese exceedances in sample BVBS1060. COPCs include VOCs, SVOCs/PAHs, metals, and energetics.
		SO	5		X	H	H			X			H				
3	80	SS	0		X						X						Reevaluate soils to the south of PRA Bravo-6 to address PCBs exceedances in sample BVBS46, adjacent to transformers. Additional analysis will address evaluation of VOCs due to LOX tank cleaning activities. COPCs include VOCs and PCBs.
		SO	5		X						H						
3	50SV	SV	5	X													Reevaluate soil vapor at sample BVSV16, southeast of PRA Bravo-6. Initial sampling reported ND in excess of applicable RLs.
--	51SV	SV	5	X													Extent evaluation soil vapor sample southwest of PRA Bravo-11, to address exceedances from BVSV1025.
3	81	SS	0		X	X	X			X			X		X		Extent evaluation of soils between PRA Bravo-6 and Bravo-11 to address VOCs, SVOC/PAH exceedances in sample BVBS1059, and TPH-diesel in sample BVBS1008, and operations at B217. COPCs include VOCs, SVOC/PAHs, TPH, metals, and perchlorate.
		SO	5		X	H	H			X			H		H		

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
3	52SV	SV	5	X													Extent evaluation soil vapor sample between PRA Bravo -6 and Bravo-11, to address exceedances from BVSV1025, BVSV03, and BVSV1020.
5	82	SS	0		X	X	X			X		X			X		Reevaluate soils west of PRA Bravo-11 to address reported ND in excess of applicable RLs for VOCs, SVOC/PAH exceedances in sample BVBS0047 and TPH in samples BVBS21 and BVBS10. Extent sample to the west of TPH exceedance in sample BVBS10. Additional analysis will address the pipeline and possible igniters (perchlorate). COPCs include VOCs, SVOC/PAHs, and TPH.
		SO	5		X	H	H			X		H			H		
3	83	SS	0		X	X	X			X		X	X		X		Evaluate soils east of PRA Bravo-6, adjacent to B217 and sewer pipeline to address data gap. This location will also address sample BVBS1059 and BVBS1062 with VOCs, PAHs, TPH and chromium, and operations at B217. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and perchlorate.
		SO	5		X	H	H			X		H	H		H		
3	53SV	SV	5	X													Extent evaluation soil vapor sample east of PRA Bravo -6, adjacent to B217 and sewer pipeline to address exceedances from BVSV1023, BVSV19, BVSV03 and BVSV1020.
5	84	SS	0		X	X	X			X			X				Evaluate data gap in soils between B731 and B731A, near ASTs identified during the aerial photograph review. This location will also address TPH in sample BVBS11. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X	H	H			X			H				
5	53SV	SV	5	X													Extent evaluation soil vapor sample between B217 and B217A, to address exceedances from BVSV18.
5	85	SS	0		X		X			X			X		X		Extent evaluation north of PRA Bravo-11, south of Bravo 2 Test Stand (B731) and adjacent to a pipeline, to address exceedances of VOCs, PAHs, and TPH in sample BVBS1063, and TPH in sample BVBS13 and BVBS1022, and VOCs in sample BVBS1046 (beneath LOX tanks). Additional analysis will address pipeline and possible use of igniters at Bravo Test Stand 2. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X		H			X			H		H		
5	86	SS	0		X	X	X			X			X				Reevaluate soils east of Bravo Test Stand 2, beneath LOX tanks to address reported ND in excess of applicable RLs for VOCs in sample BVBS1047. Additional analysis will address ASTs. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X	H	H			X			H				

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
5	87	SS	0		X	X	X			X		X	X		X		Reevaluate soils east of Bravo Test Stand 2, adjacent to LOX tanks to address reported ND in excess of applicable RLs for VOCs in sample BVBS1045. Additional analysis will address ASTs and possible use of igniters at Bravo Test Stand 2. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X	H	H			X		H	H		H		
5	54SV	SV	5	X													Extent evaluation soil vapor sample adjacent to Bravo Test Stand 2 LOX tanks, in the drainage channel, to address data gap and exceedances from BVPV02.
4	88	SS	0		X	X	X			X			X			X	Evaluate soils within the drainage channel from Bravo Test Stand 3 to Bravo Skim Pond, to address data gap and solvent storage shed. COPCs include VOCs, SVOC/PAHs, TPH, metals, and energetics.
		SO	5		X	H	H			X			H			H	
4	55SV	SV	5	X													Extent evaluation soil vapor sample in the drainage channel from the test stands to Bravo Skim Pond, to address data gap and exceedances from BVPV02.
2	89	SS	0		X	X	X	X	X	X		X	X		X	X	Evaluate soils within the drainage channel from test stands to Bravo Skim Pond, to address data gap and possible use of igniters and hydrazine at Test Stand 3. COPCs include VOCs, SVOC/PAHs, TPH, metals, and energetics.
		SO	5		X	H	H	H	H	X		H	H		H	H	
2	56SV	SV	5	X													Extent evaluation soil vapor sample in the drainage channel from the test stands to Bravo Skim Pond, to address data gap and exceedances from BVPV02.
5	90	SS	0		X	X	X			X			X				Reevaluate soils between Bravo Test Stand 2 and ASTs to the north containing hydraulic fluid and RP-1. Sample BVBS1044 to address reported ND in excess of applicable RLs for VOCs. Additional analysis will address ASTs. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X	H	H			X			H				
5	91	SS	0		X	X	X			X			X				Evaluate soils adjacent to ASTs containing hydraulic fluid and RP-1, north of Bravo Test Stand 2. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X	H	H			X			H				
5	92	SS	0		X	X	X			X			X				Evaluate soils adjacent to ASTs containing hydraulic fluid and RP-1, north of Bravo Test Stand 2. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X	H	H			X			H				

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
5	93	SS	0		X	X	X			X			X			X	Extent evaluation east of drainage channel from Bravo Test Stand 3. COPCs include VOCs, SVOC/PAHs, TPH, metals, and energetics.
		SO	5		X	H	H			X			H			H	
5	57SV	SV	5	X													Extent evaluation soil vapor sample in the drainage channel from the test stands to Bravo Skim Pond, to address data gap and exceedances from BVPV01 and BVSV1011.
5	58SV	SV	5	X													Reevaluate soil vapor at sample BVSV1011, east of Bravo Test Stand 3 and north of PRA Bravo-12. Initial sampling reported ND in excess of applicable RLs.
4	59SV	SV	5	X													Reevaluate soil vapor at sample BVSV14, southeast of Bravo Test Stand 3 and north of PRA Bravo-12. Initial sampling reported ND in excess of applicable RLs.
4	94	SS	0		X	X	X			X	X	X	X				Extent evaluation southeast of Bravo Test Stand 3 and east of PRA Bravo-12 for TPH exceedance in sample BVBS1021. Additional analysis will address the former AST identified during the aerial review and the pipelines. COPCs include VOCs, TPH, and metals.
		SO	5		X	H	H			X	H	H	H				
2	95	SS	0		X	X	X	X	X	X		X	X		X	X	Reevaluate soils at sample BTSC-2/3-5, in drainage channel from Bravo Test Stand 3 to Bravo Skim Pond. Initial sampling reported ND in excess of applicable RLs for VOCs, SVOC/PAHs, and energetics. Additional analysis will address the possible presence of hydrazine in Test Stand 3, the data gap within the drainage channel, and the LOX tanks behind Test Stand 2. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals and energetics.
		SO	5		X	H	H	H	H	X		H	H		H	H	
4	96	SS	0		X			X	X	X					X		Extent evaluation south of Bravo Test Stand 3 and PRA Bravo-12 for TPH exceedances in samples BVBS32 and BVBS44. Additional analysis will address the possible use of igniters at Bravo Test Stand 3. COPCs include VOCs and TPH.
		SO	5		X			H	H	X					H		
4	60SV	SV	5	X													Reevaluate soil vapor at sample BVSV05, adjacent to Bravo Test Stand 3 and north of PRA Bravo-12. Initial sampling reported ND in excess of applicable RLs.

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
5	97	SS	0		X	X	X	X	X	X	X		X		X		Extent evaluation adjacent to Bravo Test Stand 3 and south of PRA Bravo-11 for TPH and VOC exceedances in samples BVBS13 and BVBS1064. Additional analysis will address concerns with the operations and equipment used in B732, the pipeline, and possible use of igniters and hydrazine. Proposed sample is adjacent to elbow in pipeline. COPCs include VOCs and TPH.
		SO	5		X	H	H	H	H	X	H		H		H		
4	98	SS	0		X	X	X			X		X	X				Reevaluate soils at sample BVBS19 west of Bravo Test Stand 3 (and adjacent to pipeline) for reported ND in excess of applicable RLs for VOCs. Additional analysis will also address proximity to solvent storage shed. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X	H	H			X		H	H				
4	99	SS	0		X					X							Extent evaluation south of Bravo Test Stand 3 and east of PRA Bravo-1 for VOC and TPH exceedances in sample BVBS09. Proposed sample is between two pipelines and near the solvent storage shed. COPCs include VOCs and TPH.
		SO	5		X					X							
4	61SV	SV	5	X													Reevaluate soil vapor at sample BVSV1013, south of Bravo Test Stand 3 and east of PRA Bravo-10. Initial sampling reported ND in excess of applicable RLs.
4	100	SS	0		X								X				Evaluate soils west of Bravo Test Stand 3, adjacent to LOX tanks to address cleaning activities associated with LOX tanks and pipelines. Additional analysis will address the LOX ASTs. Sample will be collected beneath the pipeline. COPCs include VOCs and metals.
		SO	5		X								H				
--	101	SS	0		X								X				Evaluate soils west of Bravo Test Stand 3, in western portion of LOX tanks to address cleaning activities associated with LOX tanks and pipelines. Additional analysis will address the LOX ASTs. COPCs include VOCs and metals.
		SO	5		X								H				
--	102	SS	0		X	X	X			X			X				Evaluate soils in the former Air Stripping Tower area. Analysis will address the COCs treated. COPCs include VOCs, SVOC/PAHs, TPH, and metals.
		SO	5		X	H	H			X			H				
3	103	SS	0		X	X	X			X		X	X		X		Evaluate soils south of B217, adjacent to the former building awning. Analysis will address operations at B217. COPCs include VOCs, SVOC/PAHs, TPH, PCBs, metals, and perchlorate.
		SO	5		X	H	H			X		H	H		H		

TABLE 1.9-2
Data Quality Objectives: Bravo Area
NASA SSFL Field Sampling Plan

CUA	Object ID	Matrix	Targeted Sampling Depth(s) (Top Depth, ft bgs)	VOCs (SV)[1] (EPA Method 8260B)	VOCs* (EPA Method 8260B)	SVOCs (EPA Method 8270C)	PAHs (EPA Method 8270C [SIM])	NDMA (EPA Method 8270C SIM)	Formaldehyde (EPA Method 8315A)	TPH (EPA Method 8015B)	PCBs (EPA Method 8082)	Dioxins/Furans (EPA Method 8290 1613)	Metals (EPA Method 6010/6020B)	Mercury (EPA 7471A)	Perchlorate (EPA Method 8321/331.0/6850/68	Energetics (EPA Method 8330A)	Rationale/Comments
6	104	SS	0		X					X		X					Evaluate data gap for pipeline along Bravo Road. Sample will be collected beneath the pipeline. COPCs include VOCs, TPHs, and dioxins.
		SO	5		X					X		H					
6	105	SS	0		X					X		X					Evaluate data gap for pipeline along Bravo Road toward Alfa Bravo Skim Pond drainage channel. Sample will be collected beneath the pipeline. COPCs include VOCs, TPHs, and dioxins.
		SO	5		X					X		H					
6	106	SS	0		X					X		X					Evaluate data gap for pipeline west of Bravo Road, toward HWCT area. Sample will be collected beneath pipeline. COPCs include VOCs, TPHs, and dioxins.
		SO	5		X					X		H					
3	107	SS	0		X	X	X			X	X	X	X		X		Extent evaluation in the southwest corner of the B217 leach field to address exceedance BVBS07 in PRA Bravo-7. Additional analysis will address operations associated with B217. COPCs include VOCs, SVOC/PAHs, PCBs, TPH, metals, dioxins, and perchlorate.
--		SO	5		X	H	H			X	H	H	H		H		
3	62SV	SV	5	X													Extent evaluation soil vapor sample in the southwestern corner of the B217 leach field to address exceedance from SV-LF217-1, in PRA Bravo-7.

Notes:
CUA = chemical use area
DTSC GSU = California Department of Toxic Substances Control Geological Services Unit
ft bgs = feet below ground surface
SS = surface sample
SO = subsurface sample
ID = identification
NDMA = n-nitrosodimethylamine
PCB = polychlorinated biphenyl
RBSL = risk-based screening level
SV = soil vapor
SVOC = semivolatile organic compound
SVOC SIM = SVOCs with selected ion monitoring
TPH = total petroleum hydrocarbon
VOC = volatile organic compound
H = Sample will be held until it is needed; that is, to delineate a detection in shallower samples at the same location or nearby locations.
* = Surface samples (SS) for VOCs will be collected at 1 ft bgs.
[1.] Actual vertical profile sampling depths may change as field conditions warrant; however, a sample will be collected from the bottom of each boring except where noted in rationale/comments.

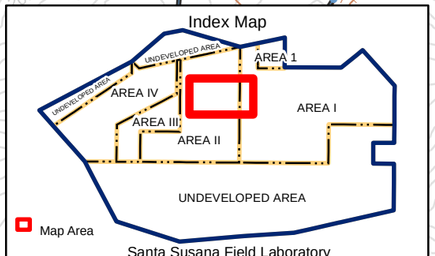
Figures

B515 STP
Ash Pile
Alfa Road
ABFF Pipeline and Water Conveyance Pipeline
AA Transformer
Fuel Filter
B208 Leach Field
Unknown Building
2208
2208A
Alfa
Alfa Drainage and Ponds
AREA II
Alfa Bravo Skim Pond
Alfa Skim Pond 5.11
Alfa Retention Pond 5.11
Bravo Skim Pond
Bravo
2Y
V-199
B212 Leach Field
UnknownTank-AA-4
Unknown-AT-AA-2
Unknown-AT-AA-1
B212 Leach Field
Unknown-AT-AA-19
Unknown-AT-AA-18
Unknown-AT-AA-5
2739
Valve Pit
Test Stand 1 5.9
Unknown-AT-AA-3
Unknown-AT-AA-4
2727A
2209
2209A
Test Stand 2 5.9
Test Area Tanks 5.10
Unknown Building
AT-24
AT-25
AT-26
UnknownTank-AA-3
Fuel Filter
V-1277
V-1278
V-57
Fuel Filter
Test Stand 3 5.9
Alfa Debris Area
2752
2212S
2212
Unknown-AT-AA-17
Valve Pit
2729A
2739
UnknownTank-AA-1
UnknownTank-AA-2
UnknownTank-AT-AA-6
UnknownTank-AT-AA-7
V-435
V-1277
V-1278
Unknown-AT-AA-12
Unknown-AT-AA-13
Unknown-AT-AA-14
Unknown-AT-AA-15
Unknown-AT-AA-16
Unknown-AT-AA-8
Unknown-AT-AA-9
Unknown-AT-AA-10
Unknown-AT-AA-11
AT-27
AT-28
V-1350
V-1370
V-1371
V-203
AREA I
Unknown-AT-AA-22
2X
Unknown Buildings

Legend

- Transformer Pole
- Manhole
- Debris Point
- Debris Line
- Leachfield
- Paved Road
- Dirt Road
- Water conveyance pipeline
- Trench
- Pipeline
- Pipeline, Removed
- Sewer Line
- Stream
- Rock Outcrop
- Fence
- Contour, 10ft interval
- Building
- Awning
- Concrete Pad/Slab
- Building, Removed
- Awning, Removed
- AST, Existing
- AST, Removed
- UST, Existing
- UST, Removed
- Not Yet Determined, Removed
- Pond, without water
- Pond, historical
- Asphalt Swale
- Asphalt, Developed
- SWMU or AOC
- Administrative Boundary
- SSFL Property Boundary

Index Map



Santa Susana Field Laboratory

0 50 100 200 Feet
0 15 30 60 Meters

30-Nov-2011
Drawn By:
A. Cooley

Figure 1.8-1 ALFA Site Map
Field Sampling Plan
Santa Susana Field Laboratory
Ventura County, California

Map Document: O:\NASA\SSFL\maps\FieldSamplingPlan\ALFA_FSPSiteMap_SDE.mxd

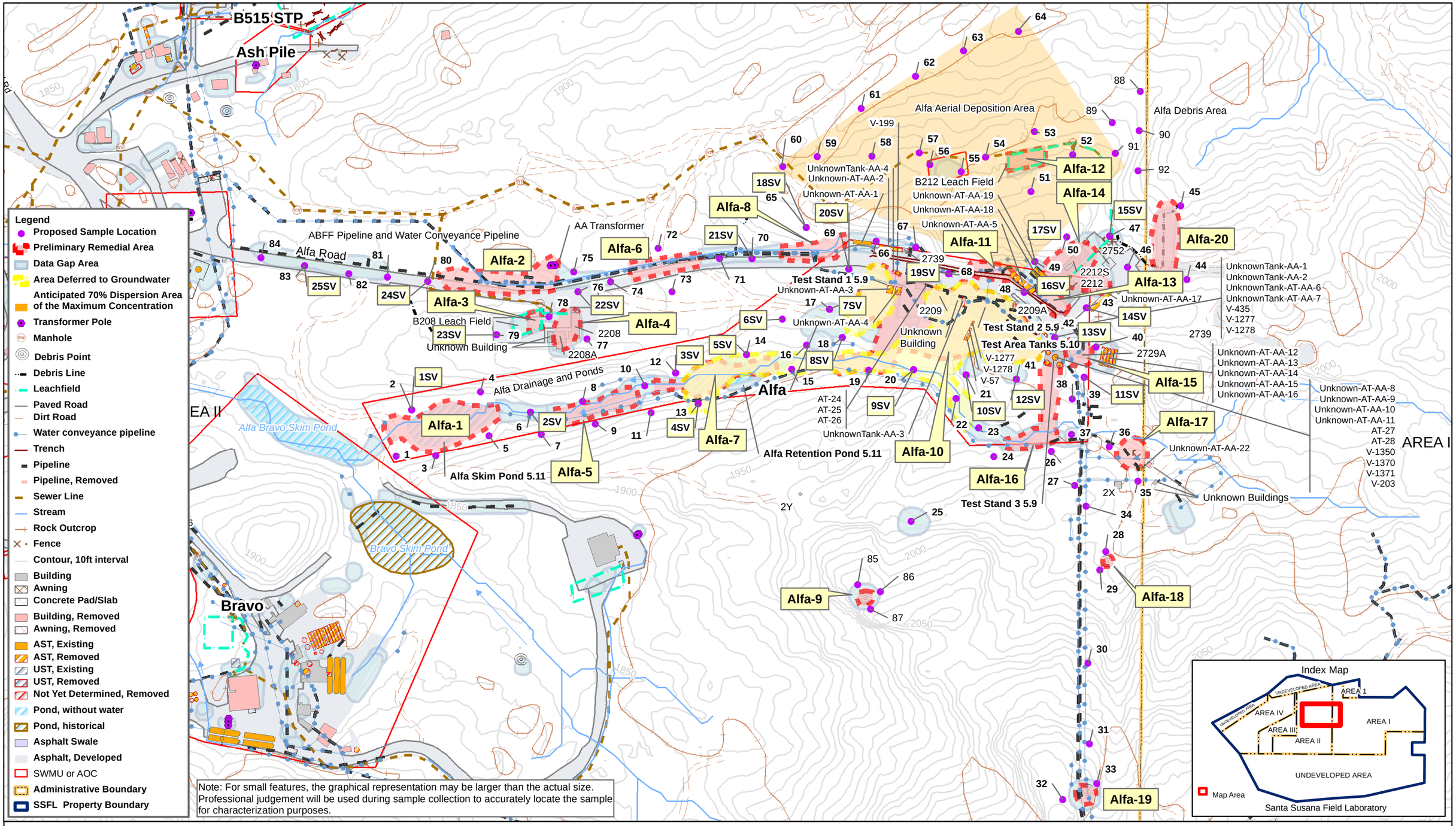
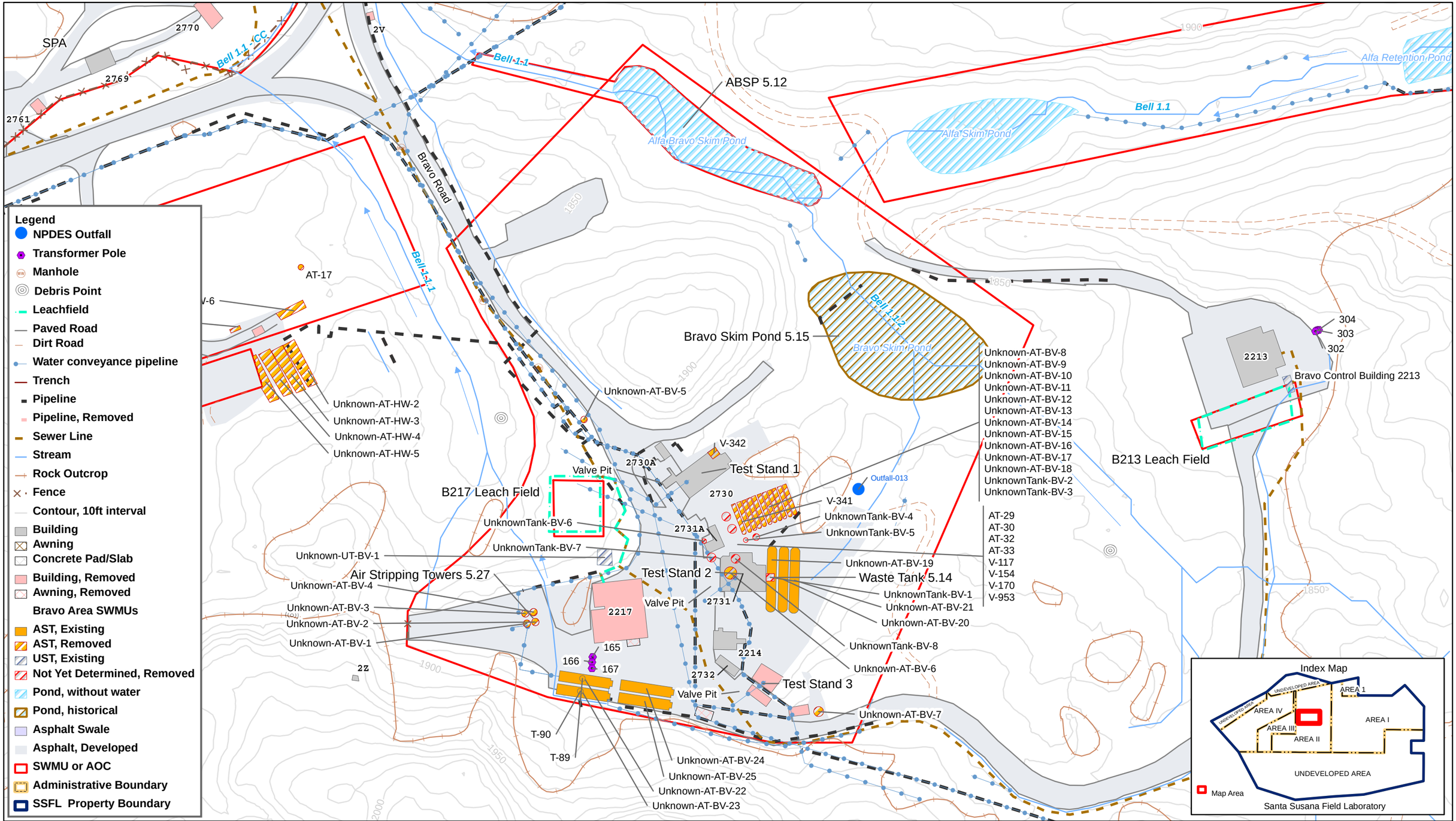


Figure1.8-2 ALFA Proposed Sample Locations
Field Sampling Plan
Santa Susana Field Laboratory
Ventura County, California

Map Document: O:\NASA\SSFL\maps\FieldSamplingPlan\ALFA_FSP_ProposedSampleLocs_SDE.mxd



30-Nov-2011
Drawn By:
A. Cooley

Figure 1.9-1 BRAVO Site Map
Field Sampling Plan
Santa Susana Field Laboratory
Ventura County, California

Map Document: O:\NASA\SSFL\maps\FieldSamplingPlan\BRAVO_FSPSiteMap_SDE.mxd

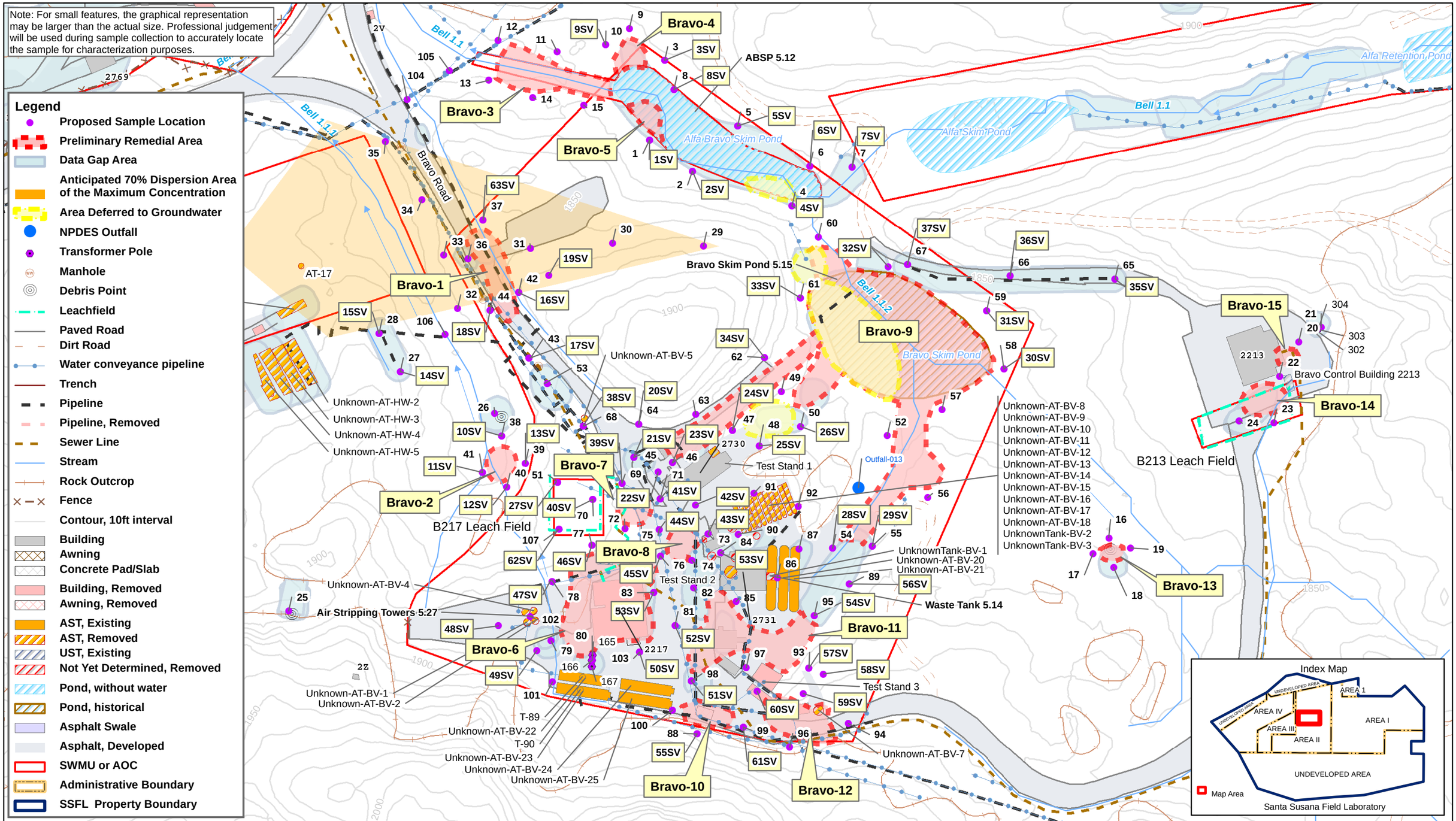


Figure 1.9-2 BRAVO Proposed Sample Locations
Field Sampling Plan
Santa Susana Field Laboratory
Ventura County, California

Map Document: O:\NASA\SSFL\maps\FieldSamplingPlan\BRAVO_FSP_ProposedSampleLocs_SDE.mxd